WEAM012101

Operation & Maintenance Manual

PC18MR-3

HYDRAULIC EXCAVATOR

SERIAL NUMBER

PC18MR-3 20668 and up

WARNING

Unsafe use of this machine may cause serious injury or death. Operators and maintenance personnel must read this manual before operating or maintaining this machine.

This manual should be kept inside the cab for reference and periodically reviewed by all personnel who will come into contact with the machine.

ORIGINAL INSTRUCTIONS

KOMATSU

Utility

1.1 FOREWORD

- This manual has been compiled by Komatsu Utility S.p.A. in order to supply customers with all the necessary information on the machine and on safety regulations, as well as the use and maintenance instructions that enable the operator to exploit the capacity of the machine with optimal results and to keep the machine efficient over time.
- The operation manual, together with the spare parts catalogue, is an integral part of the machine and must accompany it, even when it is resold, until its final disposal.
- The manual must be handled with the greatest care and always kept on board the machine, so that it can be consulted at any moment; it must be placed in the appropriate compartment inside the seat support, where the registration documents and the logbook are usually kept.
- This manual must be given to the staff who have to use the machine and carry out the routine maintenance operations; they must read the contents carefully more than once, in such a way as to clearly understand what are the correct operating conditions and the dangerous conditions that must be avoided.
  In case of loss or damage, request a new copy to Komatsu or your Komatsu Distributor.
- The illustrations contained in this manual may represent machine configurations available on request.
  Komatsu machines are constantly improved in order to increase their efficiency and reliability; this manual sums up all the information regarding the most recent technology applied at the moment in which the machine is launched.
  For any further and/or updated information, contact your Komatsu Distributor.
- Punctual periodic annotations regarding the maintenance operations that have been carried out are important, since they provide a clear report on the situation and say exactly what has been done and what has to be done after the next maintenance interval. Therefore, it is advisable to consult both the hour meter and the maintenance plan frequently.
- Over the years Komatsu Distributors have gathered considerable experience in customer service.
  If more information is needed, do not hesitate to contact your Komatsu Distributor: he always knows how to get the best performance from the machine, he can recommend the equipment that is most suitable for specific needs and can provide the technical assistance necessary for any change that may be required to conform the machine to the safety standards and traffic rules.
  Furthermore, Komatsu Distributors also offer assistance for the supply of Komatsu genuine spare parts, which guarantee safety and interchangeability.
- The table included in this manual must be filled in with the machine data, which are also the data that must be communicated to the Distributor when requiring assistance and ordering spare parts.

⚠ CAUTION

- **In this manual, the units of measurement of SI system are used, the similarities to English units of measurements are indicated ( ).**
- **The incorrect use of the machine and inappropriate maintenance operations may cause serious injury and even death.**
- **Operators and maintenance personnel must carefully read this manual before using the machine or performing maintenance operations.**
- **Any serious accident that may occur during the use of the machine or during maintenance operations is due to failure to comply with the instructions given herein.**
- **The application of the procedures and precautions described in this manual will ensure safety only provided that the machine is used correctly.**
  If the machine is used for any purpose or in any way other than those described herein, the operator shall be responsible for his own safety and for the safety of any other person involved.

1.2 INFORMATION ON SAFETY

Many accidents are caused by insufficient knowledge of and failure to comply with the safety regulations prescribed for the work and the maintenance operations that must be performed on the machine.
In order to avoid accidents, before starting work and before carrying out any maintenance operation, carefully read and be sure to understand all the information and warnings contained in this manual and given on the plates applied onto the machine. To enable the operator to use this machine safely, safety precautions are explained in this manual and labels and warning plates are affixed to the machine to highlight situations involving potential hazards and suggest how to avoid them.
Komatsu machines are manufactured and sold according to the rules or standards of the countries where they have to work. If the machines have to work in other countries, it is necessary to check that every safety devices and technical specifications are in compliance with the regulations in force; for this reason, ask Komatsu Distributor before using the machine.

Terminology used in the signs

The following words are used in the signs to inform the user that there is a potential hazard that may lead to personal injury or damage to property.
In this manual, on the labels and on the plates, the following words are used to express the potential level of the hazard.

⚠ DANGER

- **Indicates a situation of imminent danger that, if not avoided, may cause serious injury and even death. The use of this term must be limited to situations of extreme danger.**

⚠ WARNING

- **Indicates a situation of potential danger that, if not avoided, may cause serious injury and even death.**

⚠ CAUTION

- **Indicates a situation of potential danger that, if not avoided, may cause moderate injury. This term can also be used as a warning against dangerous interventions.**

Other terms used in the signs

In addition to those indicated above, the following warning terms are used to recommend the precautions to be taken to protect the machine or to supply useful information.

IMPORTANT

- **This term is used to indicate precautions that must be taken in order to avoid actions that may shorten the life of the machine.**

NOTE

- This word is used to indicate a useful piece of information.

Komatsu cannot reasonably predict every circumstance that might involve a potential hazard during the operation or maintenance of the machine; for this reason, the safety warnings included in this manual and applied onto the machine may not include all possible safety precautions.
If all the instructions given in relation to this machine are kept to, the operators and anyone in the vicinity can work in total safety, and do not run the risk of damaging the machine. In case of doubt regarding the safety measures necessary for some procedures, contact Komatsu or your local Komatsu Distributor.

⚠ DANGER

- **Before starting any maintenance operation, position the machine on a firm and level surface, lower the equipment to the ground, engage the safety locks of the equipment and the controls, and stop the engine.**

⚠ DANGER

- **To make the information clearer, some illustrations in this manual represent the machine without safety guards. Do not use the machine without guards and do not start the engine when the hood is open, unless this is expressly prescribed for certain maintenance operations.**

⚠ WARNING

- **It is strictly forbidden to modify the setting of the hydraulic system safety valves; Komatsu cannot be held liable for any damage to persons, property or the machine, if this has been tampered with by modifying the standard settings of the hydraulic system.**

⚠ WARNING

- **Before carrying out any electric welding, disconnect the battery and the alternator. (See "2.8.17 PRECAUTIONS TO BE TAKEN WHEN HANDLING THE BATTERY AND THE ALTERNATOR").**

⚠ WARNING

- **Install only optional tools or tools especially recommended and approved by Komatsu and that meet the requirements included in section "6.3.2 ATTACHMENT CONFIGURATION".**

⚠ DANGER

- **It is absolutely forbidden to operate the machine while standing on the ground.**
  Every single manoeuvre must be carried out by the operator, correctly seated in driving position.

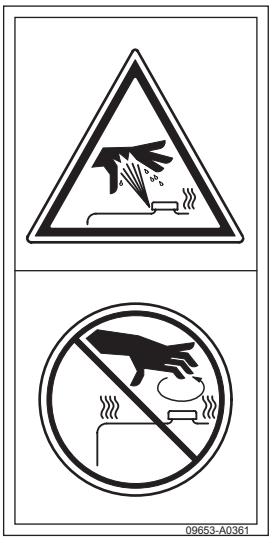
Safety labels

Safety labels are affixed to the machine to inform the operator or maintenance worker on the spot when carrying out operation or maintenance of the machine that may involve hazard.

This machine uses “Safety labels using pictograms“ to indicate safety procedures.

Safety labels using pictogram

Safety pictograms use a picture to express a level of hazardous condition equivalent to the signal word. These safety pictograms use pictures in order to let the operator or maintenance worker understand the level and type of hazardous condition at all times. Safety pictograms show the type of hazardous condition at the top or left side, and the method of avoiding the hazardous condition at the bottom or right side. In addition, the type of hazardous condition is displayed inside a triangle and the method of avoiding the hazardous condition is shown inside a circle.



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1.3 INTRODUCTION

1.3.1 INTENDED USE OF THE MACHINE

The Komatsu machines described in this manual have been designed and constructed to be used mainly for EXCAVATION and EARTH-MOVING OPERATIONS.

If provided with suitable safety devices, they can be used with authorized optional equipment having the characteristics illustrated in paragraph "6.3.2 ATTACHMENT CONFIGURATION".

1.3.2 IMPROPER OR UNAUTHORIZED USES

⚠ CAUTION

- **This paragraph describes some of the improper or unauthorized uses of the machine; since it is impossible to predict all the possible improper uses, if it is necessary to use the machine for particular applications, contact your Komatsu Distributor before carrying out the work.**

IMPORTANT

- **The instructions regarding the authorized optional equipment are given in the relevant operation and maintenance manuals; if the equipment is supplied by Komatsu, these publications are enclosed to this manual.**
- **The instructions regarding the assembly of the authorized equipment, the controls requiring special arrangements on the machine and the hydraulic couplings necessary for the operation of such equipment are grouped in the final section of this manual.**

Komatsu machines are constructed exclusively for the handling, excavation and treatment of inert materials; therefore, the following uses are absolutely forbidden:

- USE OF THE MACHINE BY MINORS OR INEXPERIENCED PERSONS.
- USE OF THE MACHINE FOR THE LIFTING OF PEOPLE.
- TRANSPORT OF CONTAINERS WITH FLAMMABLE OR DANGEROUS FLUIDS.
- USE OF THE BUCKET FOR DRIVING OR EXTRACTING PILES.
- USE OF THE MACHINE FOR TOWING DAMAGED VEHICLES.

1.3.3 MAIN CHARACTERISTICS

- Simple and easy operation.
- Hydrostatic transmission obtained through two axial piston motors that operate epicyclic reduction gears.
- Rotation of the revolving frame achieved by means of an axial piston hydraulic motor acting on an epicyclic reduction gear.
- Main equipment controlled through servo levers ensuring also combined movements that can be modulated proportionally and continually.
- Boom swing and optional equipment operated through foot pedal controls.
- Travel and blade operated through levers.
- Travel speed selection push button.
- Hydraulic track gauge adjustment.
- Complete series of instruments visible from the operating position.
- Lever accelerator.
- Easy maintenance with simplified intervals.

1.3.4 RUNNING-IN

Every machine is scrupulously adjusted and tested before delivery.
A new machine, however, must be used carefully for the first 100 hours, in order to ensure proper running-in of the various components.
If the machine is subjected to excessive work load at the beginning of operation, its potential productivity and its functionality will be shortly and untimely reduced.
Every new machine must be used carefully, paying special attention to the following instructions:

- After the start, let the engine idle for 5 minutes, in such a way as to warm it up gradually before actual operation.
- Avoid operating the machine with the limit loads allowed or at high speed.
- Avoid abrupt starts or accelerations, useless sudden decelerations and abrupt reversals.

SYNTHETIC BIODEGRADABLE OIL TYPE HEES

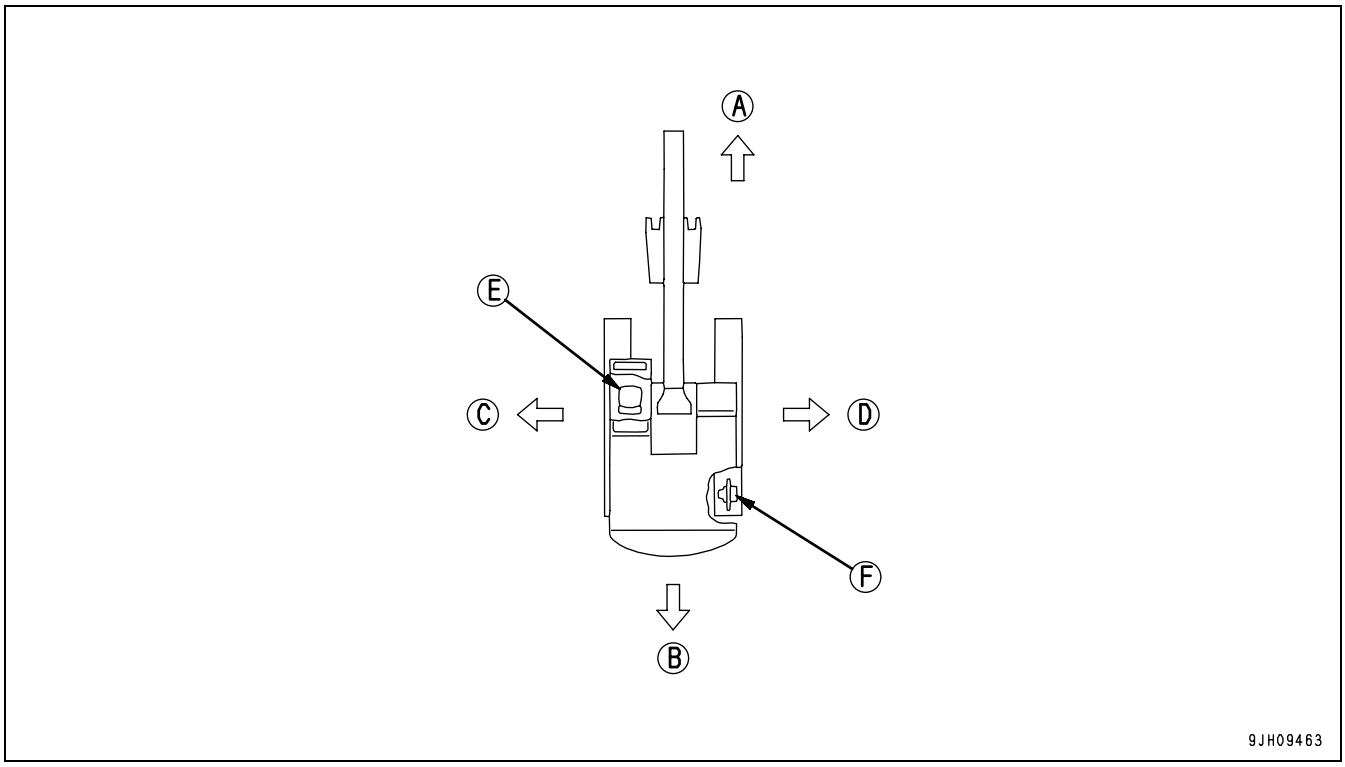
For machines in which synthetic biodegradable oil type HEES is used, perform the following operations in addition to the standard maintenance operations:

- After the first 50 hours of operation, change the hydraulic circuit drain filter.
- After the first 500 hours of operation, change the hydraulic circuit oil.

IMPORTANT

- **When changing the oil filters (cartridges), check their inner part to make sure that there are no deposits. If considerable deposits are observed, find out what may have caused them before starting the machine.**
- **The number of operating hours is indicated by the hour meter.**

1.3.5 POSITIONS AND DIRECTIONS OF THE MACHINE



(A) Forwards
(B) Backwards
(C) Left
(D) Right
(E) Operator seat
(F) Sprocket

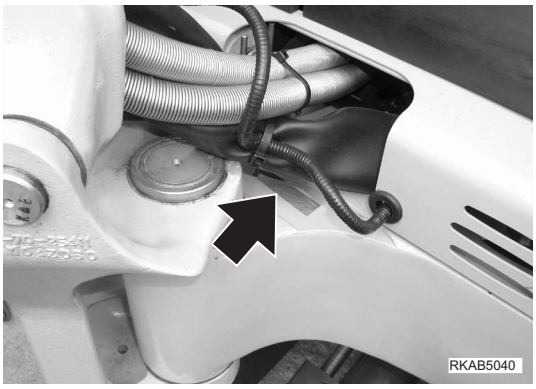
In this manual, the terms front/forward, rear/backward, left, and right refer to the travel direction as seen from the operator seat when it is facing the front and the sprocket is at the rear of the machine.

1.4 PRODUCT IDENTIFICATION

The Komatsu excavator and its main components are identified by serial numbers stamped on the identification plates. The serial number and the identification numbers of the components are the only numbers that must be communicated to the Distributor when requiring assistance and ordering spare parts.

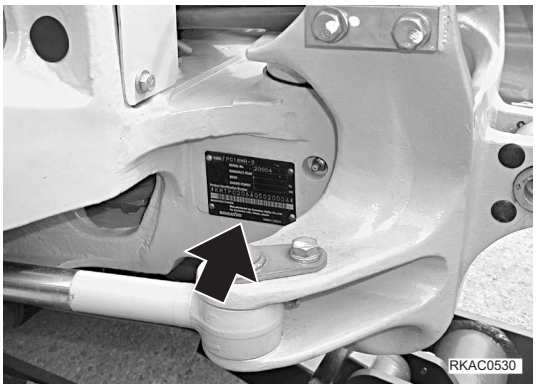
1.4.1 MACHINE SERIAL NUMBER

The machine serial number is stamped on the front upper part of the main frame, on the left side.

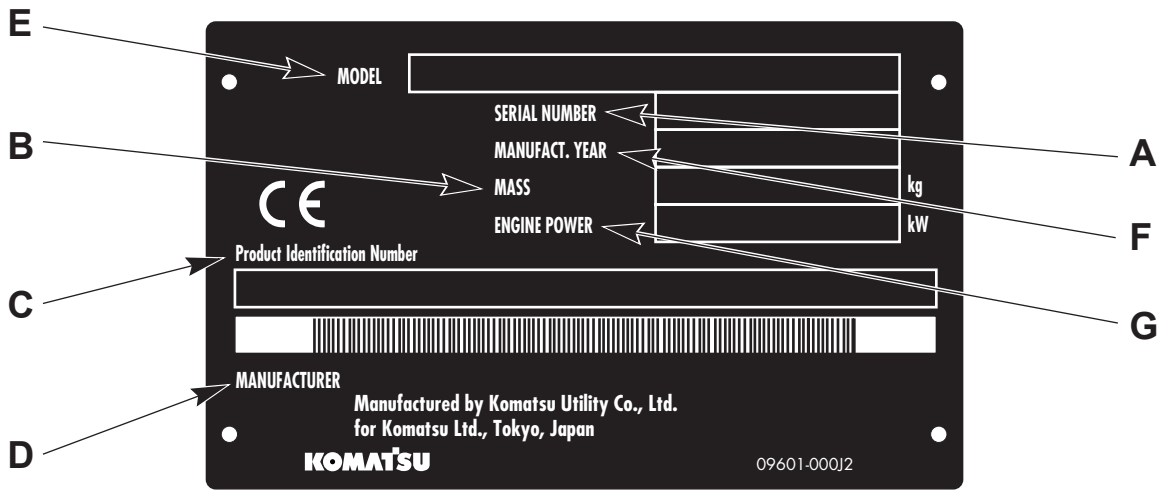


1.4.2 MACHINE IDENTIFICATION PLATE AND PRODUCT IDENTIFICATION NUMBER (PIN)

The Komatsu excavators described in this manual are CE marked, in fact they are in compliance with the EU harmonised standards.
The plate with the CE marking is applied to the front wall of the main frame, on the right side.



1.4.2.1 MACHINE SERIAL NUMBER PLATE



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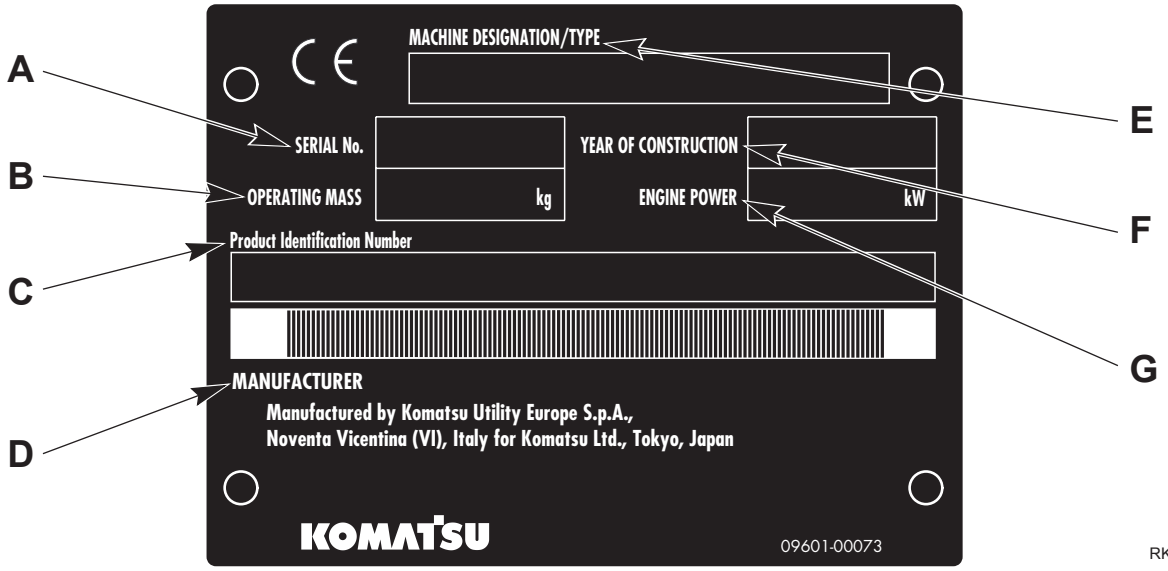
A	SERIAL NUMBER	E	MACHINE DESIGNATION TYPE
B	OPERATING MASS	F	YEAR OF CONSTRUCTION
C	PRODUCT IDENTIFICATION NUMBER	G	ENGINE POWER
D	MANUFACTURER		

1.4.2.2 MACHINE SERIAL NUMBER PLATE (according directive 2006/42/EC)



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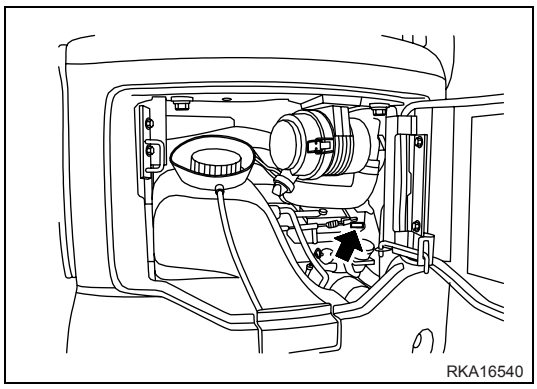
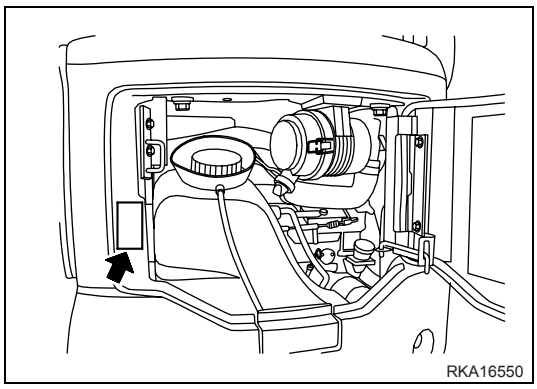
A	SERIAL NUMBER	E	MACHINE DESIGNATION TYPE
B	OPERATING MASS	F	YEAR OF CONSTRUCTION
C	PRODUCT IDENTIFICATION NUMBER	G	ENGINE POWER
D	MANUFACTURER		

1.4.3 ENGINE SERIAL NUMBER AND EXHAUST GAS EMISSION PLATE

The engine serial number is stamped on the plate positioned on the engine itself.

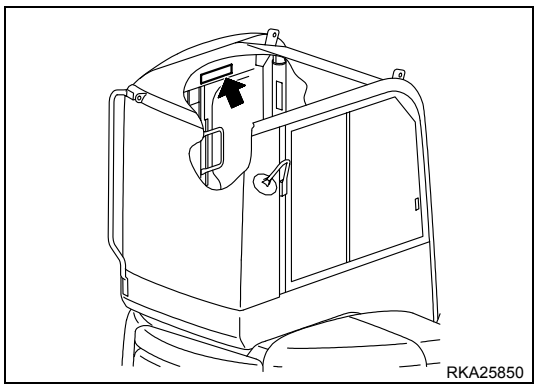


The exhaust gas emission plate is applied to the counterweight.



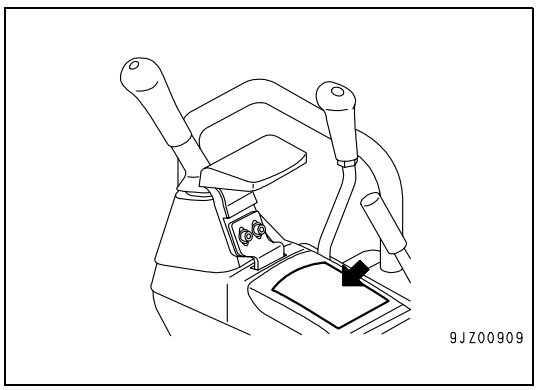
1.4.4 CAB SERIAL NUMBER

The serial number is stamped on the plate positioned on the upper left side.



1.4.5 HOUR METER

The hour counter is displayed on the machine monitor.



1.4.6 TABLE TO ENTER SERIAL NO. AND DISTRIBUTOR

Machine serial No.	
Engine serial No.	
Product identification number (PIN)	
Manufacturers name: Address:	Komatsu Utility Europe S.p.A. Via Atheste, 4 35042 Este (PD) Italy
Authorized representative: Address:	
Distributor name: Address:	
Service Personnel Phone/Fax	

1.4.7 DECLARATION OF CONFORMITY (for machines placed on the market as from 29 December 2009)

The manufacturer:
Komatsu Utility Europe S.p.A.
Via Atheste, 4
35042 Este (PD) Italy

Declares that this machine:
PC18MR-3

Fulfils all the relevant provisions of following EC Directive:

Machinery Directive	2006/42/EC
Electro Magnetic Compatibility Directive	2004/108/EC
Outdoor Noise Directive	2000/14/EC amended by 2005/88/EC

1.5 KOMTRAX SYSTEM

- KOMTRAX is a system that uses wireless communication technology to monitor machines.
- The KOMTRAX system can be used only after contacting the Komatsu Distributor and having entered into a contract with him.
- As it is a wireless system, the KOMTRAX equipment uses radio waves; therefore, a due permit is required as well as compliance with the regulations in force in the country or territory where the machine is used.
  Contact a Komatsu Distributor before selling or exporting any machine fitted with a KOMTRAX equipment.
- The KOMTRAX system can be removed or disabled by the Komatsu Distributor as required, in case the machine is sold or exported.
- Komatsu and its authorised Distributor shall not be liable for any problems or damage resulting from the nonobservance of the safety precautions described herein.

1.5.1 GENERAL PRECAUTIONS

⚠ WARNING

- **Do not remove, repair, modify or move the communication terminal, the aerial or the cables as this may lead to failures or short-circuits in the KOMTRAX equipment or the machine itself.**
  The Komatsu Distributor will be in charge of removing and installing the KOMTRAX equipment.
- **Do not flatten or damage the cables or wires. Do not pull the cables or wires hard.**
  Short-circuits and disconnected cables can cause failures or fire in the KOMTRAX equipment or the machine.
- **This machine is equipped with a two-way radio communication device KOMTRAX. Keep away from any explosive area. If the machine must operate within 12 metres from an explosive area or from an active electric exploder, the cable harness must be disconnected from the module KOMTRAX. Otherwise, it may cause serious injuries or fatal accidents.**
- **This warning does not replace the requirements or regulations in force in the area or country where this machine is operating. The following specifications are supplied in order to guarantee compliance with all the applicable requirements and regulations.**
  - **The transmission rated power for the Komtrax transmitter is 5 - 10 watt.**
  - **The frequency operation interval for the Komtrax module is 148 - 150 MHz.**
- **If you have a pacemaker, make sure that the communication aerial is placed at least 22 cm from the pacemaker as radio waves can adversely affect the pacemaker operation.**

IMPORTANT

- **Even if the starter key is turned to OFF, the KOMTRAX system can absorb a minimum quantity of energy. In case the machine is not used for a long time, strictly follow the instructions contained in section "3.6 LONG PERIODS OF INACTIVITY". If the machine is not used for a long time, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.**
  Remember that when the battery main switch is turned to OFF, the KOMTRAX system does not work.
- **Contact the Komatsu Distributor before installing protections or any other covering accessory onto the opening roof.**
- **Be careful not to let water deposit on the communication terminals or their cables.**

NOTE

- As KOMTRAX is a wireless system, it cannot be used inside tunnels, undergrounds, buildings or in mountainous areas where radio waves cannot be received.
  Even when the machine is outdoors, it cannot be used in areas where radio signals are weak or areas not covered by the signal.

NOTE

- Do not disconnect or tamper with the KOMTRAX communication terminal; consult the Komatsu Distributor in case of failures.As KOMTRAX is a wireless system, it cannot be used inside tunnels, undergrounds, buildings or in mountainous areas where radio waves cannot be received.
  Even when the machine is outdoors, it cannot be used in areas where radio signals are weak or areas not covered by the signal.
- Do not disconnect or tamper with the KOMTRAX communication terminal; consult the Komatsu dealer in case of failures.

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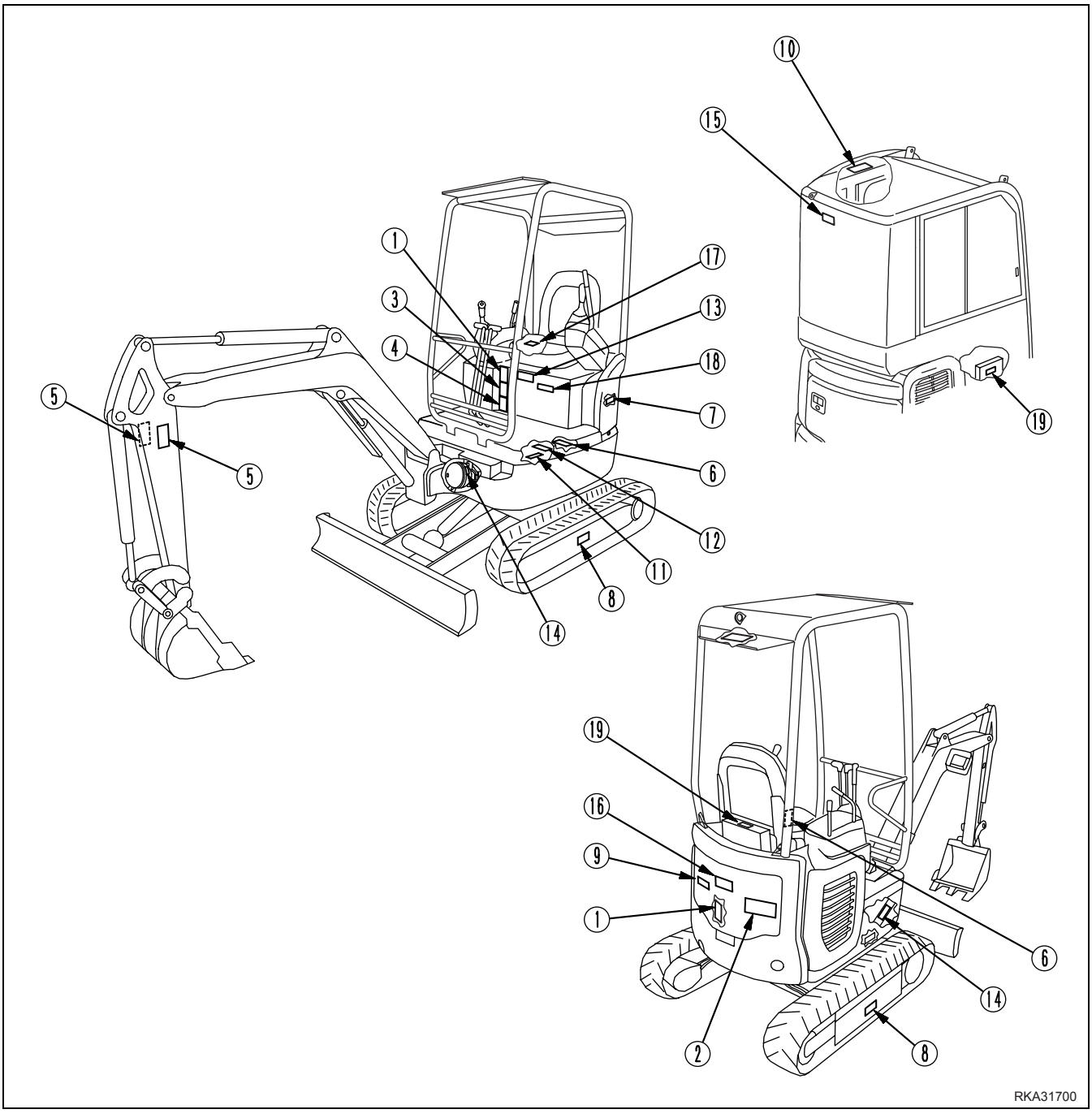
SAFETY AND ACCIDENT PREVENTION

2.1 SAFETY, NOISE AND VIBRATION PLATES

2.1.1 POSITION OF THE SAFETY PLATES

- The safety plates must always be legible and in good conditions; for this reason, if they are dirty with dust, oil or grease, it is necessary to clean them with a solution made of water and detergent.
  Do not use fuel, petrol or solvents.
- If the plates are damaged, ask for new ones to Komatsu or to your Komatsu Distributor.
- In case of replacement of a component provided with a safety plate, make sure that such a plate is applied also to the new part.
- The machine can be provided with other plates in addition to those indicated below; keep also to the instructions given in the additional plates, in any case.

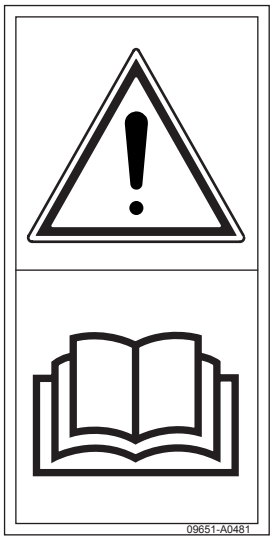


2.1.2 PICTOGRAMS AND RELEVANT MEANINGS

The warning and danger plates applied onto the machine include or are accompanied by pictograms.
The staff in charge with the operation and maintenance of the machine must be perfectly familiar with the symbols contained in the pictograms; the following list illustrates what they look like and their respective meanings.

1 - CONSULT THE MANUAL

- Carefully read the contents of the manual before using the machine or performing maintenance operations.



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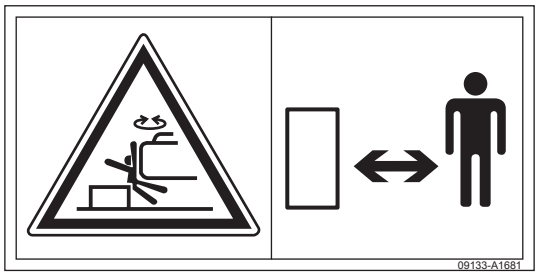
2 - SAFETY DISTANCE

- Do not get too near the machine and do not stand within its operating range.



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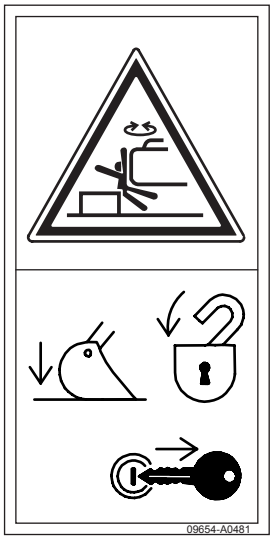
3 - BEFORE LEAVING THE WORK POSITION

- Before leaving the machine, lower the work equipment to the ground, shift the safety lever to position “lock”, stop the engine and remove the ignition key.



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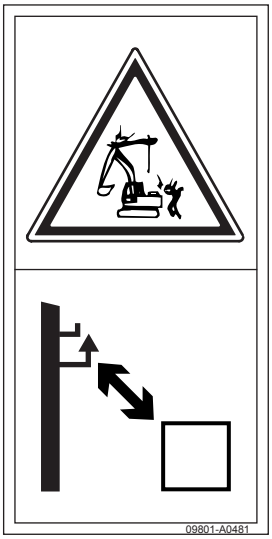
4 - RISK OF ELECTROCUTION

- Minimum safety distances from overhead lines.

Cable voltage	Min. safety distance
1.0 kV (distribution line)	5 m
6.6 kV (2–3 insulators)	5.2 m
33 kV (min. 3 insulators)	5.5 m
66 kV (min. 6 insulators)	6 m
154 kV (min. 10 insulators)	8 m
275 kV (min. 19 insulators)	10 m



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5 - WORK IN PROGRESS

- Do not approach or stand within the operating range of the equipment when it is lifted and under load.

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6 - RISK OF BURNS

- Do not open the radiator and the hydraulic oil tank when the engine is still hot.

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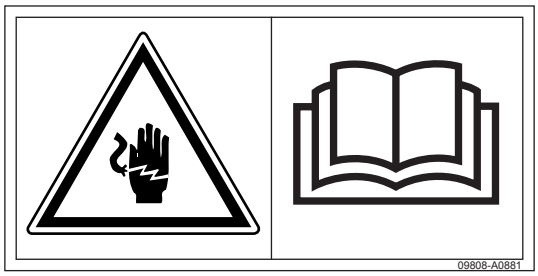
7 - BATTERY AND ELECTRIC CABLES

- Risk of electric charges in case of work on the battery or the electric cables.



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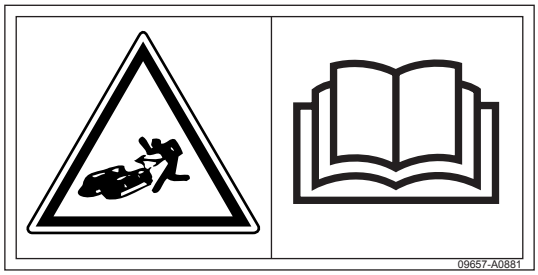
8 - ADJUSTING THE TRACK TENSION

- The adjustment of the tracks involves the risk of injuries.
- Read manual regarding adjusting track for safe and proper handling.



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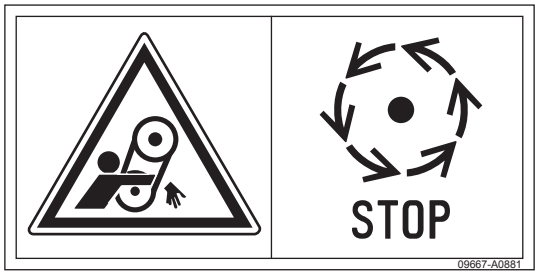
9 - DO NOT OPEN THE ENGINE HOOD

- Do not open or remove the hood when the engine is running.



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10 - CAUTION WHEN STOWING FRONT WINDOW (machine with cab)

- Make sure that the front windshield is always locked.

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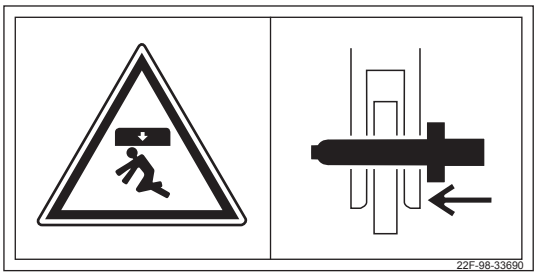
11 - PLATFORM LIFTING SAFETY PLATE

- When the platform is open, make sure that the safety pin is correctly inserted.



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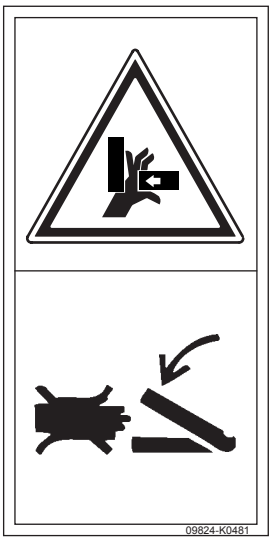
12 - HAZARDS DURING PLATFORM CLOSING

- When closing the platform, avoid body parts entering into the area under the platform, as there is danger of crushing.



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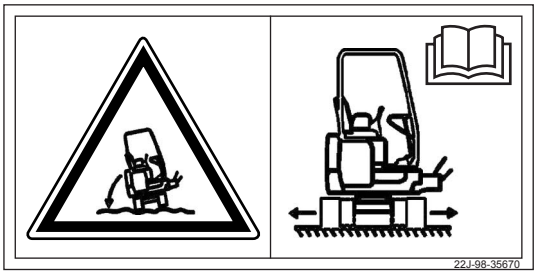
13 - LATERAL STABILITY

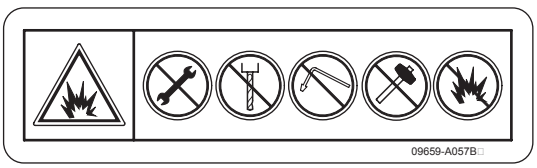
- When the gauge is fully retracted the lateral stability is reduced. In jobsites where there is danger of the machine turning over, extend the gauge and be extremely careful when travelling. Do not risk serious personal injury or death.



RKA29970

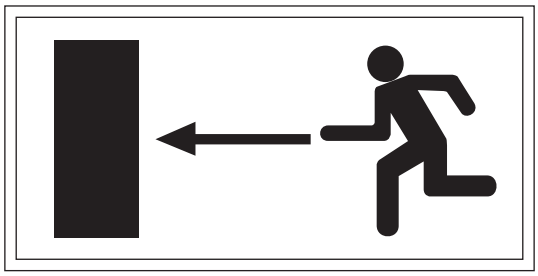
14 - RISK OF EXPLOSION ON THE HYDRAULIC ACCUMULATOR AND GAS SPRING

- Recommendations for operations on the hydraulic accumulator and gas spring.



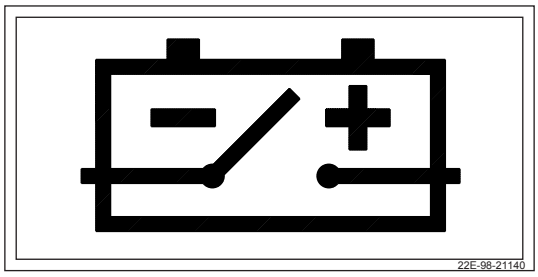
RKA28880

15 - EMERGENCY EXIT (machine with cab)



RKA25870

16 - BATTERY MAIN SWITCH (if installed)



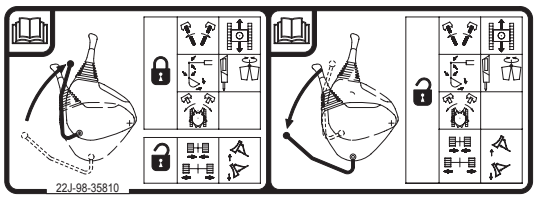
RKA24350

17 - STARTER

- Start the engine only when correctly seated in the driving position. Do not attempt to run the starter motor by tampering with the starter motor terminals.

RKA29870

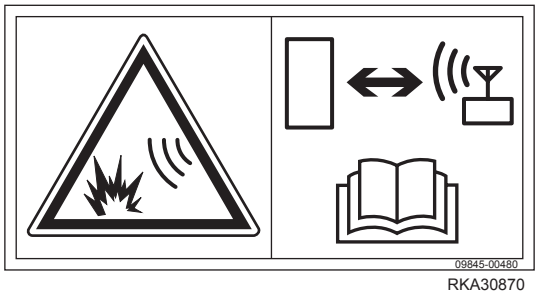
18 - THE LOCK IS OPERATED WITH THE LOCK LEVER



RKA31660

19 - PRECAUTIONS WITH THE KOMTRAX SYSTEM

- The signal indicates danger of explosion caused by a radio transmitter active in an explosive area.
- Keep the machine at a safe distance from an explosive area and from a detonator.



RKA30870

CAUTION WHEN HANDLING BATTERIES

- Never smoke or use any naked flame near the batteries, no sparks.

- Always wear safety glasses when working with batteries.

- Keep children away from batteries.

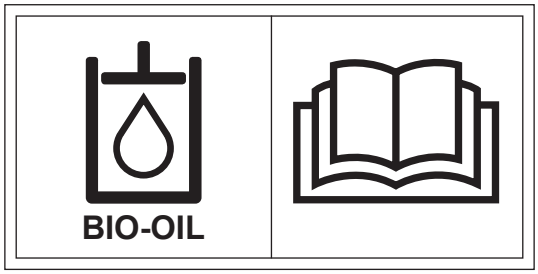
- Caution - battery acid.

- Read the operator’s manual before working with batteries.

- Caution - explosive gases.

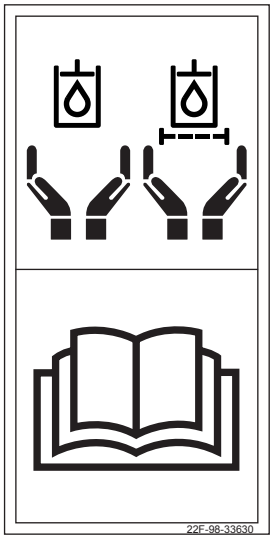
HYDRAULIC OIL TOPPING UP

- (Only for machines in which synthetic biodegradable oil type HEES is used)



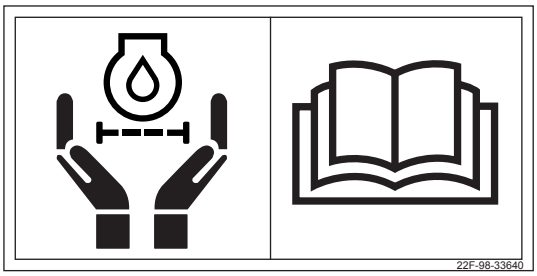
RKA14710

HYDRAULIC OIL TOPPING UP



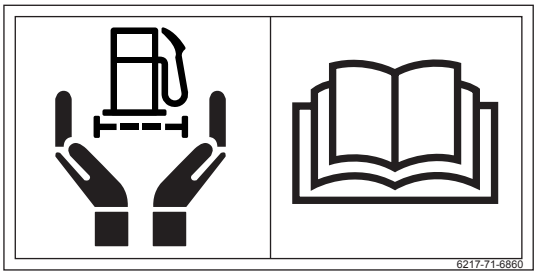
RKA28970

ENGINE LUBRICATING OIL FILTER



RKA29000

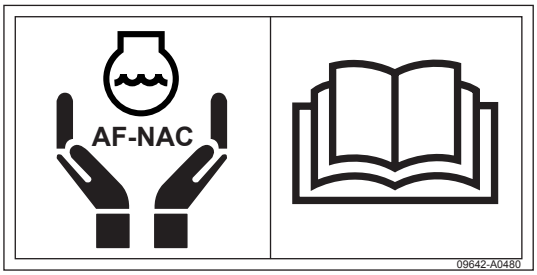
FUEL FILTER



RKA29960

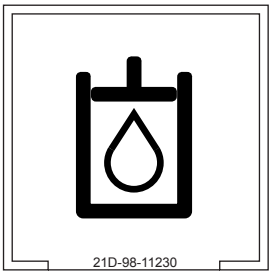
AF-NAC ENGINE COOLANT

- Fill Komatsu genuine engine coolant AF-NAC to prevent radiator damage by corrosion.



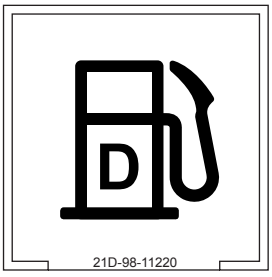
RKA29010

HYDRAULIC OIL TOPPING UP



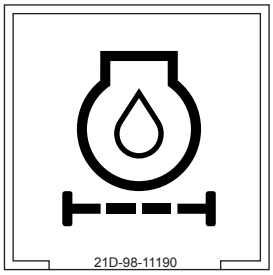
RKA29760

REFUELLING



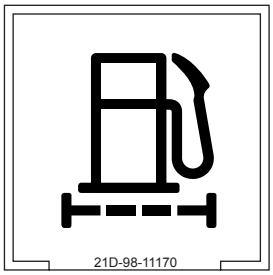
RKA29670

ENGINE OIL FILTER



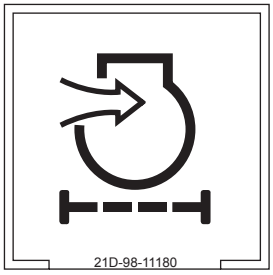
RKA29770

FUEL FILTER



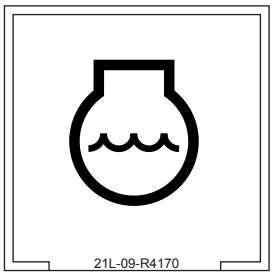
RKA29780

ENGINE AIR INTAKE FILTER



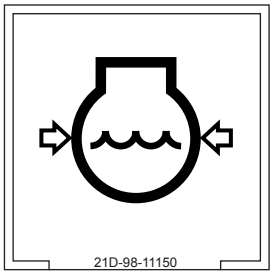
RKA30000

ENGINE COOLANT



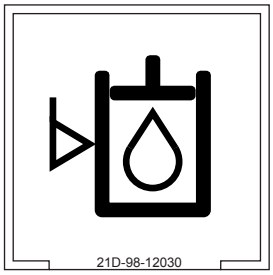
RKA29680

ENGINE COOLANT PRESSURE



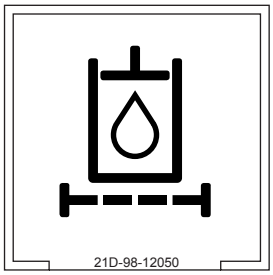
RKA29790

HYDRAULIC OIL LEVEL



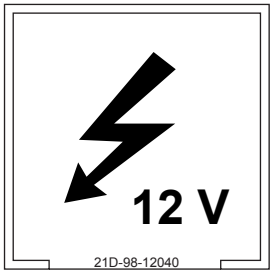
RKA29800

HYDRAULIC OIL FILTER



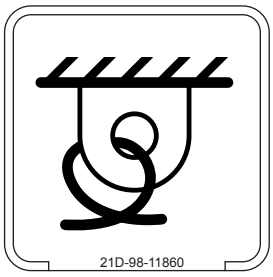
RKA29810

POWER OUTLET



RKA30060

ANCHORAGE POINT

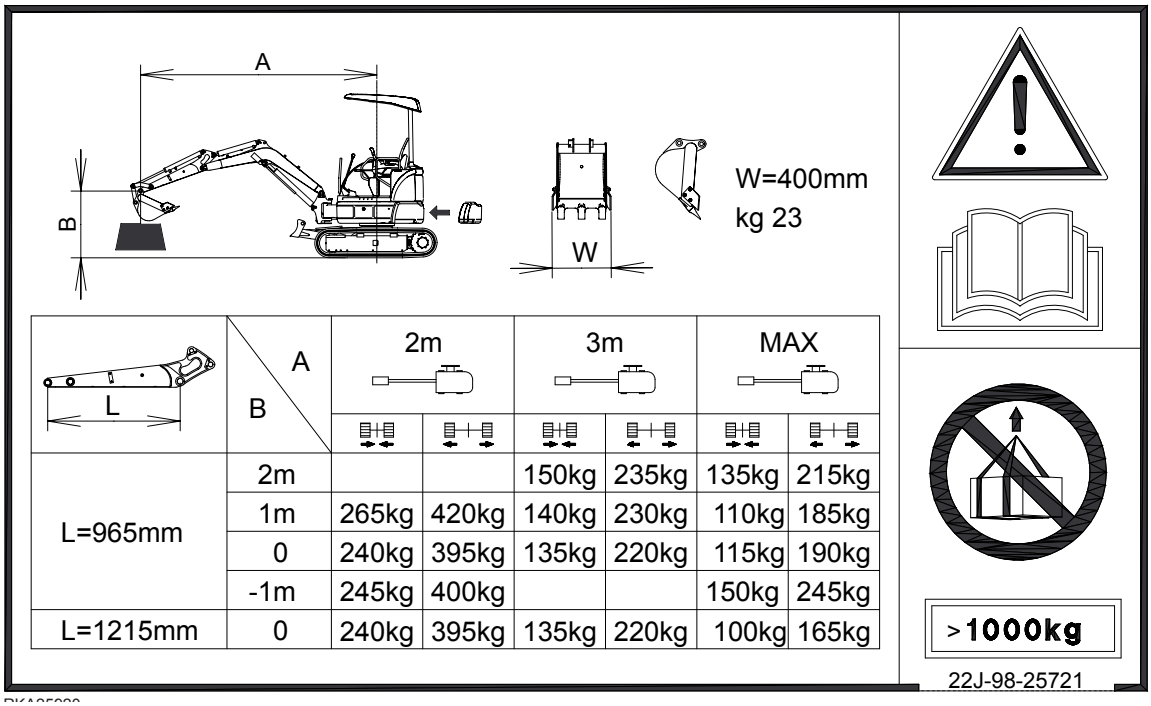


RKA28810

LIFTING POINT

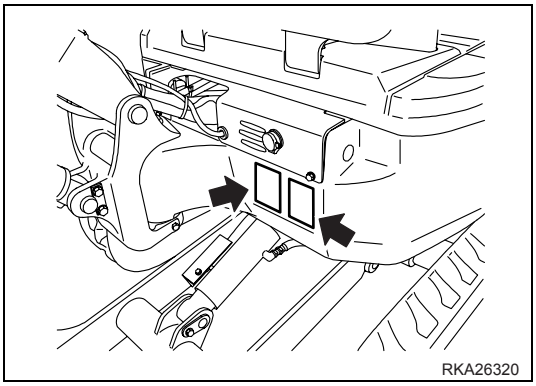
RKA28830

LIFTING CAPACITIES



		2m		3m		MAX	
L=965mm	2m			150kg	235kg	135kg	215kg
	1m	265kg	420kg	140kg	230kg	110kg	185kg
	0	240kg	395kg	135kg	220kg	115kg	190kg
	-1m	245kg	400kg			150kg	245kg
L=1215mm	0	240kg	395kg	135kg	220kg	100kg	165kg

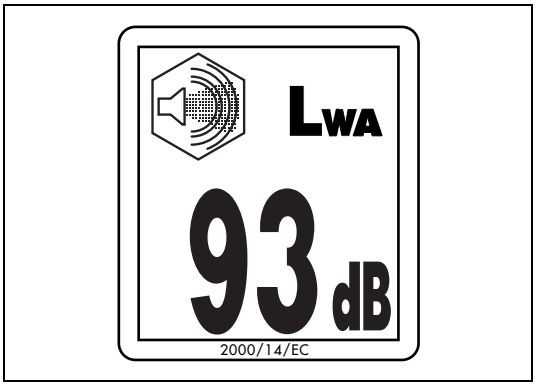
2.1.3 POSITION OF THE NOISE PLATES ON MACHINES WITH CAB



- The noise plates must always be legible and in good conditions; for this reason, if they are dirty with dust, oil or grease, it is necessary to clean them with a solution made of water and detergent.
  Do not use fuel, petrol or solvents.
- If the plates are damaged, ask for new ones to Komatsu or to your Komatsu Distributor.
- In case of replacement of a component provided with a noise plate, make sure that such a plate is applied also to the new part.

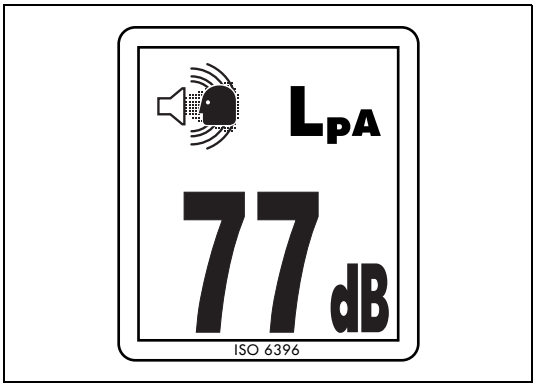
EXTERNAL NOISE

- Sound power level emitted by the machine, measured according to ISO 6395 (Dynamic test method, simulated working cycle).
  This is the guaranteed value as specified in European directive 2000/14/EC. This value includes an uncertainty-of 1.2 dB.

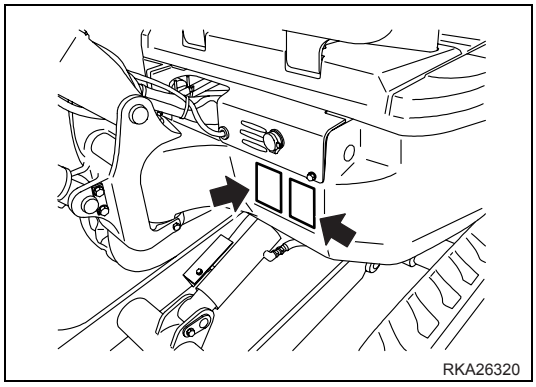


NOISE INSIDE THE CAB

- Sound pressure level at the operator's station, measured according to ISO 6396 (Dynamic test method, simulated working cycle).
  The maximum value of the standard deviation of the measured time-averaged A-weighted emission sound pressure level at the operator's position is 1.9 dB, in accordance with ISO 11201.



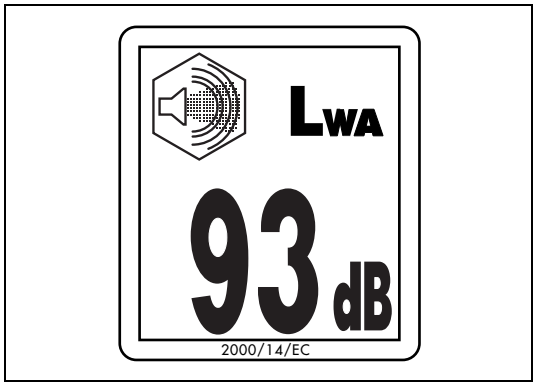
2.1.4 POSITION OF THE NOISE PLATES ON MACHINES WITH CANOPY



- The noise plates must always be legible and in good conditions; for this reason, if they are dirty with dust, oil or grease, it is necessary to clean them with a solution made of water and detergent.
  Do not use fuel, petrol or solvents.
- If the plates are damaged, ask for new ones to Komatsu or to your Komatsu Distributor.
- In case of replacement of a component provided with a noise plate, make sure that such a plate is applied also to the new part.

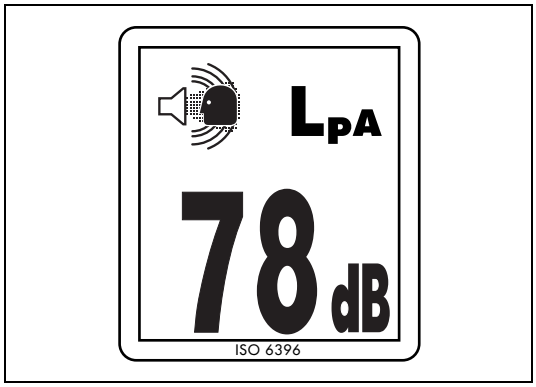
EXTERNAL NOISE

- Sound power level emitted by the machine, measured according to ISO 6395 (Dynamic test method, simulated working cycle).
  This is the guaranteed value as specified in European directive 2000/14/EC. This value includes an uncertainty-of 1.2 dB.



NOISES IN THE OPERATOR'S EAR

- Sound pressure level at the operator's station, measured according to ISO 6396 (Dynamic test method, simulated working cycle).
  The maximum value of the standard deviation of the measured time-averaged A-weighted emission sound pressure level at the operator's position is 1.9 dB, in accordance with ISO 11201.



2.1.5 VIBRATIONS TO WHICH THE OPERATOR IS SUBJECTED

When used for its intended purpose, levels of vibration for the earth-moving machine transmitted from the operator's seat are lower than or equal to the tested vibrations for the relative machinery class in compliance with ISO 7096.

The actual acceleration value for the hands and arms is less than or equal to 2.5 m/s², the factor of uncertainty for this vibration value is 1.2 m/s² according EN 12096: 1997.

The actual acceleration value for the body is less than or equal to 0.5 m/s², the factor of uncertainty for this vibration value is 0.2 m/s² according EN 12096: 1997.

These values were determined using a representative machine and measured during the typical operating condition indicated below according to the measurement procedures that are defined in the standards ISO 2631/1 and ISO 5349.

OPERATING CONDITION:

Excavating (Digging-loading-rotating-unloading-rotating).

GUIDE TO REDUCE VIBRATION LEVELS ON MACHINE

The following guides can help an operator of this machine to reduce the whole body vibration levels:

1. Use the correct equipment and attachments.
2. Maintain the machine according to this manual.
   - Tension of crawler (for crawler machines).
   - Brake and steering systems.
   - Controls, hydraulic system and linkages.
3. Keep the terrain where the machine is working and travelling in good condition.
   - Remove any large rocks or obstacles.
   - Fill any ditches and holes.
   - Site manager should provide machine operators with machine and schedule time to maintain terrain conditions.
4. Use a seat that meets ISO 7096 and keep the seat maintained and adjusted.
   - Adjust the seat and suspension for the weight and size of the operator.
   - Wear seat belt.
   - Inspect and maintain the seat suspension and adjustment mechanisms.
5. Steer, brake, accelerate, and move the attachment levers and pedals slowly so that the machine moves smoothly.
6. Adjust the machine speed and travel path to minimize the vibration level.
   - When pushing with bucket or blade, avoid sudden loading; load gradually.
   - Drive around obstacles and rough terrain conditions.
   - Slow down when it is necessary to go over rough terrain.
   - Make the curve radius of travelling path as large as possible.
   - Travel at low speed when travelling around sharp curves.
7. Minimize vibrations for long work cycle or long distance travelling.
   - Reduce speed to prevent bounce.
   - Transport machines long distances between worksites.

8. The following guidelines can be effective to minimize risks of low back pain.
   - Operate the machine only when you are in good health.
   - Provide breaks to reduce long periods of sitting in the same posture.
   - Do not jump down from the cab or machine.
   - Do not repeatedly handle and lift loads.

2.2 GENERAL PRECAUTIONS

2.2.1 GENERAL SAFETY RULES

- Only trained and authorized staff can use the machine and perform maintenance operations.
- Follow all the safety rules, precautions and instructions when using the machine or performing maintenance operations.
- When working with other operators or when the work site is often occupied by other operators, make sure that everyone knows and understands all the agreed signals and, in any case, that everyone works in such a way as to be able to see the machine and to be visible to the operator.

2.2.2 HOW TO BEHAVE IN CASE OF ANOMALIES

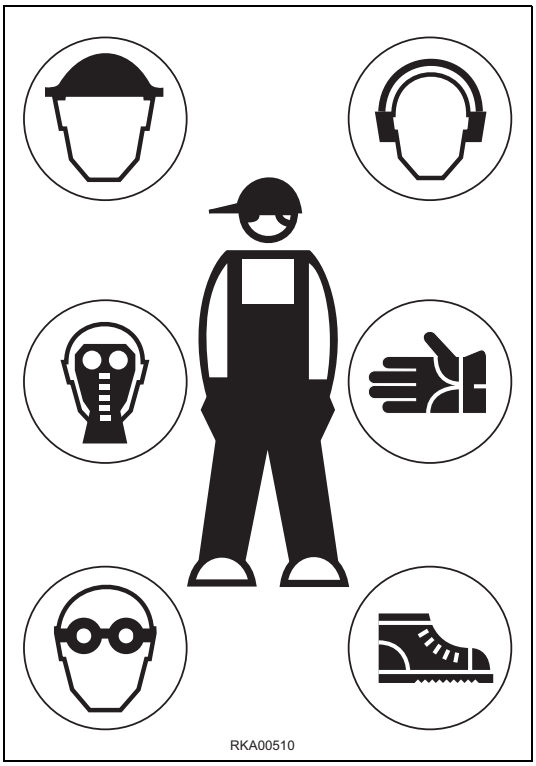
- If anomalies are observed while the machine is working or is being serviced (noise, vibrations, bad smells, incorrect measures, smoke, oil leakages, or any other anomaly indicated by the warning devices or the warning lights), inform the staff in charge, so that the necessary measures can be taken. Do not use the machine until such anomalies have been eliminated.

2.2.3 SAFETY DEVICES AND GUARDS

- Make sure that all the guards and covers are in the correct position. Have guards and covers changed or repaired if damaged. Neither use the machine without guards, nor remove the guards when the engine is running.
- Always use the proper safety devices to lock the machine when parking and use the seat belt correctly.
- Do not remove the safety devices and always keep them in good operating conditions.
- Any improper use of the safety devices may result in serious injury or even death.

2.2.4 CLOTHING AND PERSONAL PROTECTION ITEMS

- Do not wear large or loose clothes, rings and watches, and do not approach the machine with loose long hair, since they can get entagled in the moving parts of the machine and cause serious injury or damage.
  Avoid also wearing clothes dirty with oil or fuel, since they are flammable.
- Wear a hard hat, goggles, safety shoes, mask, gloves and ear muffs when operating the machine or performing maintenance operations.
- Always wear safety goggles, a hard hat and heavy gloves if your job involves scattering metal chips or minute materials; these precautions are particularly useful when hammering the equipment connection pins and when blowing compressed air into the air filter and the radiator.
  During these operations, make also sure that no one is standing or working near the machine without the necessary protection items.
- When working for 8 hours with a noise level exceeding 90 dBA, it is necessary to use headphones or ear plugs and be particularly careful, especially at the end of the work shift.



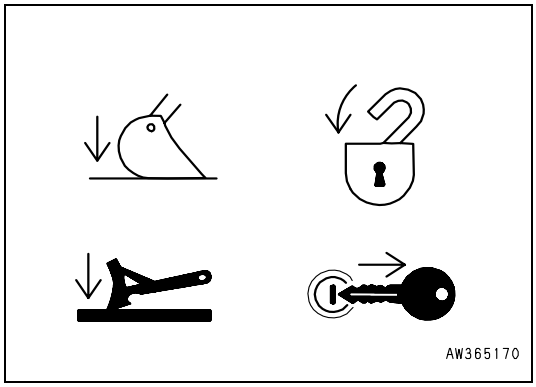
2.2.5 UNAUTHORIZED MODIFICATIONS

- Any modification made without the authorization of Komatsu can involve hazards.
- Before making a modification, consult your Komatsu Distributor. Komatsu declines any responsibility for injury or damage caused by unauthorized modifications.

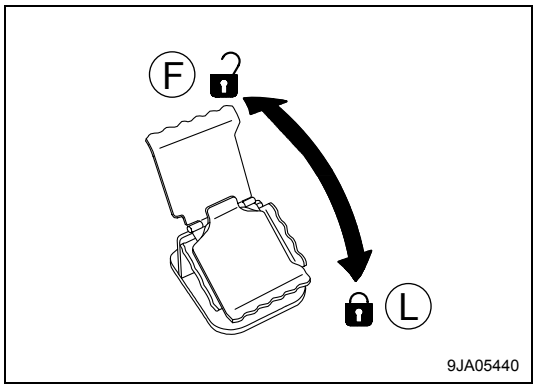
2.2.6 LEAVING THE OPERATOR SEAT

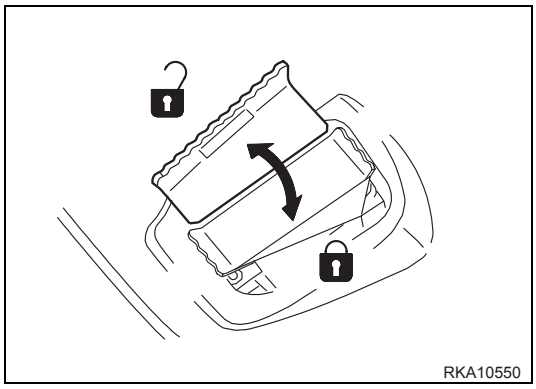
- When leaving the operator seat, even if temporarily, make sure that the machine is in a safe position. (See "2.4.14 PARKING THE MACHINE").
- Before leaving the operator seat, carry out the following operations in the sequence indicated below:

1 - Lower the equipment to the ground.



2 - Attach the safety devices for boom swing control and optional tools.

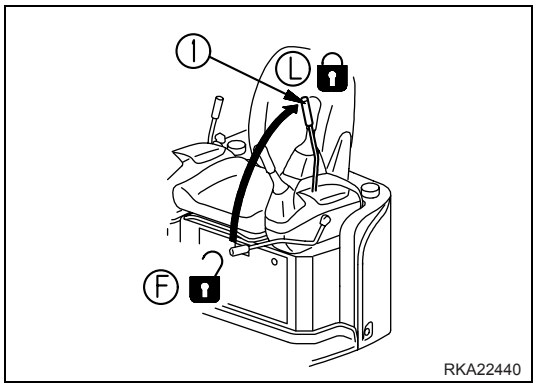




3 - Lock the equipment control by shifting the safety lever (1) to the “locked” position (L).

4 - Stop the engine. (See "3.3.3 STOPPING THE ENGINE").

5 - If you have to go so far away that you will not be able to see the machine, extract the ignition key.

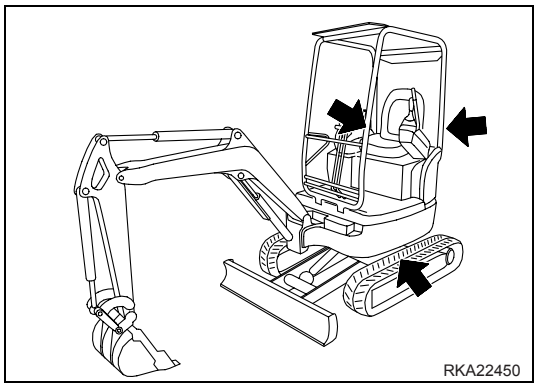


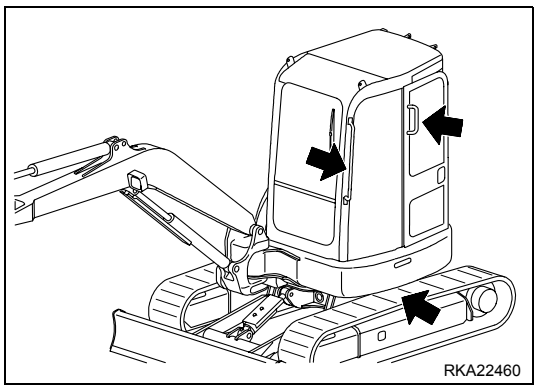
2.2.7 EMERGENCY EXIT

- In the even of an emergency where the cab door cannot be opened, use the hammer provided to break the window and escape through the window, taking care to avoid injury cause by broken glass.
  For more details, see "3.2.4.4 EMERGENCY EXIT HAMMER (machines with cab)".
- Before leaving the operator cab, remove any glass fragments from the window edges and take care not to injure yourself. Be careful not to slip on the glass fragments scattered on the ground.

2.2.8 GETTING ON AND OFF THE MACHINE

- Do not jump on or off the machine, neither when it is at rest nor when it is moving.
- When getting on or off the machine, always use the handles and the tracks; get on and off the machine very carefully.
- Do not hold or rest on the control levers.
- Both when getting on and when getting off the machine, always maintain three points of contact (holding or resting points), in order to avoid losing your balance and falling down.
- Tighten the handle screws if they are loose, and clean the handles and tracks if they are dirty with oil or grease.
  Carefully clean the cab floor if it is dirty with oil, grease, mud or rubble.


RKA22450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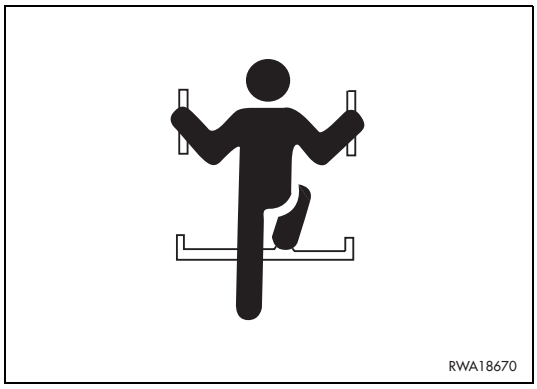

RWA18670

2.2.9 IT IS FORBIDDEN TO CLIMB ON THE EQUIPMENT

Do not allow anyone to climb on the bucket, the grapple forks, or other equipment. There is the risk of falling down and be seriously injured.

2.2.10 ARTICULATED PARTS

The free space around the work equipment changes depending on the movement of the articulated parts. Becoming entangled in the articulated parts may be the cause of serious injuries. Do not allow anyone to get too near rotating or telescopic parts of the machine.

2.2.11 LIFTING OF PERSONNEL PROHIBITED

Under no circumstances should this machine be used for the lifting of personnel.

2.2.12 PREVENTING FIRES DUE TO FUEL AND OIL

Fuel, oil and some types of antifreeze can easily ignite if they get in contact with a flame. Fuel is flammable and therefore very dangerous.

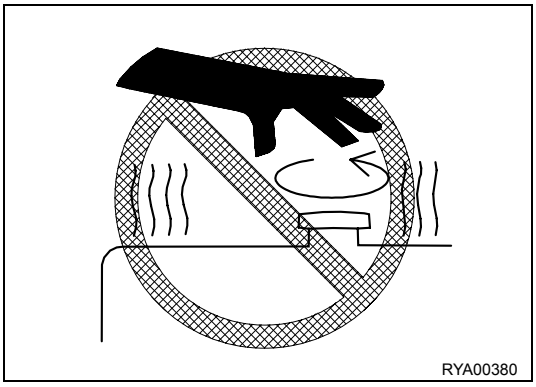
- Keep any naked flame away from flammable fluids.
- Stop the engine and do not smoke when refuelling.
- Refuel and add oil only after stopping the engine and in well ventilated places.
- Refuel and add oil in a well delimited area and do not allow unauthorized persons to approach.
- When refuelling, hold the fuel gun firmly and keep it constantly in contact with the filler until you have finished, in order to avoid sparks due to static electricity.
- After refuelling or adding oil, tighten the fuel or oil cap securely.
- Do not fill the tank completely, in order to leave room for the fuel to expand.
- In case some fuel is spilled, wipe it up immediately.


RKA00480


RKA00490

2.2.13 PREVENTING BURNS

- If the engine coolant, the engine oil and the hydraulic oil are hot, use heavy cloths and wear gloves, heavy clothing and safety goggles before carrying out any check or touching the hot parts.
- Before checking the coolant level, stop the engine and let the fluid cool down.
  If a check is necessary due to the overheating of the engine, slowly loosen the radiator cap to release any residual pressure before removing it. The hot fluid that spurts out may cause serious burns.
- Before checking the engine oil and hydraulic circuit oil levels, stop the engine and let the oil cool down. The hot oil that can be sprayed out of the tank may cause serious burns.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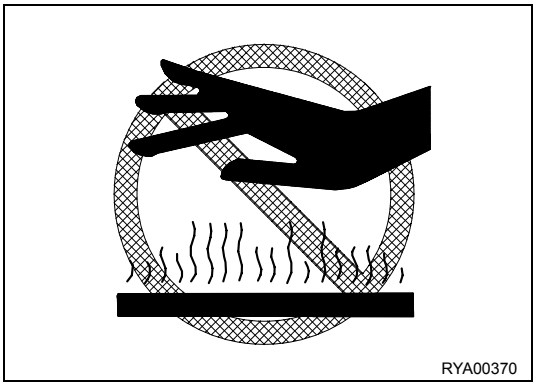
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2.2.14 PREVENTING FIRES CAUSED BY ACCUMULATED INFLAMMABLE MATERIAL

- Remove dry leaves, detritus, pieces of paper, soot or any other inflammable material accumulating around the engine, exhaust manifold, silencer and battery or inside the lower housing panels.
- To prevent ignition caused by sparks released by other sources of flame, remove ant inflammable material such as dry leaves, detritus, pieces of paper, soot etc. accumulating around the cooling system (radiator, oil cooler) or inside the lower housing panel.

2.2.15 FIRES CAUSED BY ELECTRICAL WIRING

Short-circuiting in the electrical system may cause fires. Observe the following precautions to prevent this risk.

- Ensure that all electrical wiring is clean and correctly connected at all times.
- Check for loose connections or damaged wiring daily. Reconnect any loose connectors and tighten all loosened clips. Repair or replace any damaged wiring.

2.2.16 HOW TO BEHAVE IN CASE OF FIRE

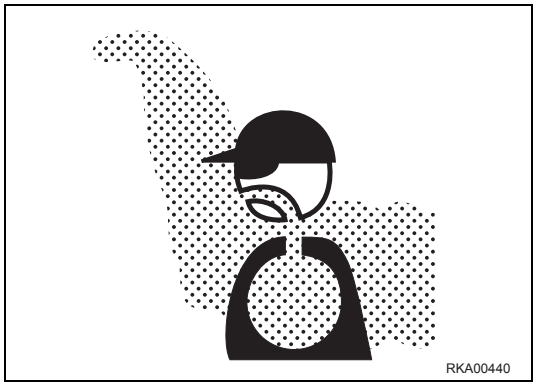
In case of fire, abandon the machine immediately, proceeding as follows.

- Turn the ignition switch to OFF to stop the engine.
- Use the handles and tracks to get off the machine.
- Never jump off the machine. This may lead to falling and severe injury.

2.2.17 DETERGENT FOR THE WINDOWS

Use an ethyl alcohol based detergent. Methyl alcohol based detergents may irritate the eyes, therefore avoid using them.

2.2.18 PREVENTING DAMAGE DUE TO ASBESTOS POWDER

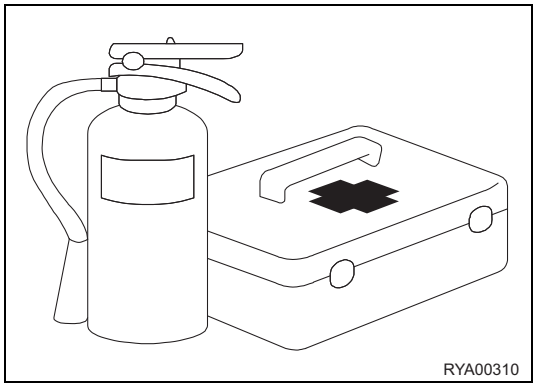


- Inhaling asbestos powder is very dangerous.
- If the material to be handled contains asbestos fibres, it is compulsory to make sure that all the laws and safety regulations in this regard are respected.
- If the regulations in force concerning work in environments contaminated by asbestos fibres are not complied with, it is forbidden to use the machine.

2.2.19 PREVENTING DAMAGE CAUSED BY THE WORK EQUIPMENT

- Do not stand within or approach the operating range of the work equipment, even when the operator is on board the machine and the engine is running.
- Do not stand or work under the arms or the articulations when the arms are lifted, if you are not sure that the safety locks have been duly engaged.
- Do not carry out any operation requiring the arms to be lifted, if you are not sure that the locks are correctly positioned and connected to the arms.

2.2.20 FIRE EXTINGUISHERS AND FIRST AID KIT



- Make sure that fire extinguishers have been provided and check their position.
- Periodically make sure that the fire extinguishers are loaded and that you know how to use them.
- Find out where the first aid kit has been placed.
- Periodically make sure that the first aid kit contains the necessary disinfectants, bandages, medicins, etc.
- It is necessary to know what to do in case of fire.
- Make sure that you have the phone numbers of the persons or structures you may need to contact in case of an emergency at hand (both at the worksite and where maintenance operations are performed).

2.2.21 PRECAUTIONS CONCERNING THE ROPS STRUCTURE

- If the canopy is inadvertently hit or the machine overturns during work, the ROPS structure may be damaged, which consequently reduces its stiffness and the operator's safety.
  In case of impact or damage, contact Komatsu or a Komatsu Distributor to have the canopy structure and resistance checked
- Do not remove the ROPS canopy for any reason whatsoever and avoid using the machine without canopy.
- If it is absolutely necessary to remove the ROPS canopy, always contact your Komatsu Distributor before carrying out this operation.

2.2.22 PRECAUTIONS CONCERNING THE CAB STRUCTURE

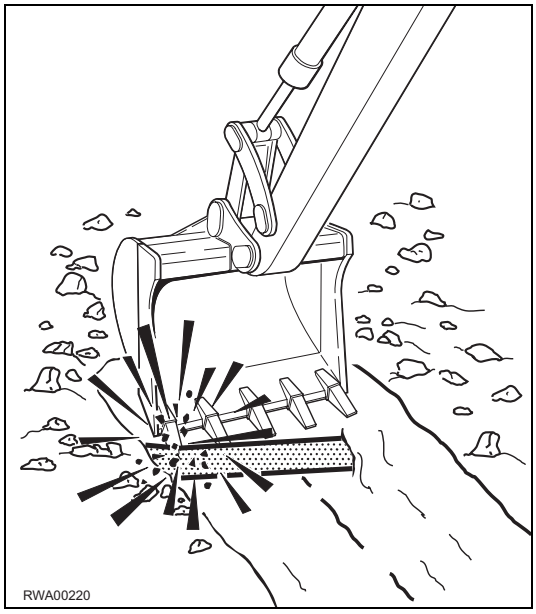
- If the cab is inadvertently hit or the machine overturns during work, the cab may be damaged with consequent reduction of its stiffness and of the safety that must be guaranteed to the operator.
  Contact Komatsu or an Authorized Komatsu Distributor to have the cab structure and resistance checked in case of impact or damage.

2.2.23 PRECAUTIONS CONCERNING THE EQUIPMENT

- When installing and using optional equipment, carefully read the relevant manual and keep to the instructions given therein.
- Do not use optional or special equipment without the authorization of Komatsu or one of its Distributors.
  The installation and use of unauthorized equipment may create safety problems and adversely affect the efficiency and life of the machine.
- Komatsu cannot be held liable for any injury, damage or product failure resulting from the installation and use of unauthorized equipment.

2.3 PRECAUTIONS TO BE TAKEN BEFORE STARTING THE ENGINE

2.3.1 SAFETY AT THE WORK SITE



- Before starting the engine, thoroughly check the area for any unusual condition of the ground due to which work may be dangerous.
- Check the conditions of the ground at the work site and before starting the engine define the work plan and the best and safest operating procedure.
- Make the ground surface as level as possible before carrying out any operation.
- In case of work on the road, protect pedestrians and cars by designating a person for work site traffic duty and install fences around the work site.
- If water lines, gas lines, and telephone or high-voltage electric lines are located under the work site, contact the relevant utility company in order to find out their exact positions or to make them ineffective until the end of the operations. Be careful not to sever or damage any of these lines.
- Check the depth and flow of water before operating in water or on river banks.

2.3.2 FIRE PREVENTION

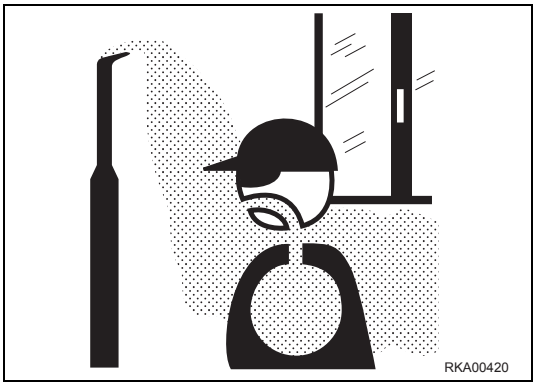
- Completely remove any wood chips, rubbish, paper and other flammable materials that may have accumulated inside the engine compartment, since they may cause fires.
- Check the fuel and hydraulic system pipes for leaks and if necessary repair them. Wipe up any excess oil, fuel or flammable fluids.
- Make sure that fire extinguishers are available in the work area.

2.3.3 PRECAUTIONS CONCERNING THE OPERATOR SEAT

- Do not leave objects or tools lying around inside the cab. They may hinder the operation of the controls and cause serious accidents.
- Keep the cab floor and the controls (pedals and levers) clean, by removing any trace of oil and grease and, as far as the floor is concerned, remove any excess dirt (earth, stones, etc.).
- Check the seat belt and change it if it is broken or damaged.
  Replace any component only with homologated parts available at Komatsu or its Distributors.

2.3.4 ROOM VENTILATION

- Before starting the machine in confined or poorly ventilated places, provide for proper ventilation or connect the engine exhaust pipe to a suction duct. The engine exhaust gases can be deadly.



2.3.5 PRECAUTIONS TO BE TAKEN FOR THE LIGHTS

- Remove any trace of dirt from the lights, in such a way as to ensure perfect visibility on the work area.
- Make sure that the work lights have been correctly installed. Make also sure that they come on correctly.

2.3.6 CAB WINDOWS

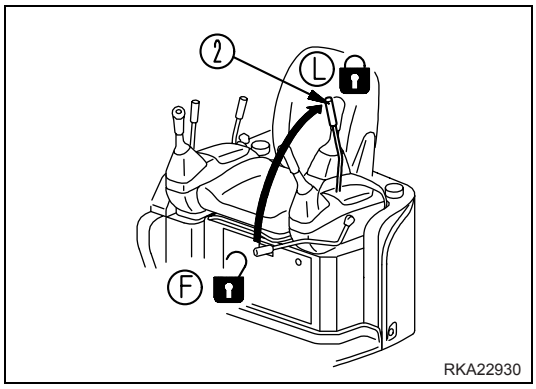
- If a cab window breaks on the side facing the work equipment, this may hit the operator. Therefore, it is advisable to stop the machine immediately and to replace the broken glass.
- Check the level of the detergent for the front windshield which has to be an ethyl alcohol based detergent. Do not use a methyl alcohol based detergent as it may irritate the eyes.

2.3.7 CLEANING THE WINDOWS AND CHECKING THE WINDSHIELD WIPER BLADES

- Remove any trace of dirt from the cab windows; this will optimize visibility.
- Check the conditions of the windshield wiper blades; the scraping wire must be smooth, with no indentations and attached to the rubber back of the blade.
  In case of doubt on the efficiency of the scraping wire, change the blades.

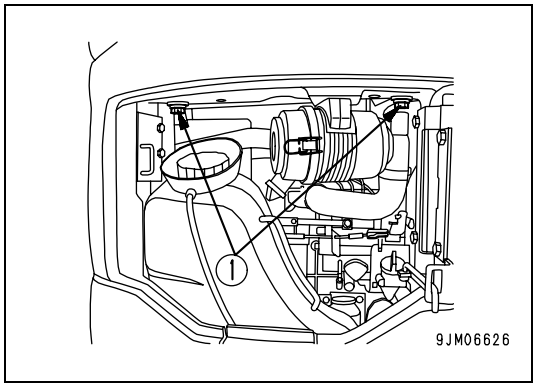
2.4 PRECAUTIONS TO BE TAKEN WHEN WORKING

2.4.1 STARTING THE ENGINE

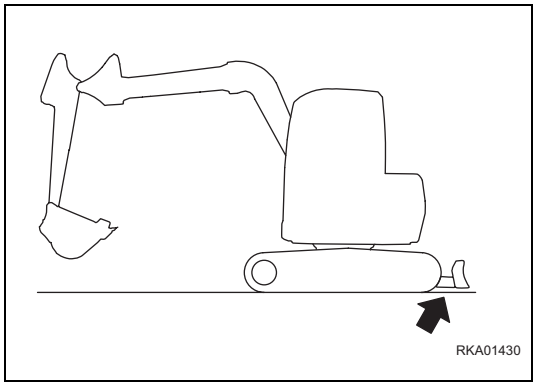


- Before getting on the machine, walk around it and check for people and objects that might be in the way.
- Do not start the engine if warning plates have been attached to the control levers.
- Before starting the engine, make sure that the safety lever (2) is in position “lock” (L).
- When starting the engine, sound the horn as an alert signal.
- Start the engine only while seated with fastened seat belt.
- Do not allow anyone to get on the machine.
- Make sure that the platform fastening screws (1) are well tightened. Incorrect tightening of the cab floor may lead to serious injury.

If any anomaly is found, provide for the necessary repairs.



2.4.2 CHECK THE DIRECTION BEFORE STARTING THE MACHINE



- Before operating the travel levers, check the position of the blade.
  If the blade is positioned on the rear part of the machine, the operation of the travel levers is inverted.
  In this condition, take care not to mistake the travel movements during the use of the machine.
  (See "3.3.4 HOW TO MOVE THE MACHINE").

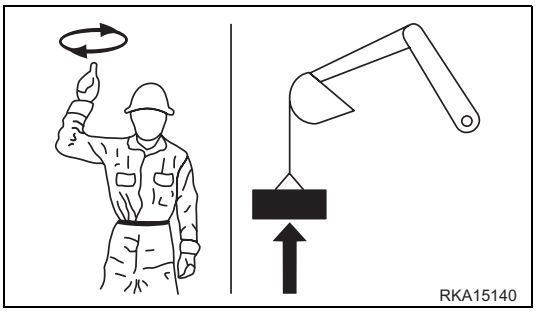
2.4.3 HAND SIGNALS

⚠ WARNING

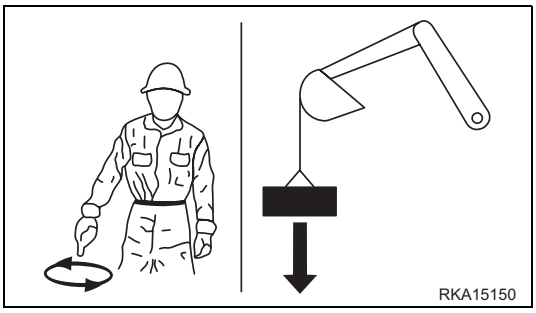
- **When it is necessary to position loads, make excavations or move the machine with reduced field of vision, the operator must be helped by another person standing on the ground and making signals to indicate the manoeuvres to be carried out, according to the specific signals defined by the relevant regulations.**
- **No movement or operation should be carried out if the signals have not been clearly understood by the operator and the signalman.**
- **When additional instructions different from those defined by the manual signalling system are necessary, these must be agreed upon by the operator and the signalman before starting the job.**
- **Only one person must be entrusted with making signals.**
- **The operator must make sure that the signalman is always within his field of vision and follow all his signals.**

The use of hand signals serves to direct the lifting, handling and positioning of the loads lifted by the work equipment. Hand signals can also be used during digging operations or when the machine travels, if the field of vision of the operator is reduced. The direction of movement of the hands and arms in relation to the machine must define the signal, independently of the position of the signalman. Hand signals must be performed following the indications given below.

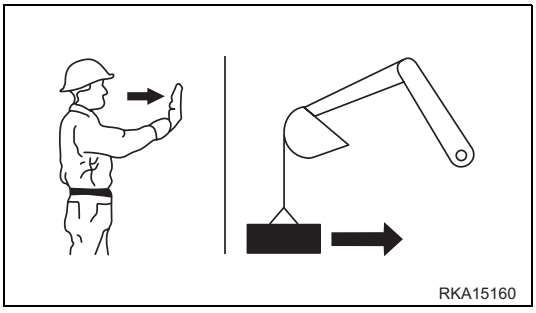
1 - LIFT THE LOAD VERTICALLY
With a forearm in vertical position and the forefinger pointing upwards, rotate the hand making small circles.



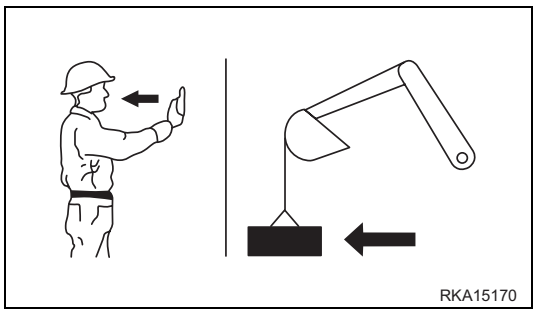
2 - LOWER THE LOAD VERTICALLY
With an arm extended and the forefinger pointing downwards, rotate the hand making small circles.



3 - MOVE THE LOAD AWAY IN HORIZONTAL DIRECTION
With an arm extended forwards and the hand in vertical position directed towards the load to be moved away, move the hand in the direction of the movement to be carried out.



4 - BRING THE LOAD NEARER IN HORIZONTAL DIRECTION
With an arm extended forwards and the hand in vertical position directed towards the signalman, move the hand in the direction of the movement to be carried out.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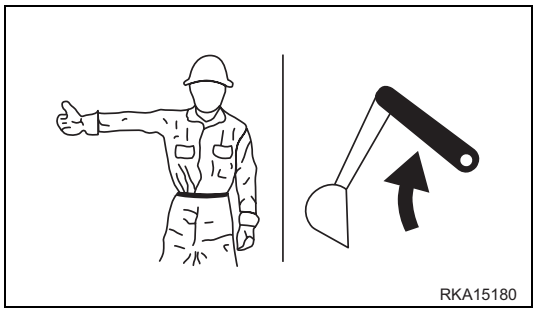
5 - LIFT THE BOOM
With an arm extended in horizontal position and closed fingers, point the thumb upwards.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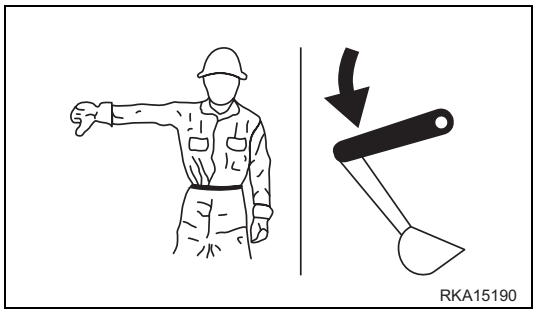
6 - LOWER THE BOOM
With an arm extended in horizontal position and closed fingers, point the thumb downwards.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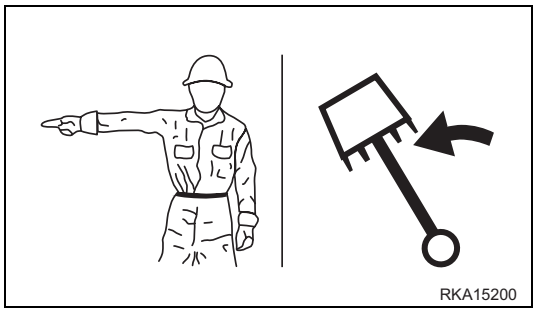
7 - SWING THE BOOM
With an arm extended in horizontal position, point the forefinger in the desired swing direction.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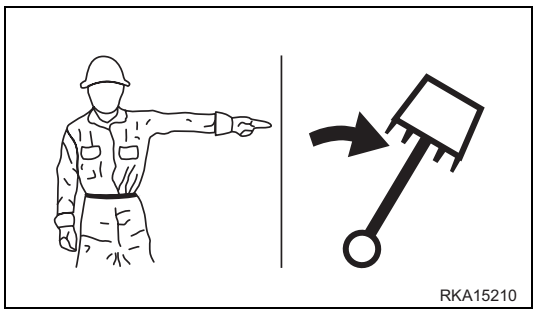
8 - SWING THE BOOM
With an arm extended in horizontal position, point the forefinger in the desired swing direction.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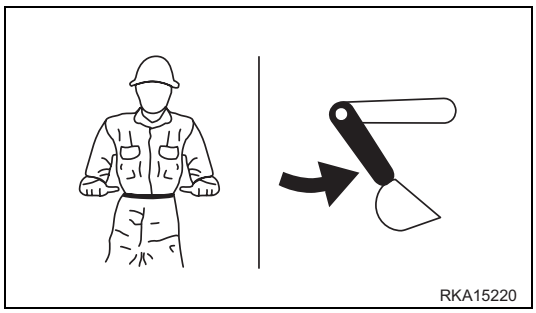
9 - FOLD THE ARM
With both hands clasped, point the thumbs inwards.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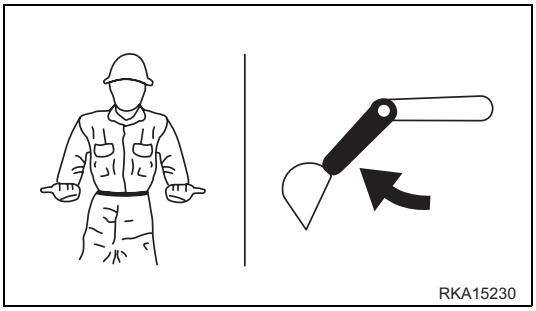
10 - EXTEND THE ARM
With both hands clasped, point the thumbs outwards.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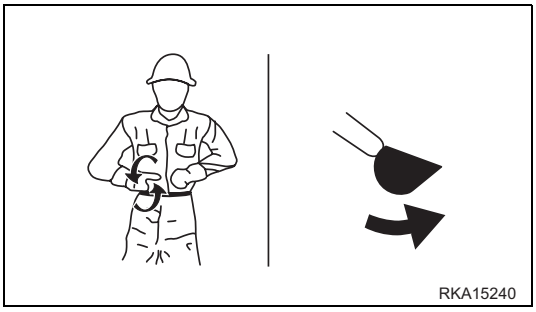
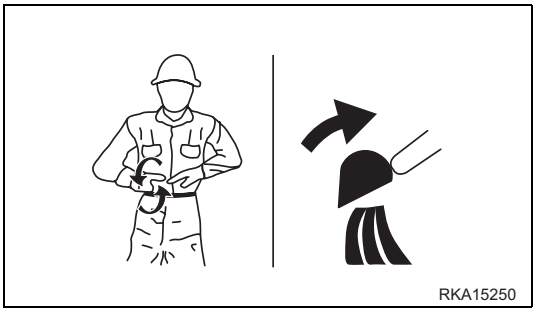
11 - FOLD THE BUCKET
Keep one hand still and closed. Rotate the other hand vertically with the thumb pointed towards the clasped hand.


RKA15240

12 - OPEN THE BUCKET
Keep one hand still and open. Rotate the other hand vertically with the thumb pointed towards the open hand.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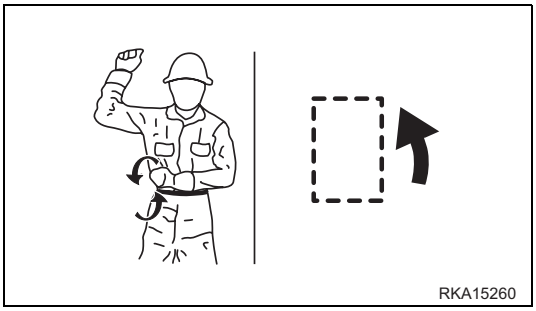
13 - TRAVEL WHILE STEERING
Lift the forearm corresponding to the inner steering side with clenched fist. Rotate the other fist vertically indicating the wheel's turning direction.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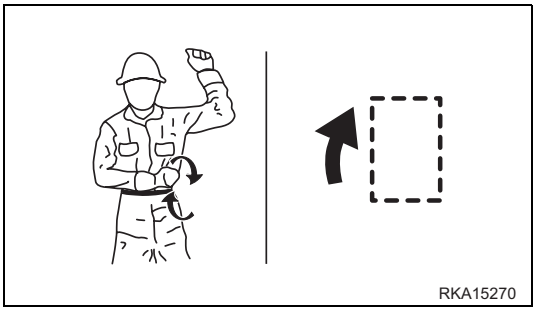
14 - TRAVEL WHILE STEERING
Lift the forearm corresponding to the inner steering side with clenched fist. Rotate the other fist vertically indicating the wheel's turning direction.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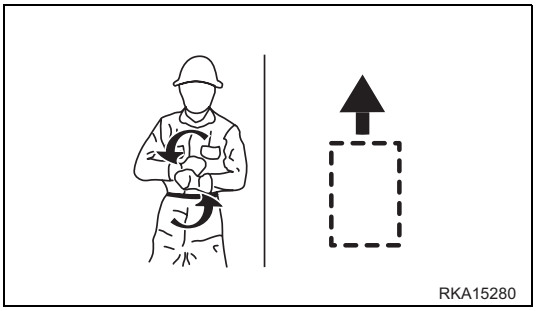
15 - TRAVEL STRAIGHT AHEAD
Rotate the fists vertically indicating the turning direction of the wheels.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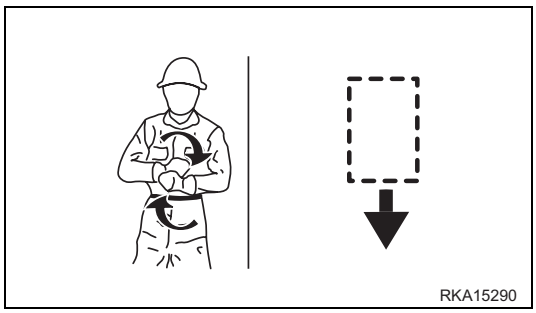
16 - TRAVEL STRAIGHT AHEAD
Rotate the fists vertically indicating the turning direction of the wheels.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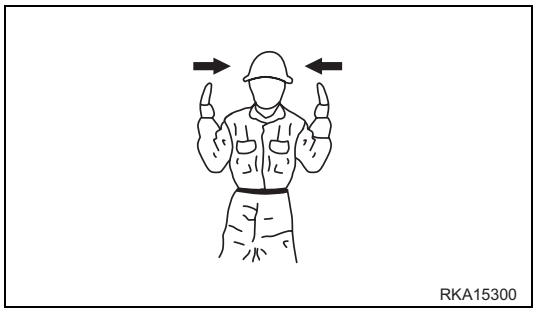
17 - DISTANCE TO BE COVERED
With the hands raised and facing inwards, move the hands laterally indicating the distance to be covered.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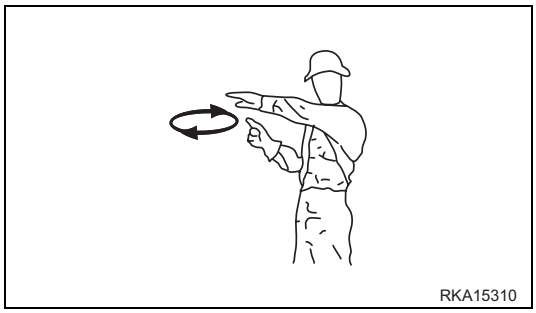
18 - CARRY OUT THE MOVEMENTS SLOWLY
One hand still in front of the hand that indicates the movement to be carried out. (The figure represents the “lift slowly” control).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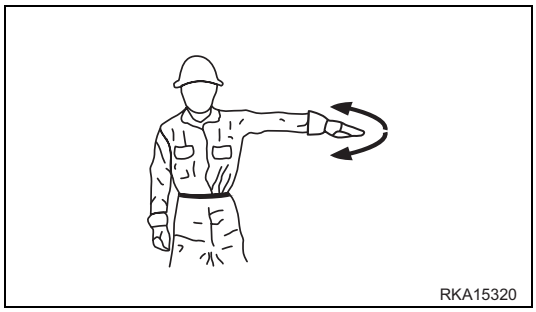
19 - STOP
With one arm extended laterally, open the hand facing downwards and move the arm forwards and backwards.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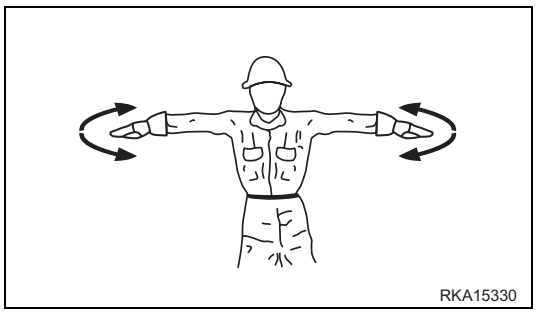
20 - EMERGENCY STOP
With both arms extended in horizontal position, open the hands downwards and move both arms forwards and backwards.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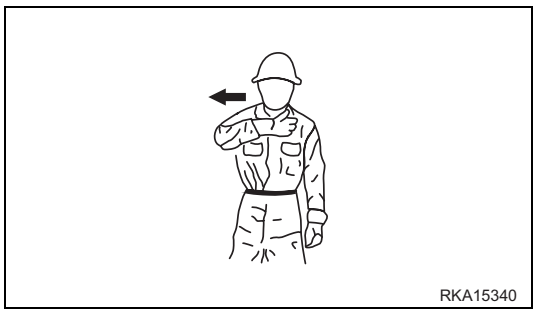
21 - STOP THE ENGINE
Pass thumb or forefinger across the throat.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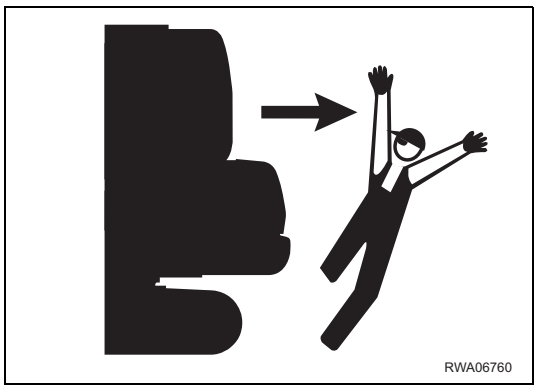
2.4.4 CHECKS FOR TRAVELLING IN REVERSE

- When operating in areas that may be hazardous or have poor visibility, designate a person to direct the movements of the machine and traffic on the work site.
- Make sure that no unauthorized person is within the machine operating range or in its travel direction.
  If necessary, put up appropriate fences.
- Before moving the machine, sound the horn in order to warn everyone close to the work area.
- There are blind spots behind the machine, which cannot be seen and where someone may be standing: therefore, it is necessary to make sure that there is no one behind the machine before travelling in reverse.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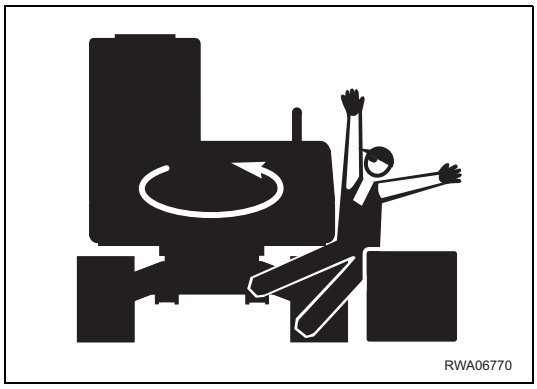
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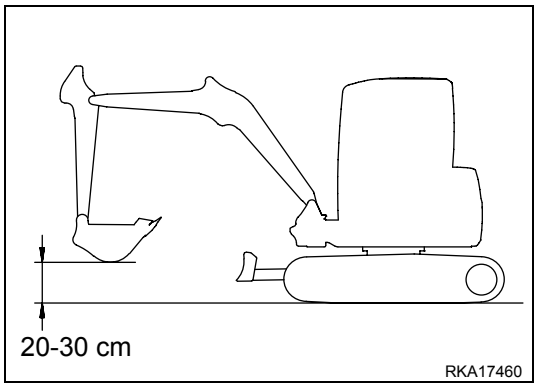
2.4.5 MOVING THE MACHINE

- When moving the machine, position the bucket at about 20÷30 cm from the ground; this position makes it possible to evaluate more precisely the space required for the movements and at the same time ensures the stability of the machine.
- Make sure that the driver seat is directed towards the blade.
  Otherwise, pay attention to the steering and advance manoeuvres, since they are inverted.
- If the work equipment control levers must be used during travel, avoid moving them abruptly; sudden manoeuvres change the attitude of the machine and make driving difficult.
- When travelling on rough ground, keep the speed low and avoid sudden movements of the bucket arm.
- If possible, avoid moving on obstacles.
  If the machine has to travel over an obstacle, keep the equipment as close to the ground as possible and travel at low speed.
  Never move on obstacles that may incline the machine considerably (over 10°).
- If one of the rubber tracks moves on an obstacle or gets into a hole, the machine may overturn.
  In these cases, reduce the speed to minimum and be very careful to the balance of the machine.



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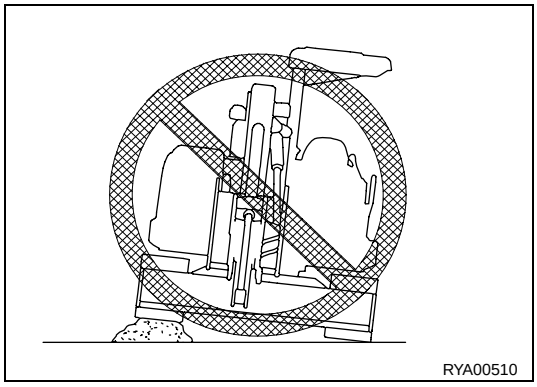
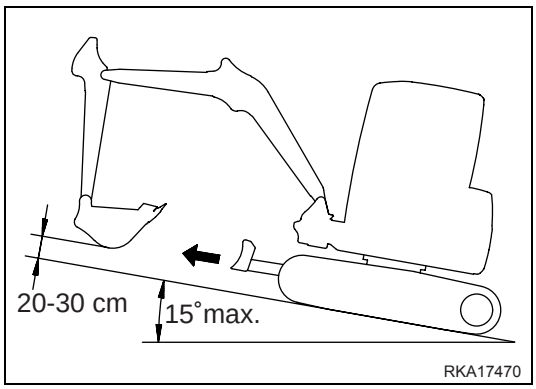
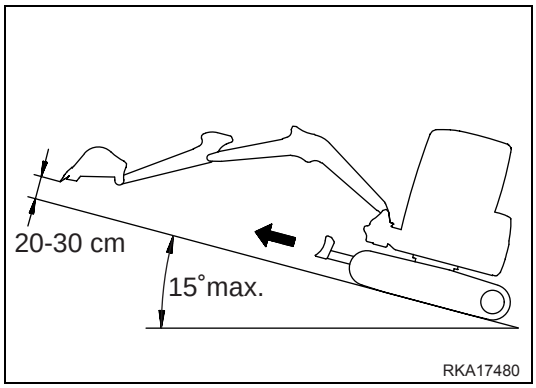
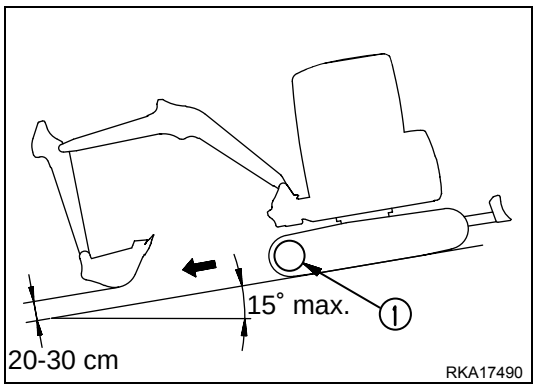

RYA00510

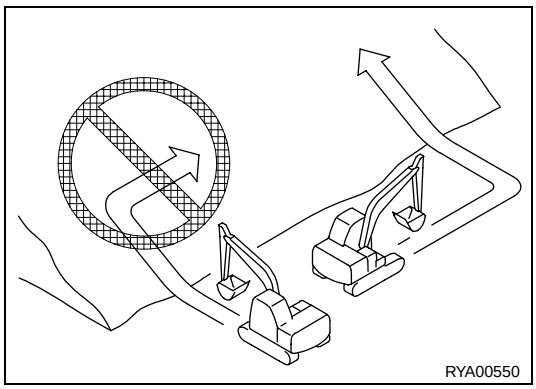
2.4.6 MOVING ON SLOPES

- Operations on slopes and on river or lake banks with damp ground may cause the machine to tip over or slip.
- On hills, banks or slopes, keep the bucket very close to the ground (20-30 cm from the ground), and in case of emergency quickly lower it to the ground to help the machine stop.
- When travelling up a steep slope, extend the work equipment forward to improve the balance of the machine, keep the work equipment approximately 20-30 cm above the ground, and travel at low speed.
- When travelling downhill, lower the engine speed, keep the travel lever close to the neutral position, and travel at low speed.
  When travelling downhill, position the machine with the revolving frame rotated by 180°, so that the sprocket (1) and the boom are in travelling direction, as shown in the figure, and proceed at low speed.
- Do not change direction on slopes; side movements must be carried out on level ground, or with inclination not exceeding 10° .
- Do not move on slopes whose inclination exceeds 15°, since the machine may overturn.
- When the fuel level indicator reaches the red reserve area during work on a slope, immediately provide for refuelling; due to the inclination of the machine, the engine may suck in air and stop suddenly, which represents a grave risk for the safety of the operator and of the persons standing before the machine.
- If the engine stops suddenly, immediately lower the bucket to the ground.

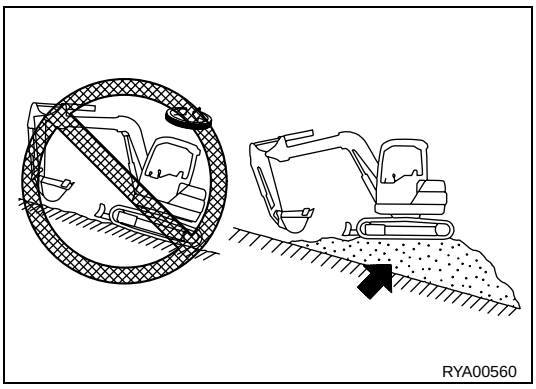








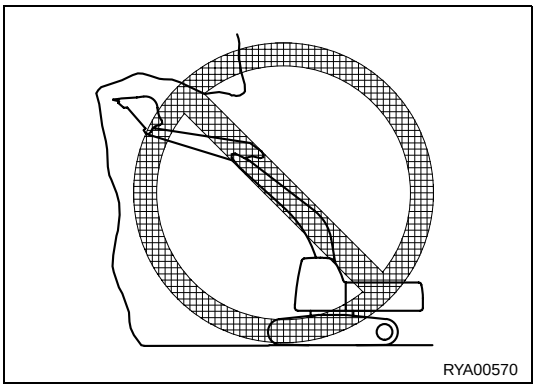
2.4.7 WORKING ON SLOPES



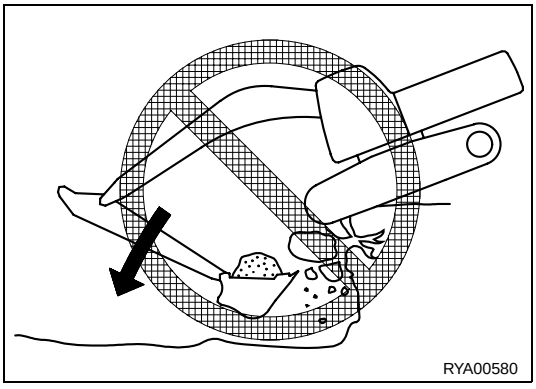
- Operations on slopes and on river or lake banks with damp ground may cause the machine to tip over or slip.
- When working on slopes (max. inclination 10°), avoid turning the revolving frame, if possible, since this may cause the machine to lose balance and overturn.
  It is particularly dangerous to swing the equipment on slopes when the bucket is full.
  If these operations are going to last long, accumulate soil in such a way as to create a horizontal platform on which the machine can be positioned.

2.4.8 UNAUTHORIZED OPERATIONS

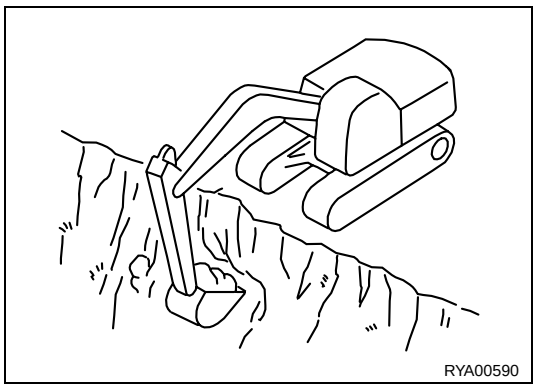
- It is dangerous to use the bucket or lift arm for crane operations, so do not carry out such operations.
- No people on attachments
  - Never let anyone ride on the work equipment, or other attachments. There is a hazard of falling and suffering serious injury.
  - Never use the machine for lifting of personnel.
- Do not carry out excavations under overhangs.
  The overhang may collapse and fall on the machine.



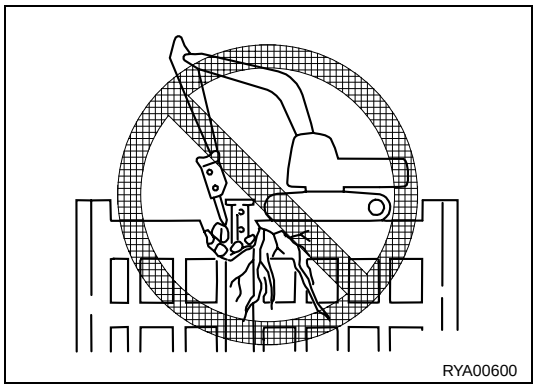
- Do not excavate too deeply under the front of the machine.
  The ground under the machine may collapse and cause the machine to fall.



- To make it easier to escape from the machine in case of emergency, set the tracks at right angles to the road shoulder or coast, with the sprocket at the rear, when carrying out digging operations.


RYA00590

- Do not carry out demolition work under the machine, since it may become unstable and tip over.
- When working on the top of buildings or other structures, check these structures and their strength before starting work. In fact, the buildings may collapse and cause serious injury or damages.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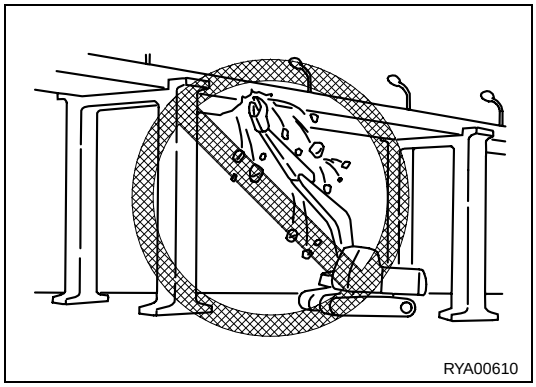
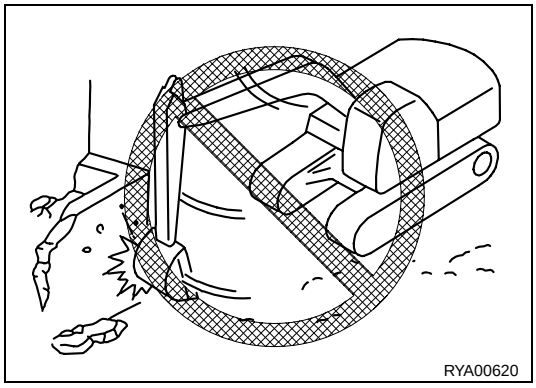
- When carrying out demolition work, do not position the machine under the structure being demolished, since broken parts may fall down or the building may collapse causing serious injury or property damage.


RYA00610

- Do not use the impact force of the work equipment for breaking work. Flying pieces of broken materials may damage the work equipment or even cause serious personal injury.
- As a general rule, the machine is more liable to overturn when the work equipment is swung to one side than when it is at the front or rear.


RYA00620

- When using a breaker or other heavy-duty equipment, the machine may lose its balance and overturn. Both when operating on flat ground and when operating on slopes, keep to the following instructions:
  1 - Do not lower, swing, or stop the work equipment suddenly.
  2 - Do not extend or retract the boom cylinder suddenly, since the impact may cause the machine to overturn.
- Do not move the bucket over the head of other workers or over the operator seat of dump trucks or other transport equipment. The load may be spilled or the bucket may hit the dump truck and cause serious injury or property damage.
- The operator or person attaching the sling should inspect the bucket link lifting device and all components in the load line (e.g. chains, shackles etc.) visually for damage or deformation before use to ensure that they are not damaged or worn.
  Any damaged, deformed or worn parts should not be used and must be replaced.

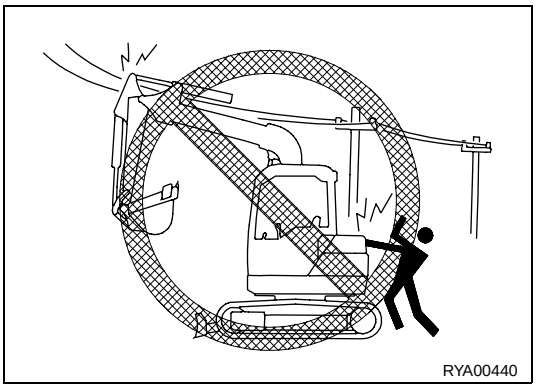
2.4.9 PREVENTING ELECTROCUTION

- Digging operations near overhead electric lines are extremely dangerous and they may also cause death due to electrocution; for this reason, when working near overhead electric lines always respect the minimum safety distances prescribed by the competent authorities and by the accident-prevention rules in force.
- As far as underground long-distance lines are concerned, the minimum distance depends on the covering of the ducts in which the cables are laid.
- The basic safety precautions to be taken to prevent this risk are the following:
  1 - Wear shoes with thick rubber or leather soles.
  2 - Request the aid of another person who can warn you if the machine gets too close to the electric line.
  3 - Operate at low speed.
  4 - Get acquainted with the behaviour rules to be followed in case of electrocution.
  5 - Keep the phone number of the electricity company and of the nearest first aid station at hand.
- If the work equipment gets accidentally entangled in the cables, the operator must not leave the cab until the electricity company has insulated the line.
- When carrying out this kind of operations, warn everyone standing in the work area to keep a safety distance from the machine and the work equipment.
- Ask the electricity company in advance the voltage of the cables and the minimum safety distance.

⚠ DANGER

- **The minimum distances from overhead lines can vary in the different countries, according to the climate and to the humidity percentage in the air.**
  Indicatively, the distances indicated in the following table should be respected.

Cable voltage	Min. safety distance
1.0 kV (distribution line)	5 m
6.6 kV (2–3 insulators)	5.2 m
33 kV (min. 3 insulators)	5.5 m
66 kV (min. 6 insulators)	6 m
154 kV (min. 10 insulators)	8 m
275 kV (min. 19 insulators)	10 m


RYA00440

2.4.10 VISIBILITY

- Make sure that there are no people or obstacles in the area surrounding the machine and check the conditions of the worksite to ensure that all operations and movements can be carried out safely.
- Switch on the work lights as soon as visibility decreases.
- If visibility is reduced due to mist, smoke or heavy rain, stop the machine in a safe position and wait for the weather to improve until visibility becomes acceptable.
- Before travelling or operating the machine, the operator should sound the horn to warn people in the area.

2.4.11 WORKING ON ICY OR SNOW-COVERED SURFACES

- If the ground is icy or covered with snow, even a slight slope may cause the machine to slip sidewards, therefore it is advisable to move at low speed and to avoid abrupt starts, stops or turns.
- When it has snowed heavily, the road shoulders and any obstacle are buried in the snow and are not visible, therefore proceed with care when clearing the snow.

2.4.12 PREVENTING DAMAGE CAUSED BY THE WORK EQUIPMENT

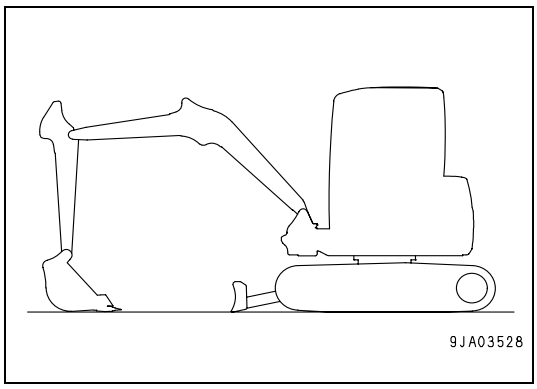
- When working in tunnels, galleries, under electric cables or other ducts (air, telephone lines) and wherever the height is limited, proceed with the greatest care to prevent the bucket or the arms from causing any damage.

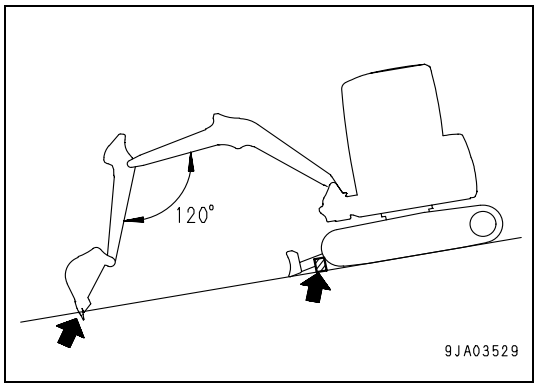
2.4.13 WORKING ON LOOSE GROUND

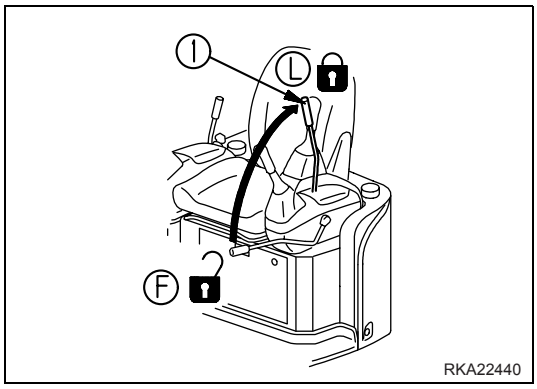
- Avoid operating the machine too close to the edge of cliffs, overhangs and deep ditches.
  These areas may collapse, making the machine fall down or tip over and this could result in serious injury or even death.
  Remember that after heavy rain or earthquakes these dangerous conditions usually get worse.
- The earth laid near ditches is loose and is likely to collapse due to the weight or vibrations of the machine.
  Pay the utmost attention and always fasten the seat belt; close the cab door, if provided.
- In case of work in areas where stones or other material may fall on the machine, install the FOPS protection device.

2.4.14 PARKING THE MACHINE

- Park the machine on firm and level ground. If this is not possible and it is necessary to park on a slope, position the machine with the bucket directed downwards and carry out the following operations:
  1 - Rotate the bucket to the dumping position and lower the arms until thrusting the teeth into the ground.
  2 - Stop the engine.
  3 - Put wedges or safety blocks under the tracks.
- Always lower the work equipment to the ground; if it is necessary to park with raised arms, make sure that the safety locks are engaged.
- Always lock the equipment control by shifting the safety lever (1) to the “locked” position (L).
- When leaving the machine, remove the ignition key.
- If it is necessary to park on public roads, provide for signalling the presence of the machine according to the local regulations in force (signalling fires, fences, road works ahead, two-way traffic, direction signs, etc.).



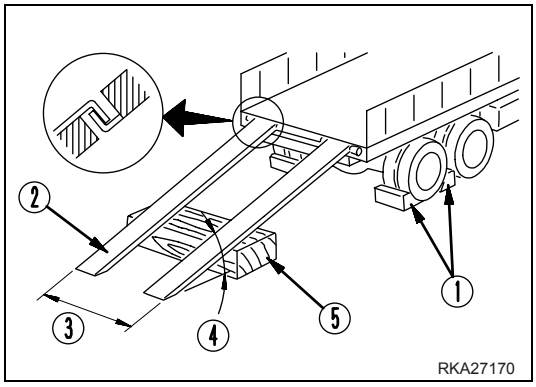




2.5 TRANSPORTING THE MACHINE ON MOTOR VEHICLES

2.5.1 LOADING AND UNLOADING THE MACHINE

- Loading and unloading the machine on/from a motor vehicle always involves potential hazards. Proceed with extreme care.
- Perform loading and unloading operations on firm, level ground. Maintain a safety distance from the edges of ditches or from road sides.
- If the vehicles used are not specially equipped for this purpose, put support blocks under the ramps, in order to prevent them from bending.
- Always lock the wheels of the transport vehicle with wedges.
- Always use ramps that are sufficiently wide and can support the weight of the machine. The longitudinal axes of the ramps must be parallel to each other and perpendicular to the loading board, and their distance must be suitable for the tread of the machine.
- Make sure that the ramps are securely positioned and fastened to the loading board, and that they have the same length.
- Position the ramps with a maximum inclination of 15°.
- Make sure that the surface of the ramps is clean and there is no trace of grease, oil, soil or ice; remove dirt from the tracks before loading the machine on the vehicle.
- The machine must be loaded on the vehicle with the bucket directed forwards, that is, in the driving direction of the vehicle.
- Do not correct the trajectory of the machine on the ramps. If necessary, get down the ramps and start the operation again.
- After loading the machine, block the tracks with wedges and secure it with tie-downs or chains to prevent any sideward movement (see "3.4 TRANSPORTING THE MACHINE").



(1) Wedges
(2) Ramp
(3) Distance between the ramps
(4) Ramp angle: Max.15°
(5) Lock

2.5.2 TRANSPORTING THE MACHINE

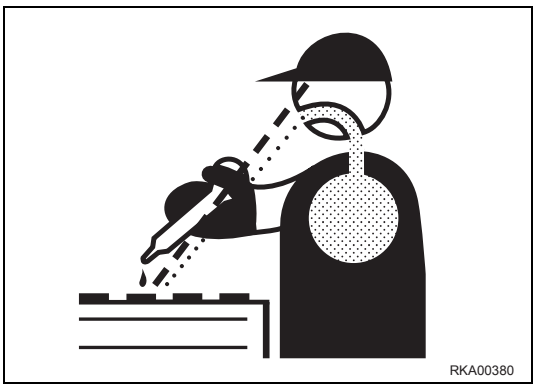
⚠ CAUTION

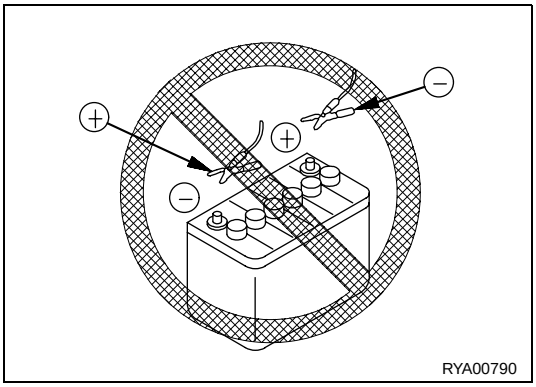
- **During transport, the machine must be secured to the vehicle.**

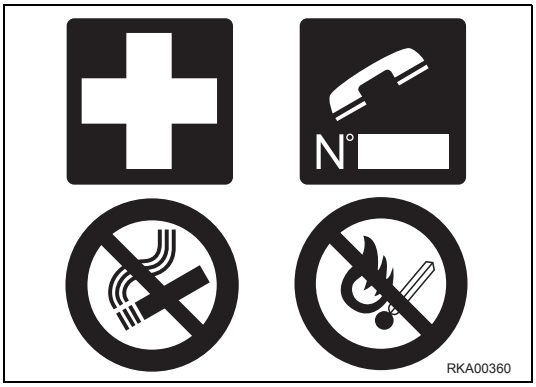
- Define the route to be followed, taking in consideration the width, height and weight of the transport means and of the machine.
  Make sure that the dimensions of the machine are compatible with the road and any gallery, subway, bridge, electric and telephone lines, etc.
- Keep to the regulations in force regarding the permissible width, height, weight of the machine and the transport speed.

2.6 BATTERY

2.6.1 PREVENTING RISKS THAT MAY BE DUE TO THE BATTERY



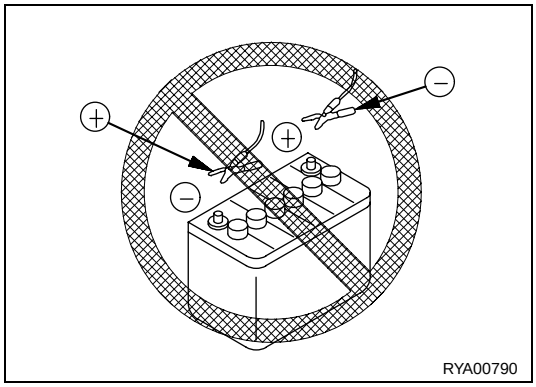


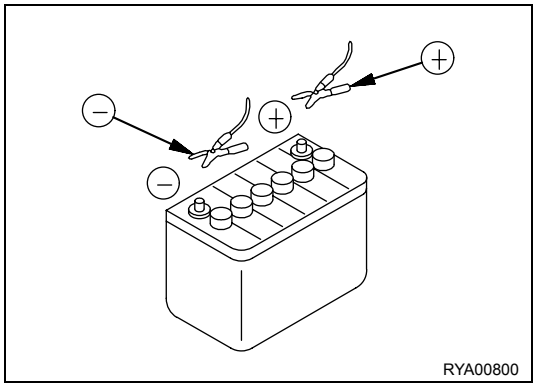


- Electrolytic batteries contain lead and sulphuric acid, which can cause burns. It can also corrode clothing and make holes in it. In case of contact with battery acid, immediately wash the affected part with plenty of water.
- Battery acid may cause blindness if sprayed into the eyes. If acid gets accidentally into your eyes, flush them immediately with plenty of water and consult a doctor without delay.
- If you accidentally swallow battery acid, drink a large quantity of water or milk, beaten egg white or vegetable oil and in any case antiacid substances like magnesia, bicarbonate, etc., and call a doctor or a poison treatment center immediately.
- When handling batteries, always wear safety goggles.
- Batteries produce hydrogen, which is highly explosive and can easily ignite with small sparks or naked flames.
- Before any operation on the battery or before disconnecting the cables, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.
- When disconnecting the battery leads, first disconnect the negative (–) ground cable and afterwards the positive (+) one. Upon connecting them again, connect the positive (+) cable first and the negative (–) ground cable last.
- Avoid short-circuiting the battery terminals through any contact, even if accidental, with metal objects or tools or by inverting them.
- Tighten the battery terminals securely. Loose terminals may generate sparks and may cause the battery to explode.
- Install the battery securely to the determined place.
- When removing the battery cables, first turn the starting switch to the OFF position, wait over one minute, then turn the battery disconnect switch to the OFF position and take out the battery disconnect switch key. Then begin the cable removal at the ground (negative "-") cable side. When installing the battery cables, be sure to begin with the positive (+) cable side and finish at the ground cable side.

2.6.2 STARTING WITH BOOSTER CABLES

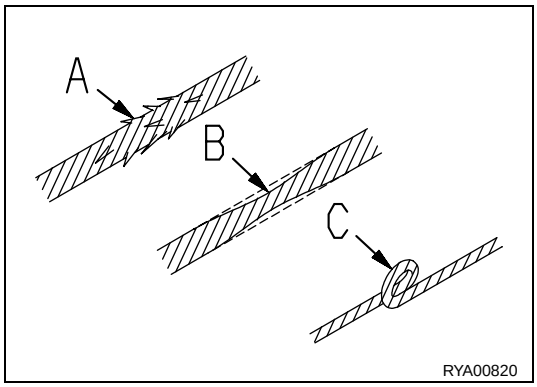
- When starting the machine with booster cables, always wear safety goggles.
- When starting the engine by means of another machine, avoid any contact between the two machines.
- Before connecting the additional cables, make sure that both the starter key and the battery main switch are turned to OFF.
- When connecting the booster cables, make sure to connect the positive cable (+) first and then the negative or earth cable (–). After the start, disconnect first the negative or earth cable (–) and then the positive cable (+).
- Connect the batteries in parallel: positive to positive and negative to negative.
- When connecting the earth cable to the body of the machine to be started, operate as far as possible from the battery. (See "3.7.5 IF THE BATTERY IS DOWN").
- Do not attempt to start the engine by short-circuiting the starter terminals (see "2.8.18 PRECAUTIONS CONCERNING THE STARTER").

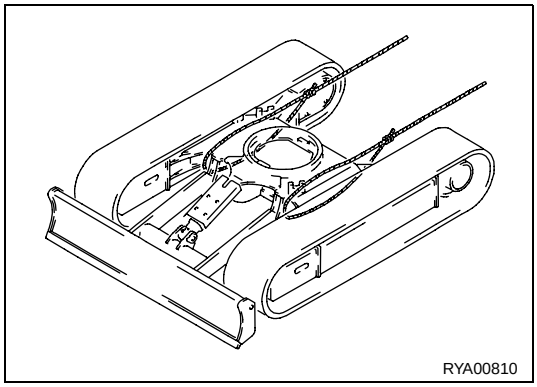




2.7 PRECAUTIONS FOR THE REMOVAL OF THE MACHINE

- Before removing the machine, make sure that all the controls are in neutral.
- Incorrect manoeuvres may cause serious damage, personal injury and even death.
- To move the machine, use properly dimensioned steel cables; do not use worn cables or cables with broken strands (A), deformed cables (B), twisted cables (C).
- During the removal, no one can be allowed to get near the machines or the cable.
- Do not stand astride the cable.
- Move the machine only as far as necessary to allow the required repairs to be carried out.
- Put wooden blocks between the towing cable and the machine body, in order to avoid wear or damage.
- Do not remove the machine in any way other than that indicated in paragraph "3.7.3 REMOVING THE MACHINE".





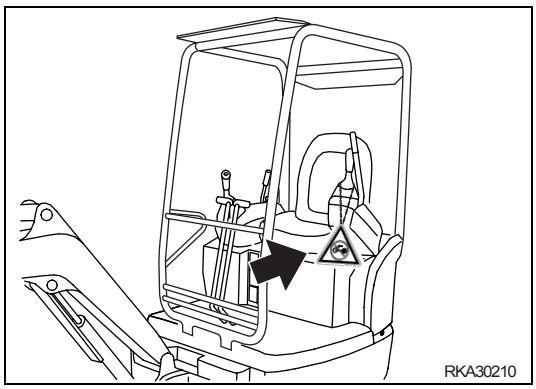
⚠ CAUTION

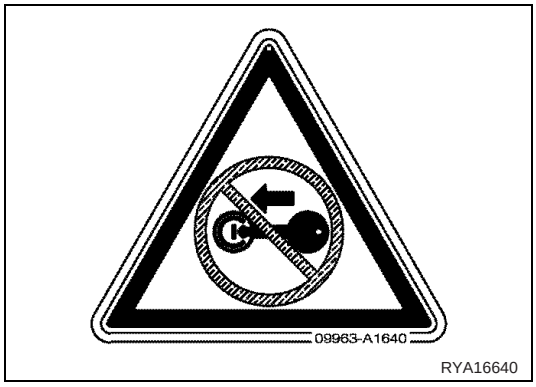
- **The maximum applicable force for the removal is**
  F= 1,300 kg (for canopy)
  F= 1,440 kg (for cab)
- **Use cables having the same length and draw continuosly and constantly, without jerks.**
- **Position and connect the machine to be removed taking care that it is on the same axis as the towing vehicle; the traction force exerted must be parallel to the axis of movement of the machine.**

2.8 PRECAUTIONS FOR MAINTENANCE

2.8.1 WARNING PLATES

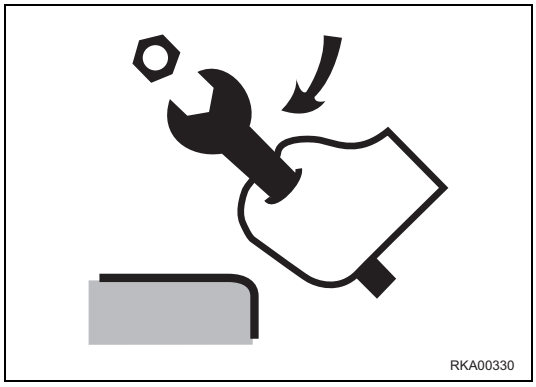
- Before starting any maintenance operation, position the machine on a firm and level surface, lower the equipment to the ground, engage the safety locks of the equipment and the controls, and stop the engine.
- If another person starts the engine and operates the control levers while the operator is servicing the machine, this may result in serious injury or even death.
- To avoid these risks, always attach warning plates to the control levers and to the ignition key before performing any maintenance operation; if necessary, attach additional warning tags also around the machine and in particular to the cab door handles.





2.8.2 TOOLS

- Use only the tools supplied together with the machine and high-quality tools suitable for the tasks to be performed.
- Do not use worn, damaged, low-quality tools or tools that are not suitable for the tasks to be performed, in order to avoid any personal injury.



2.8.3 STABILITY

- When dismantling or assembling the machine for the purpose of maintenance or repair, always ensure that at each stage of the process, care is taken to ensure that the machine remains stable. Failure to do this could result in serious injury or death.

2.8.4 MAINTENANCE STAFF

- Any maintenance operation must be carried out exclusively by authorized and duly trained staff; specific and personal protection measures must be adopted when grinding, welding and when using sledges or heavy hammers.
- When assembling the equipment or cylinder connection pins, use wooden, plastic or in any case not excessively hard tools to check the centering of the holes.
  Avoid using your fingers, since the may be injured or even cut off.

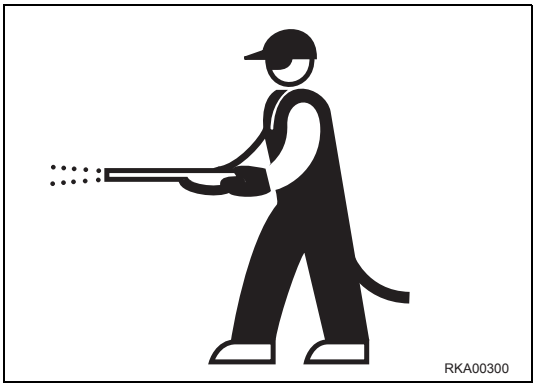
2.8.5 EQUIPMENT

- The normal or special equipment that must be installed on the machine or that have been removed must be stored in a safe place and positioned in such a way as to prevent them from falling down. If they fall on someone, they may cause serious injury.
- When assembling or removing any equipment, make sure that the ropes and the lifting hook are in good conditions and properly dimensioned for the load to be lifted.

2.8.6 WORKING UNDER THE MACHINE

- Before performing service or repairs under the machine, always lower the work equipment to the ground or in any case lower it as much as possible.
- Always secure the tracks so that they cannot move.
- Do not work under the machine, if this is not sufficiently supported.

2.8.7 CLEANING THE MACHINE



- Spilled oil or grease, scattered tools or broken pieces are dangerous, because they may cause someone to slip or trip. Always keep the machine and the work site clean and tidy.
- To clean the machine, use a pressurized jet of warm water or steam and the specific detergents available on the market. Do not use diesel oil, oil or solvents, since the former leave an oily coat that favours the sticking of dust, while the latter (even if weak) damage the painted surfaces and therefore facilitate rusting.
- While cleaning the machine, keep the pressurized jet at a minimum distance of approx. 60 cm, in order not to damage the warning plates and the pictograms.
  If the plates are damaged, request Komatsu or your Komatsu Distributor to send you spare plates and change them.
- Water into the electrical system provokes the oxidation of the contacts and may hinder the start of the machine or even make it start suddenly and abruptly. For this reason, avoid using water or steam jets to clean sensors, connectors or the inside of the cab.

2.8.8 USE OF THE ENGINE DURING MAINTENANCE

- During maintenance operations, make the engine run only when indispensable. If it is necessary to have the engine running (for example, to wash the cooling circuit or to check the functionality of the alternator), an operator should constantly remain in the cab, in order to be able to stop the engine whenever necessary.
- During maintenance operations with running engine, do not release the control locking devices from the “locked” position or change the position of the travel levers.
  Maintenance staff must not move any control lever.
- When carrying out maintenance operations, do not touch the moving parts of the machine and avoid wearing large and loose clothes.

2.8.9 PERIODICAL CHANGE OF THE PARTS THAT ARE CRITICAL FOR SAFETY

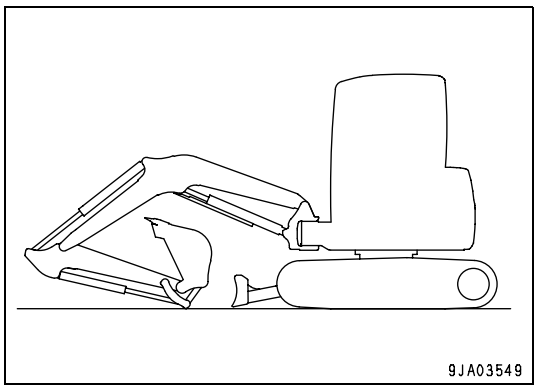
- To ensure that the machine can be used as long as possible in total safety, it is necessary to add oil and carry out the required maintenance operations at regular intervals. To increase safety, safety-related components like pipes and belts must be periodically changed.
  For the replacement of the parts that are critical for safety, see "4.7 PERIODICAL CHANGE OF SAFETY-RELATED COMPONENTS".
- The material used for making these components naturally changes over time and prolonged use may cause deterioration, wear and excessive stress, with the consequent risk of breakages thay may lead to serious injury and property damage. It is difficult to evaluate the conditions of these components through an external check or based on the operator's feelings during work, therefore it is advisable to change them according to the recommended intervals.
- If any defect should be found out, change or repair the components that are critical for safety even before the end of the recommended intervals.

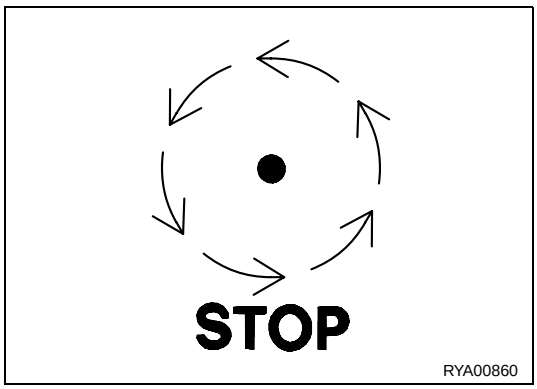
2.8.10 REPAIR WELDS

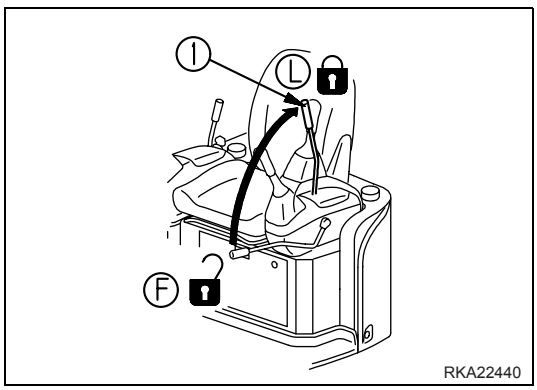
- Welding operations must be always carried out by a qualified welder, in a place where suitable equipment is available. Welding operations may be the cause of fire and electrocution, therefore do not allow unauthorized personnel to make welds.
- Before starting welding work, turn the starting switch to the OFF position, wait over one minute, then switch off the battery disconnect switch and take out the battery disconnect switch key.

2.8.11 STOP THE ENGINE BEFORE CARRYING OUT ANY MAINTENANCE OPERATION OR INSPECTION

- Stop the machine only on firm and level ground and stop the engine before carrying out any maintenance operation or inspection.
- If it is necessary to have the engine running during maintenance, shift the safety lever (1) to the “locked” position (L) and carry out any maintenance operation with the help of another person; one operator must remain on board and the words to be used during the operation must be agreed upon in advance.
- The person who carries out the maintenance operation must be very careful not to touch any moving part of the engine.





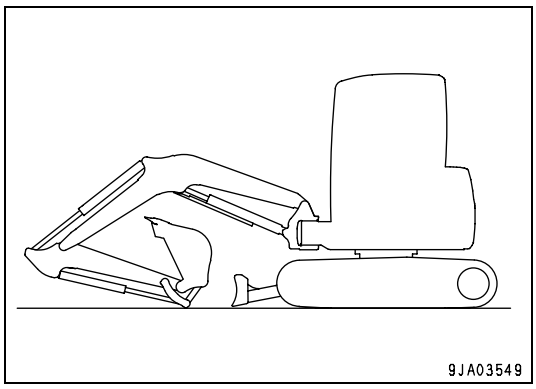


2.8.12 BATTERY MAIN SWITCH PRECAUTIONS (if installed)

- Should the electric circuits need to be checked or serviced, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.
- The switch must be always turned to OFF:
  - When the machine is not going to be used for a long period or when the machine is prepared for prolonged inactivity.
  - When the electric circuits need to be fixed.
  - Before arc welding.
  - Before removing the battery.
  - Before replacing a fuse.

2.8.13 SAFETY MEASURES TO OPEN (TILT) THE PLATFORM

To open (tip) the platform, see "3.2.9 TILTING THE CAB FLOOR".

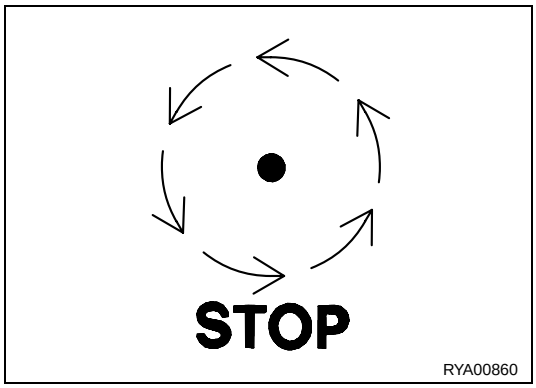


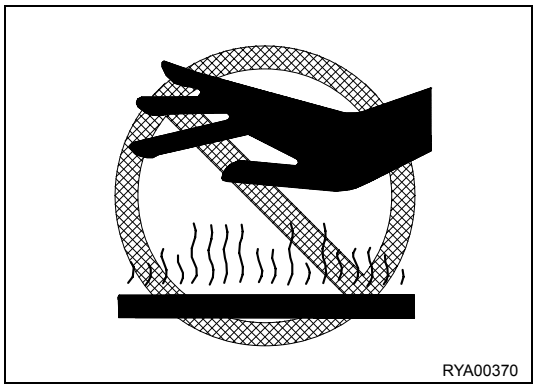
Safety measures to park the machine

- Park the machine on a firm and level surface.
- Select a place with no risks of landslide, falling objects or floods.
- Lower the working tool and scraper completely to the ground.

Measures for opening and closing

- Do not open the platform when the machine is on a slope or if there is strong wind.
  This may cause serious personal injuries.
- Do not open or close the platform with the engine running or if the safety device lever is in the working position (F), as this is extremely dangerous.
- Immediately after the engine stops, the components and the oil are extremely hot and may cause burns.
  Before starting to open the platform, check that the temperature in the engine compartment has lowered.
- Upon opening the platform, do not go up or down from the operator seat.
  You may fall and get seriously injured.





2.8.14 RULES TO BE FOLLOWED WHEN REFUELLING OR ADDING OIL

- Keep away from naked flames while refuelling or adding oil.
- Spilled fuel or oil make the ground slippery and may cause accidents; clean any dirty area immediately and carefully.
- Always tighten the safety caps of the fuel tank and of the hydraulic oil tank securely.
- Do not use fuel to clean any part of the machine that is dirty with oil or dust.
- Always top up the fuel and oil tanks in properly ventilated areas and refrain from smoking.
- When refuelling, hold the fuel gun firmly and keep it constantly in contact with the filler until you have finished, in order to avoid sparks due to static electricity.
- Do not fill the tank completely, in order to leave room for the fuel to expand.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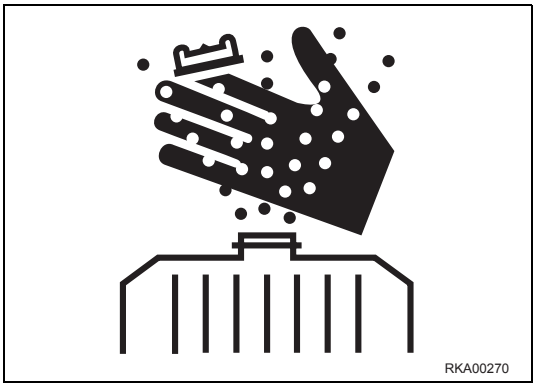
2.8.15 CHECKING THE COOLANT LEVEL IN THE RADIATOR

- Let the engine and the radiator cool down before checking the coolant level.
- If it is necessary to remove the cap with hot engine, wear suitable clothes and protections and loosen the cap slowly, in order to release the pressure gradually.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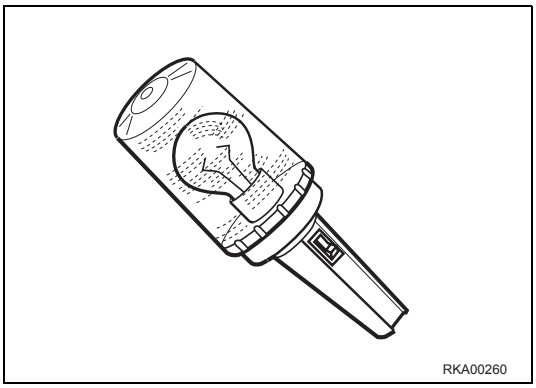
2.8.16 USING LAMPS

- When checking the fuel, oil, coolant or battery electrolyte level, always use homologated explosion-proof lamps.
  If such lamps are not used, there is danger of fire or explosion.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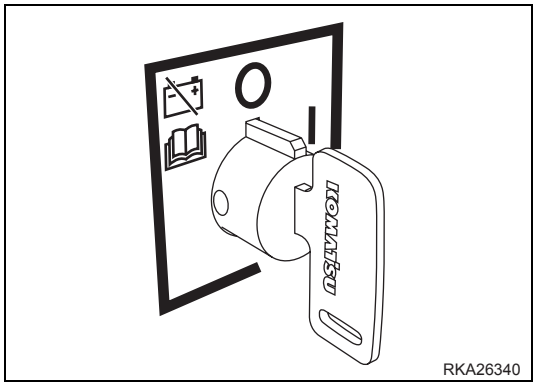
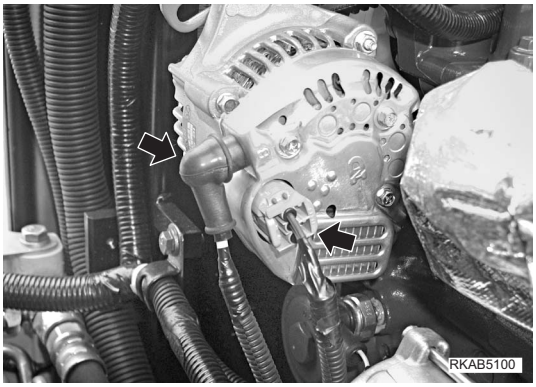
2.8.17 PRECAUTIONS TO BE TAKEN WHEN HANDLING THE BATTERY AND THE ALTERNATOR

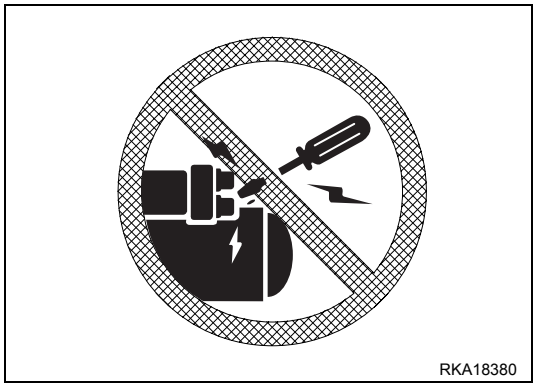
- When the electrical system is being repaired or when electric welds are made, turn the battery main switch to OFF (O) to interrupt the current (see "3.2.2 pos: 9. Battery main switch (if installed)").
- If electric welds are necessary for the machine, besides disconnecting the battery, disconnect the alternator and the KOMTRAX system control unit.





2.8.18 PRECAUTIONS CONCERNING THE STARTER

- Start the engine only when correctly seated in the driving position.
- Do not start the engine by tampering with the terminals of the starter, since the machine may move.
- Sudden or accidental movements of the machine may cause serious injury or even death.

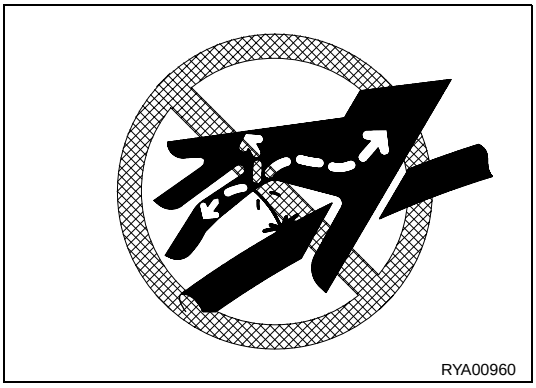


2.8.19 HANDLING HIGH-PRESSURE HOSES

- Do not bend high-pressure hoses or rub them with abrasive or cutting objects.
  Do not use any bent or cracked pipes or hoses that were previously rejected because of leaks or fastening defects, since they may burst during use.
- Always repair or replace any loose or faulty fuel or oil pipe. Any leakage of fuel or oil may cause fires.

2.8.20 PRECAUTIONS TO BE TAKEN WHEN HANDLING HIGH-PRESSURE OIL

- Do not forget that the work equipment circuits are always under pressure; for this reason, when it is necessary to add or drain hydraulic oil or to perform maintenance operations or inspections on the hydraulic circuit, it is advisable to lower the equipment to the ground and completely release the pressures and the residual pressure present in the tank.
  Small leakages from pipes under pressure and the resulting jets are extremely dangerous, since they can perforate the skin and penetrate in the blood circulation or injure the eyes.
  For this reason, always wear goggles and thick gloves during the inspections and use a piece of cardboard or a sheet of plywood to check for oil leakages.
  If you are hit by a jet of high-pressure oil or are injured, even if slightly, immediately consult a doctor.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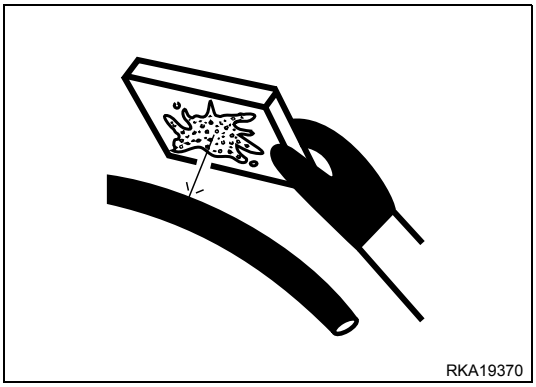
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2.8.21 PRECAUTIONS FOR MAINTENANCE OPERATIONS AT HIGH TEMPERATURES AND HIGH PRESSURE

- When the machine is stopped at the end of work, the engine coolant, the oil and all the components are hot and the hydralic circuits are under pressure.
  In these conditions, if the coolant, the hydraulic oil and the engine oil are to be drained in order to change them or the filters, there are serious risks of damage and burns.
  Wait for the temperature to lower within the normal operating range (40-45°C) before carrying out any maintenance operation.


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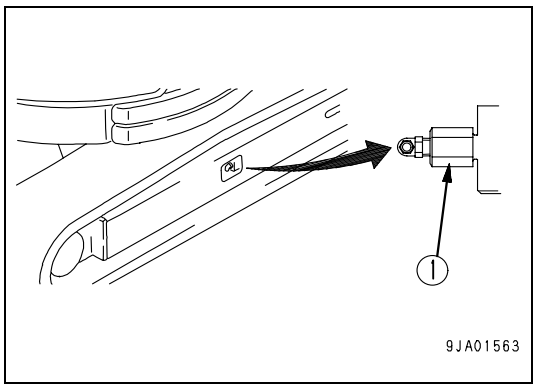
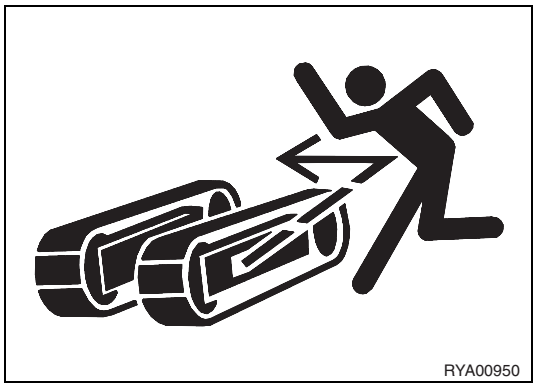
2.8.22 PRECAUTIONS TO BE TAKEN WHEN USING HIGH-PRESSURE GREASE TO ADJUST THE TRACK TENSION

- The grease contained in the track tension adjustment device is pressurized. If the adjustment is not carried out according to the instructions given in the maintenance section, the grease valve (1) may be ejected due to the high pressure and this may be dangerous for the operator.
- When loosening the valve (1) to reduce the track tension, do not give it more than one turn.
- Keep your face, hands and other body parts away from the valve (1).





2.8.23 DO NOT REMOVE THE SHOCK ABSORBING SPRING FROM THE SHOCK ABSORBER UNIT

- The shock absorber unit is provided with a shock absorbing spring with high preload, in order to absorb the impacts of the front idler roller.
  Do not attempt to remove the spring, since this may lead to serious accidents and even death.
  For any operation on the shock absorber unit, contact your Komatsu Distributor.

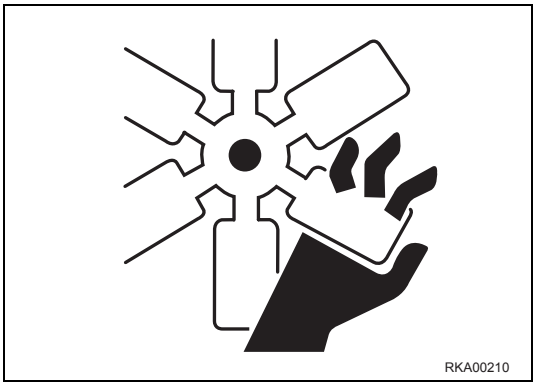
2.8.24 HYDRAULIC ACCUMULATOR AND GAS SPRING

The hydraulic accumulator and gas springs contain high pressure nitrogen. When performing operations in the accumulator or gas springs, a careless procedure may result in an explosion causing serious, and even fatal, injuries. For this reason, keep to the following instructions:

- do not remove the accumulator and the gas spring;
- do not place the accumulator and the gas spring near sparks or open flames;
- do not drill the accumulator and the gas spring, do not weld or use oxyhydrogen flames;
- do not hit, crush or crash the accumulator and the gas spring;
- discharge the gas before disposing of the accumulator and the gas spring. Have this operation carried out only by a Komatsu Distributor.

2.8.25 COOLING FAN AND BELT

- Be careful to the revolving parts and do not allow anyone to get too close to them, since clothes or limbs may get caught into them.
- If hands, clothes, or tools become entangled in the fan blades or the fan belt, they may be cut, torn or seriously injured/damaged; for this reason, avoid touching any revolving parts.

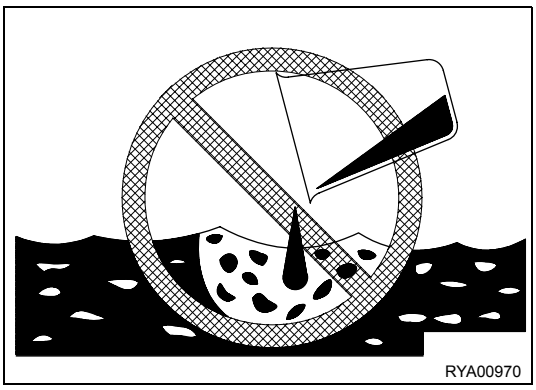


2.8.26 CHEMICAL HAZARD

During maintenance or dismalting operations, where there is a risk of contact with hazardous chemical substances, relevant safety precautions should be taken. If any doubt exists, contact your Komatsu distributor.
See also disposal of "2.8.27 WASTE MATERIALS".

2.8.27 WASTE MATERIALS

- Do not dispose of used oil in the sewer system, rivers, etc.
- Always put used oil in containers. Do not drain exhausted oil directly on the ground.
- Keep to the laws and regulations in force when disposing of harmful substances such as oil, fuel, solvents, used filters and batteries.



2.8.28 COMPRESSED AIR

- When cleaning the machine or its parts with compressed air, flying particles may cause serious injury or property damage.
- When using compressed air to clean the machine components or the radiator, always wear safety goggles, mask, gloves, and other protection items.

2.8.29 PRECAUTIONS TO BE TAKEN WHEN HANDLING TECHNOPOLYMERS AND ELASTOMERS

⚠ DANGER

- **Some components of the machine contain polymeric and elastomeric materials (Viton sealing rings, Teflon rings, piston rings made of fluoroelastomers, electric cable insulating materials, etc.).**
  At ambient temperature and up to approximately 200°C these materials can be handled without taking special precautions, since they are completely inert.
  If these materials are burnt, they send out gas and become highly toxic.
  Once they have cooled down, these materials must be collected in tight bags using heavy, waterproof gloves; then, gloves and materials must be disposed of according to the current regulations in force.
  The contaminated parts of the machine must be washed with highly alkaline detergents and then with a solution of water and detergent.

- Avoid burning gaskets, eletric cables, sealing rings.
- Dispose of elastomeric and polymeric waste according to the regulations in force.
- Do not touch any burnt elastomeric or polymeric waste and in case of accidental burning avoid inhaling the toxic gases produced.
- In case of contact with the skin, immediately rinse with a solution made of water and an alkaline detergent for about 30 minutes and then contact a poisoning treatment center without delay.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2.8.30 PRECAUTIONS TO BE TAKEN WHEN USING SYNTHETIC BIODEGRADABLE OIL TYPE HEES

- It is not possible to mix the synthetic biodegradable oil type HEES with ordinary hydraulic oils, since when the temperature increases insoluble compounds are generated, which deposit on the filters and clog them (the maximum concentration of ordinary oil must not exceed 1% of the total quantity of oil).
- Biodegradable oil can be used only in the hydraulic system; it cannot be used for the engine, the transmissions, the braking system, etc.
- Before introducing biodegradable oil in the hydraulic system, drain the system completely, disconnecting the cylinders and all the parts that may contain traditional oil, then change the drain filter with a new one.
  Start the engine and let it idle before using the equipment, wait for the engine temperature to reach at least 40°C, then start moving the equipment to fill all the circuits with oil. Stop the engine and check the oil level (see "3.3.1.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE" - " CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP").

2.8.31 FINAL DISPOSAL OF THE MACHINE

- At the end of the working life of the machine, ask Komatsu Distributor for the final disposal.

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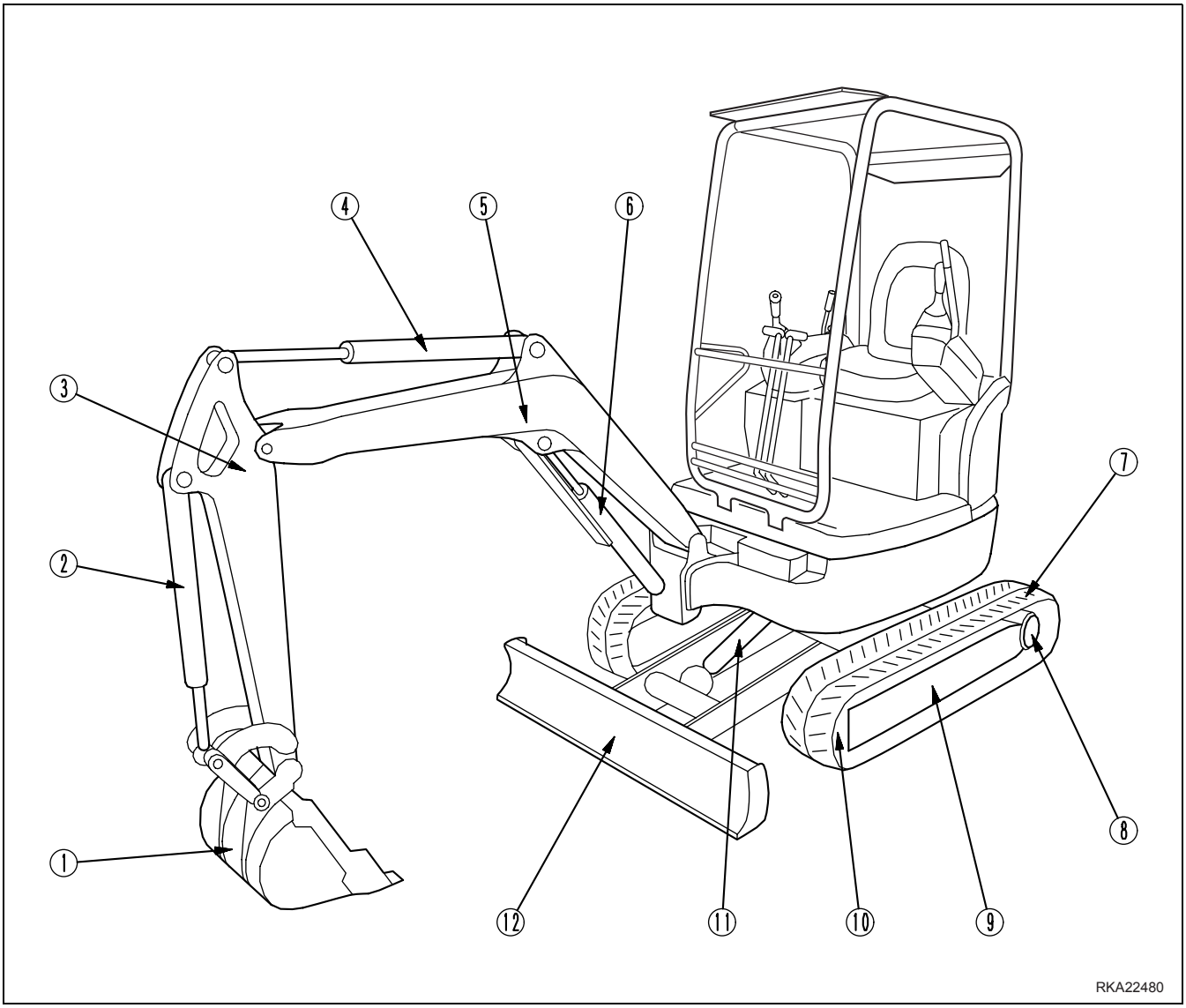
THE MACHINE AND ITS OPERATIONS

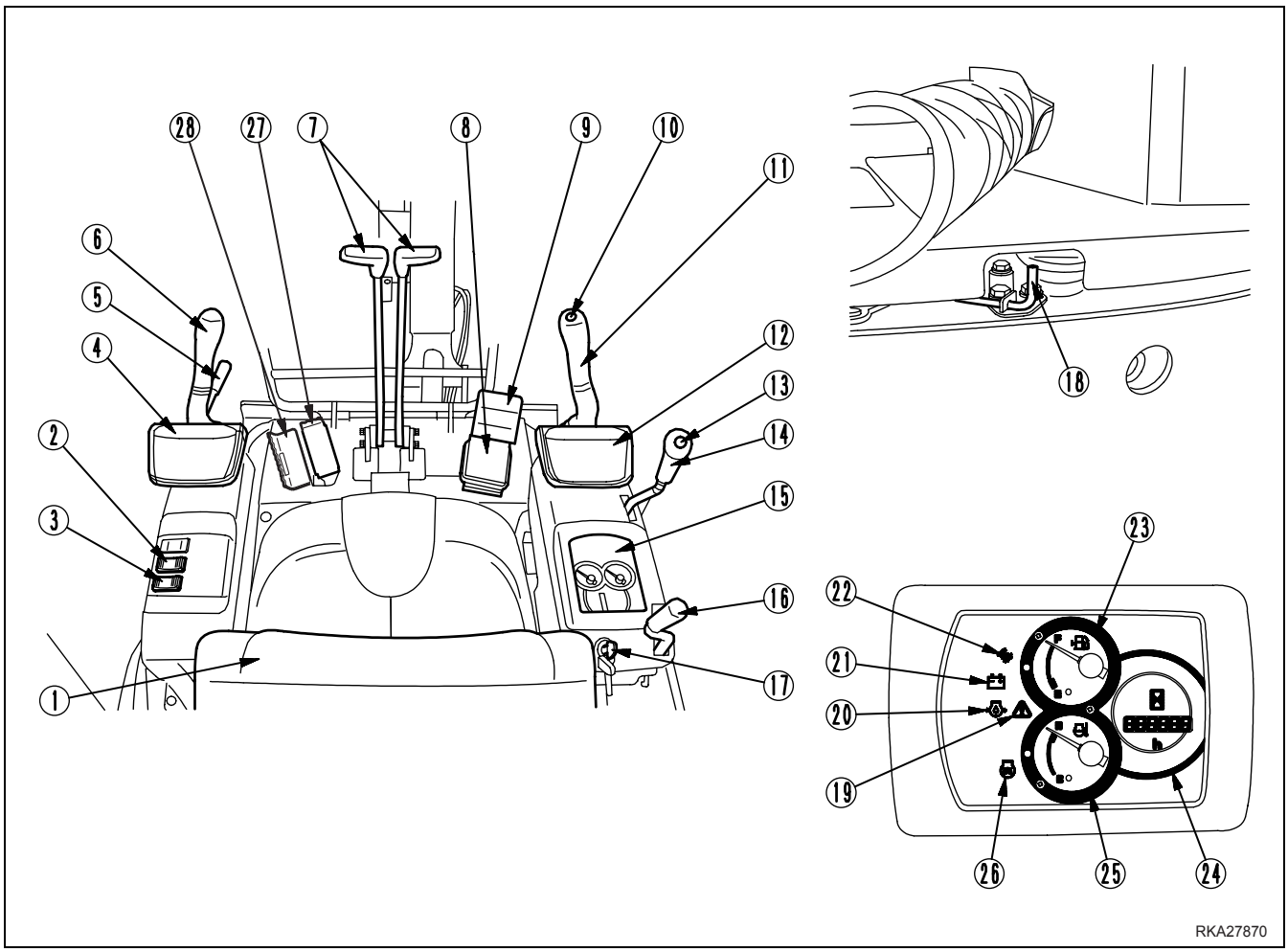
3.1 MACHINE ILLUSTRATIONS

3.1.1 OVERALL VIEW OF THE MACHINE



(1) Bucket
(2) Bucket cylinder
(3) Arm
(4) Arm cylinder
(5) Boom
(6) Boom cylinder
(7) Track
(8) Sprocket
(9) Undercarriage
(10) Idler roller
(11) Blade cylinder
(12) Blade

3.1.2 CONTROLS AND GAUGES



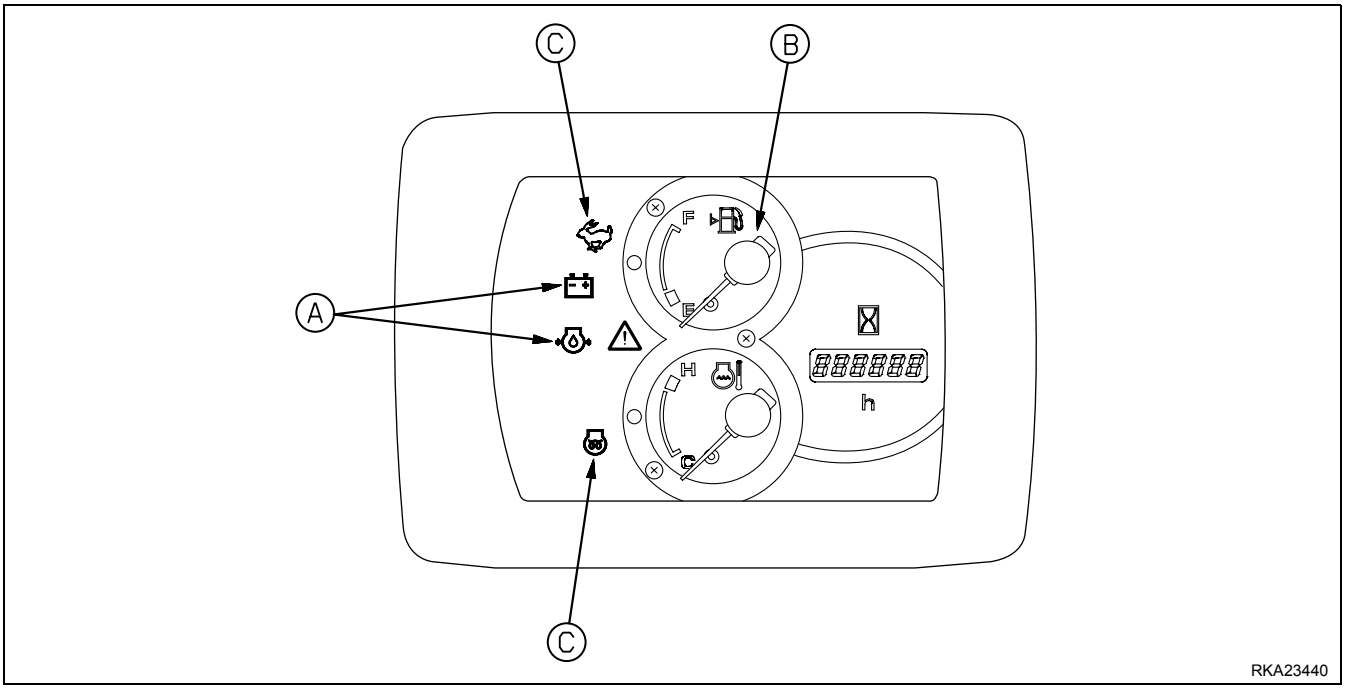
(1) Operator seat
(2) Blade/adjustable track gauge selection switch
(3) Working lights switch
(4) Left hand arm rest
(5) Control locking lever (safety lever)
(6) Left work equipment control lever
(7) Travel levers
(8) Boom swing control pedal
(9) Pedal locking device
(10) Horn
(11) Right work equipment control lever
(12) Right hand arm rest
(13) Travel speed selection switch
(14) Blade/adjustable track gauge lever
(15) Warning lights and indicators display
(16) Accelerator lever
(17) Ignition switch
(18) Cab floor locking lever
(19) Electrical system control warning light (optional)
(20) Engine oil pressure warning light
(21) Battery charge level warning light
(22) Travel speed increase warning light
(23) Fuel level indicator
(24) Hour meter
(25) Engine coolant temperature indicator
(26) Engine preheating warning light
(27) Optional equipment control pedal
(28) Pedal locking device

3.2 INSTRUMENTS AND CONTROLS

The following paragraphs describe the devices that are necessary for correct operation of the machine.

To perform the required operations correctly and safely, it is important to understand the equipment operating methods and the meaning of the information displayed.

3.2.1 WARNING LIGHTS AND GAUGES



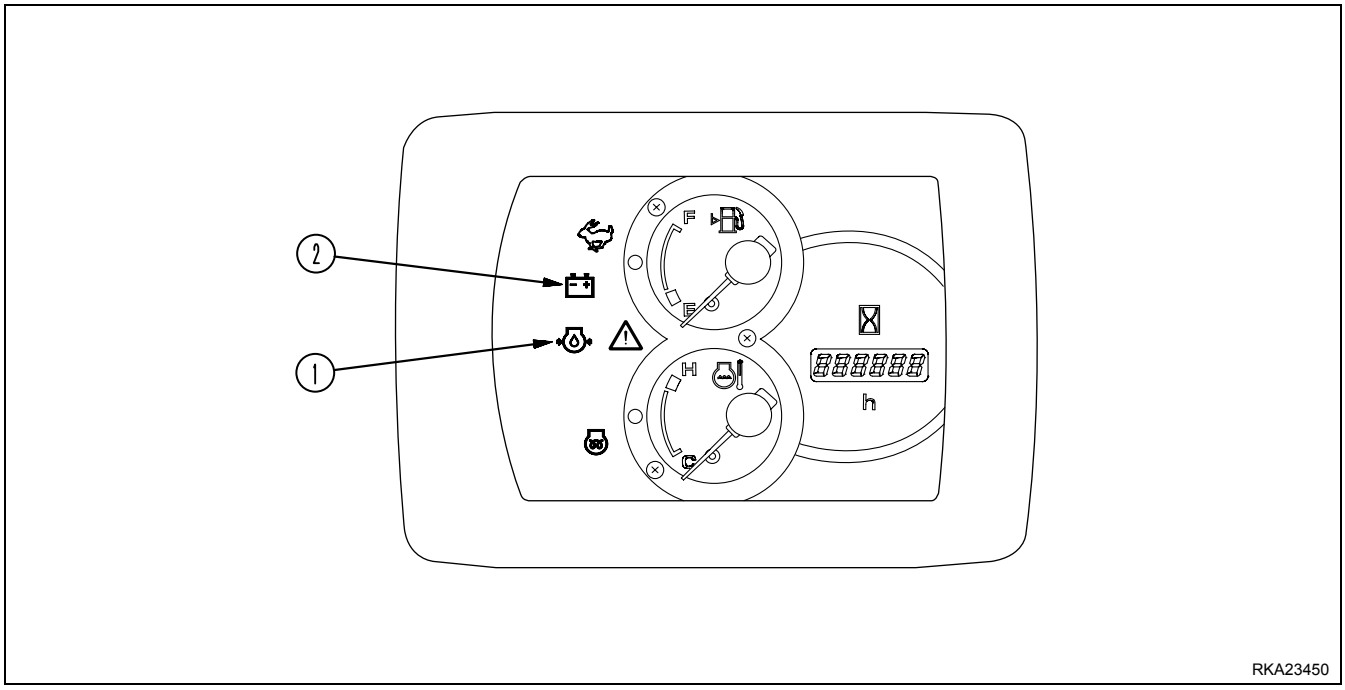
(A) Emergency lights
(B) Gauges
(C) Warning lights

3.2.1.1 EMERGENCY WARNING LIGHTS

⚠ CAUTION

- **If a warning light comes on or the acoustic alarm sounds while the engine is running, stop the engine immediately and try to locate the cause of the failure.**

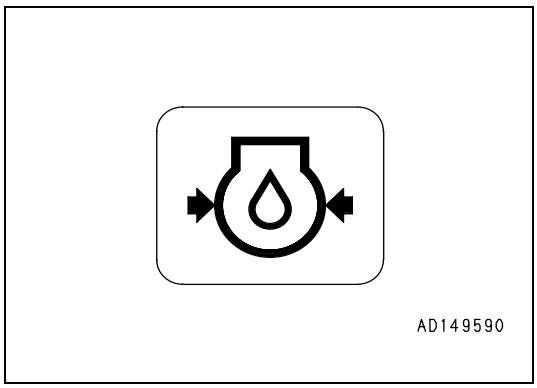
These warning lights must always be checked while the engine is running. If any anomaly occurs, the warning light corresponding to the faulty function comes on and the acoustic alarm starts sounding. Carry out the necessary repairs immediately.



(1) Engine oil pressure warning light (2) Battery charge level warning light

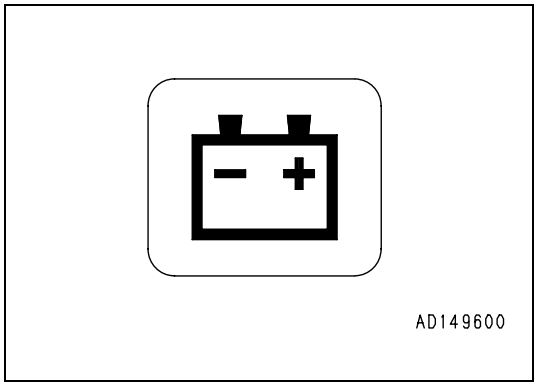
1. Engine oil pressure warning light

This warning light comes on, together with the acoustic alarm, when the engine is not running and the starting circuit is operated, and goes out as soon as the engine lubrication circuit is pressurized.
If it does not go out or comes on when the engine is running, stop the machine immediately and try to find the cause of the failure, see ("3.7.6 OTHER TROUBLES").



2. Charge level warning light

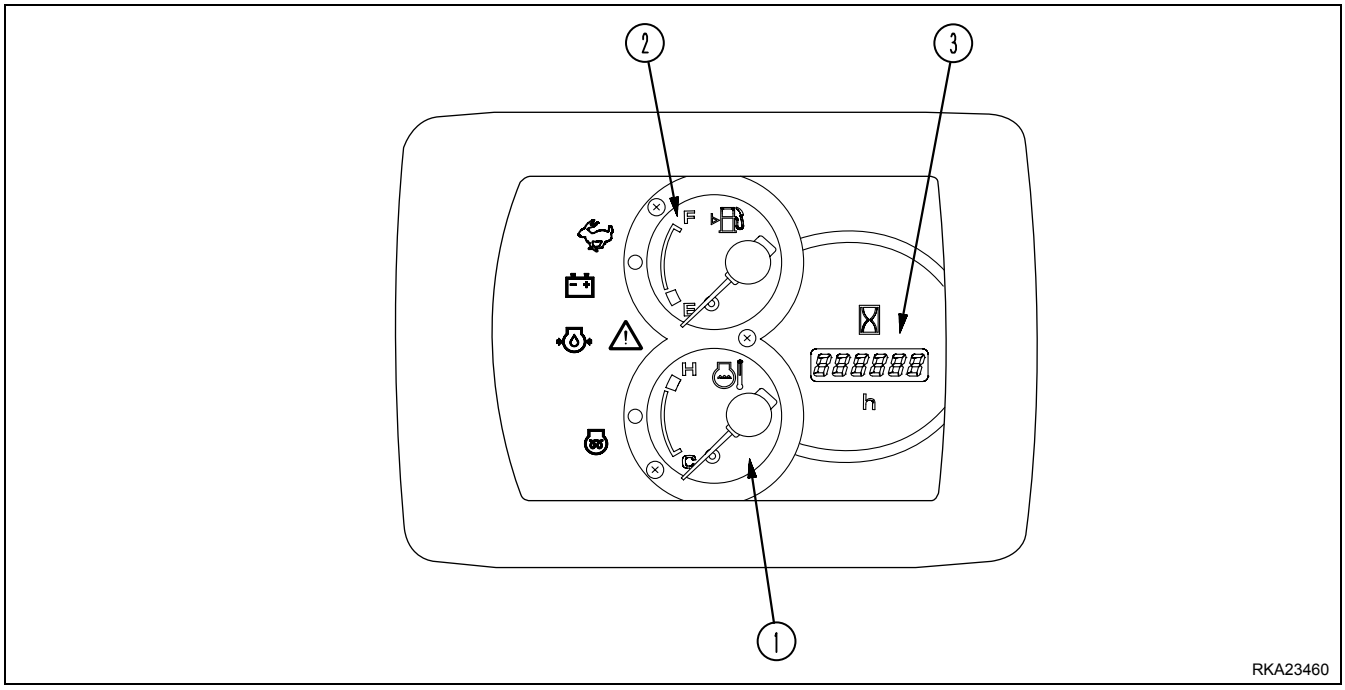
This warning light comes on, together with the acoustic alarm, when the starting circuit is energized and goes out when the engine exceeds the idling speed; if this warning light remains on even when the engine is running at the normal operating speed, this means that the alternator is not working and the battery is not charged correctly.



IMPORTANT

- **If the warning light remains off when the ignition key is turned to position ON, this means that the alternator is faulty or broken.**

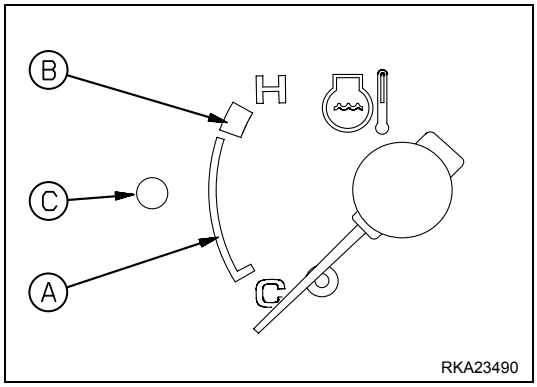
3.2.1.2 GAUGES



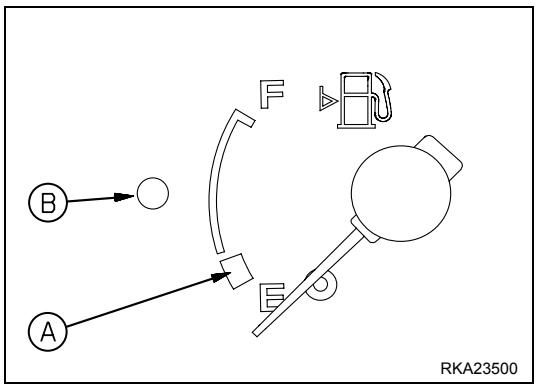
(1) Engine coolant temperature indicator
(2) Fuel level indicator
(3) Hour meter

1. Engine coolant temperature indicator

It indicates the engine coolant temperature, which should normally be approximately 80–85°C.
After starting the engine, let it warm up before starting work.
If the indicator exceeds the set values during operation and reaches the red overheating area (B), let the engine idle until the indicator returns within the normal operating range (A).
When the indicator reaches the red overheating area (B), the acoustic alarm sounds and the warning light blinks (C).
If the inconvenience occurs again, try to find out if there is any failure (see "3.7.6 OTHER TROUBLES").



2. Fuel gauge



It indicates the fuel level in the tank and functions only when the ignition key is in position ON (see "3.2.2 pos: 1. Ignition switch").

F: maximum level.

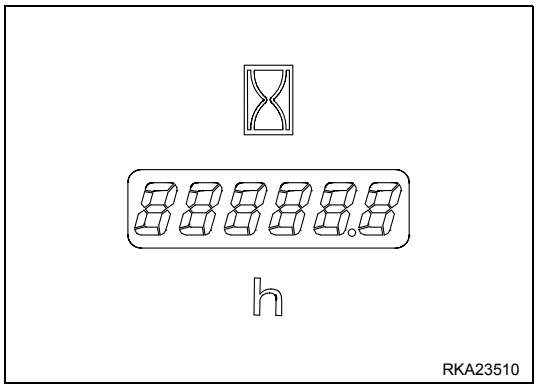
E: minimum level.

If the quantity of fuel in the tank is less than 6.0 litres, the indicator reaches the red reserve area (A) and the warning light (B) blinks.

NOTE

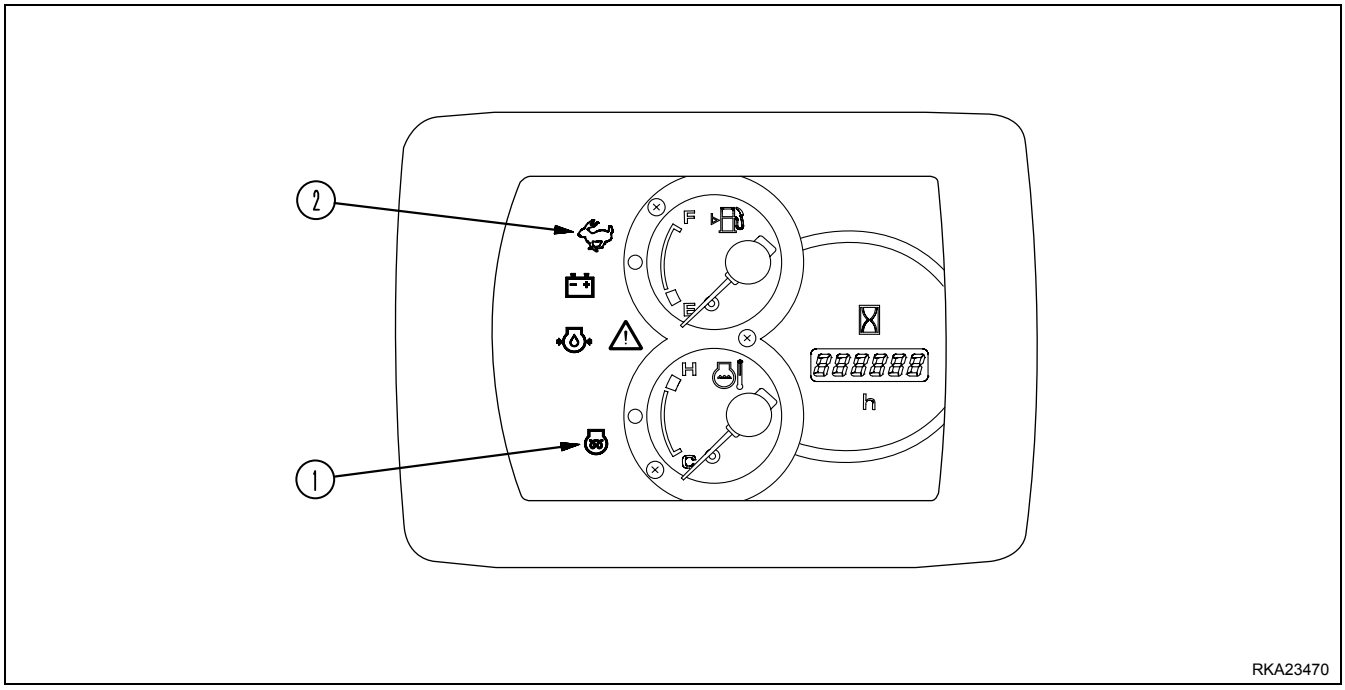
- If the indicator reaches the red reserve area (A) during use, stop the machine and provide for refuelling.

3. Hour meter



This instrument indicates the total number of operating hours of the engine. The count is continuous and the hour number is increased by 0.1 when the engine has worked for 0.1 hour (6 minutes), independently of the engine speed.
The hour counter keeps counting even if the machine isn't working or travelling.
The reading of the hour counter must be used as reference for the machine maintenance intervals.

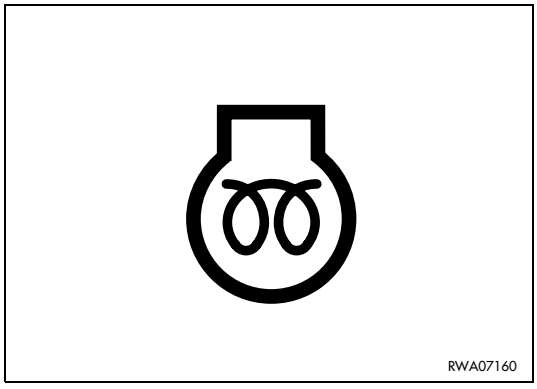
3.2.1.3 WARNING LIGHTS



(1) Engine preheating warning light (2) Travel speed increase warning light

1. Engine preheating warning light

This warning light comes on when the ignition key is turned to the preheating position (HEAT) to start the engine at low temperatures. It turns off automatically after about 18 seconds, once preheat is completed and the sound alarm goes on.

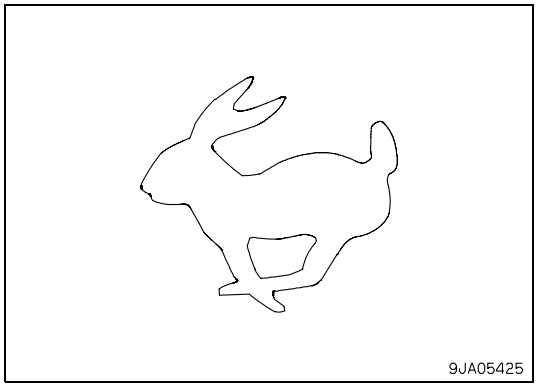


2. Travel speed increase warning light

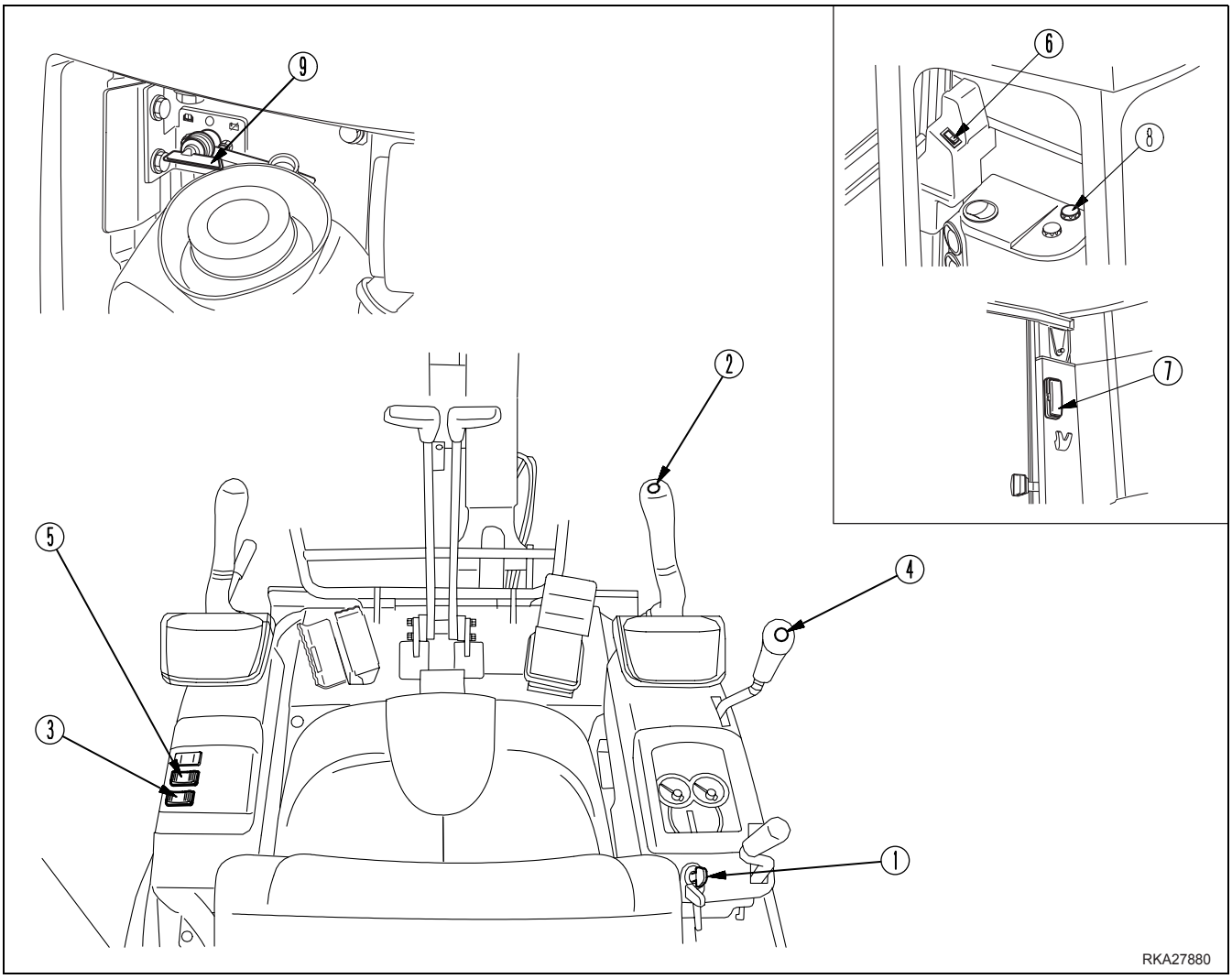
This warning light comes on when the travel speed selection switch is in high speed position (see "3.2.2 pos: 4. Travel speed selection switch"). When the selector switch is in normal position (low speed), the warning light on the control box is off.

NOTE

- When the machine travels at high speed on soft ground or up a slope and the load increases, the low speed is automatically selected, but the travel speed increase warning light remains on.

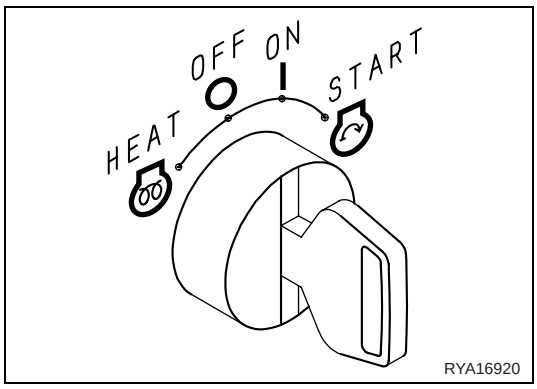


3.2.2 SWITCHES AND PUSH BUTTONS



(1) Ignition switch
(2) Horn
(3) Working lights switch
(4) Travel speed selection switch
(5) Blade/adjustable track gauge selection switch
(6) Windshield wiper switch (machines with cab)
(7) Ventilation and heating switch (machines with cab)
(8) Overhead light (machines with cab)
(9) Battery main switch (if installed)

1. Ignition switch



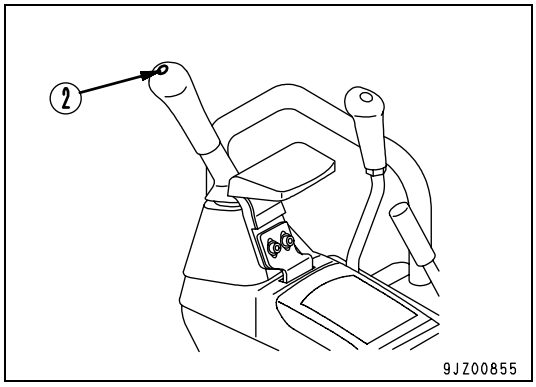
This is a four-position rotary switch and is used to switch the engine on and off.

- Position OFF
  When the switch is in this position, the ignition key can be inserted and removed. When the key is turned to this position, the power supply to the electric circuit is interrupted and the engine stops.
- Position ON
  The load and light circuits are under voltage. Keep the key in this position when the engine is on.
- Position START
  This is the ignition position. Keep the key in this position to make the starter run. As soon as the engine starts, release the key, which will automatically return to position ON.
- Position HEAT (preheating)
  When starting the engine in cold weather, turn the key to position HEAT for approximately 18 seconds, until the corresponding warning light goes out. Release the key, which will automatically return to position OFF. Start the engine by rotating the key to position START.

IMPORTANT

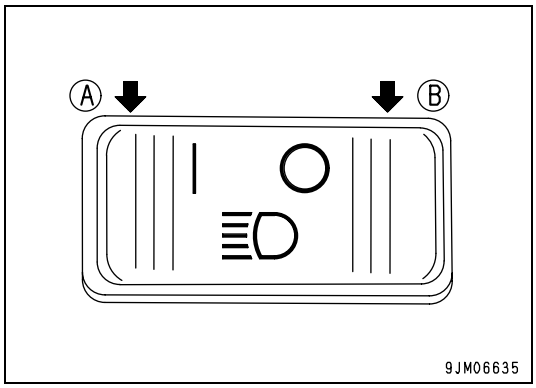
- **If the engine has stopped due to lack of fuel, start it by proceeding as follows: turn the ignition switch to position ON, wait for 15 seconds and then turn the key to position START.**

2. Horn



This button is positioned at the centre of the right lever knob and serves to send out a warning signal at the beginning of work and in case of danger.

3. Working lights switch

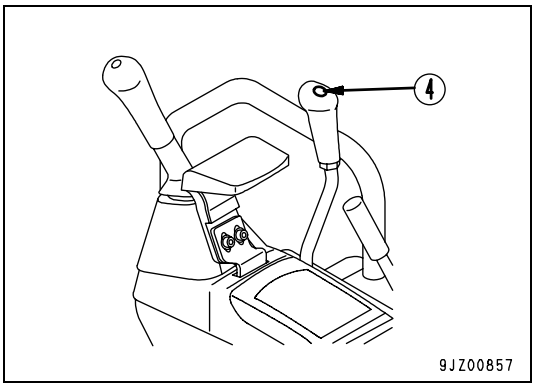


This is a two-position (ON-OFF) switch and is used to turn the lights on and to light up the warning lights and gauges display.

Position ON (A):Lights on and warning lights and gauges display lit up

Position OFF (B):Lights and display off.

4. Travel speed selection switch



⚠ WARNING

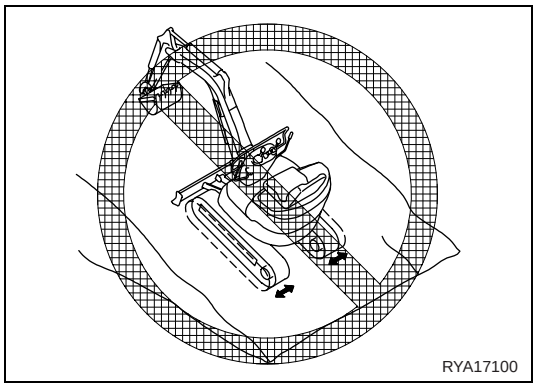
- **When loading or unloading the machine on/from a trailer, always travel at low speed. Never operate the travel speed selection switch during the loading or unloading operation.**
- **If the translation speed shifts from high to low while the machine is moving, the latter may swerve to one side even if moving straight on. Stop the machine before shifting translation speed.**

The switch is placed on the blade control lever knob centre and is used to select the translation speed. Each time the switch is pressed, the translation speed shifts from high to low or vice versa.
When high speed is selected, the speed increase warning light is lit on the indicators and warning lights display, see "3.2.1.3 WARNING LIGHTS". When low speed is selected, the warning light turns off.

NOTE

- When the engine is started, the low speed is automatically selected.
  When the machine travels on soft ground or up a slope at high speed and the load increases, the low speed is automatically selected, but the speed increase warning light remains on. When the load is reduced, the travel system automatically changes over to high speed.

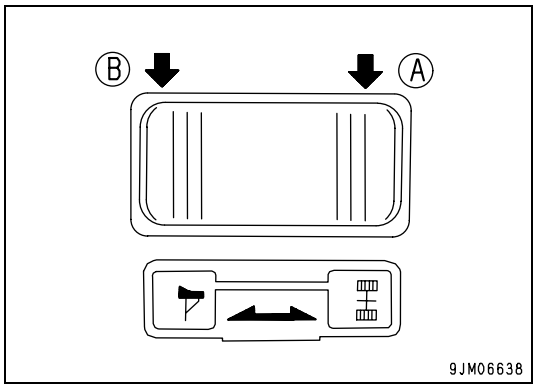
5. Blade/adjustable track gauge selection switch



⚠ WARNING

- **Use the narrow track gauge only when it is necessary to go through narrow passages or when there is no other choice. For normal applications and digging operations, always select the wide track gauge.**
- **Avoid adjusting the track gauge when the machine is working on a slope: the machine may lose stability and overturn. Always adjust the track gauge on level surfaces.**
- **When the track gauge is narrowed completely, also the lateral stability of the machine is reduced. In work sites where the machine runs the risk of overturning, always widen the track gauge and pay the utmost attention during travel.**
- **The control of the scraper and the adjustable track is not locked, even if the safety device lever is in locking position. Therefore, do not touch the control lever if no operations with the scraper or the adjustable track are being carried out.**
- **Before using the blade/adjustable track gauge lever, check the position of the switch.**

This is a two-position switch and allows the operator to choose between using the blade and adjusting the track gauge.



Adjustable track gauge (A):when the switch is in this position, it is possible to adjust the track gauge.

Blade (B): When the switch is in this position, it is possible to use the blade.

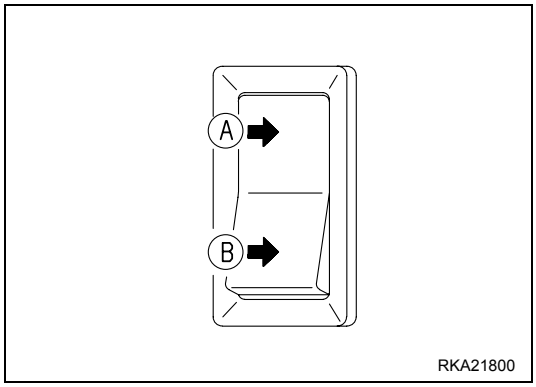
For further details on how to use the blade and adjust the track gauge, (see "3.2.3 pos: 5. Blade/adjustable track gauge lever").

6. Windshield wiper switch (machines with cab)

Switch (6) activates the front windscreen wiper and it is also used as windscreen washer switch.

The switch functions as described below:

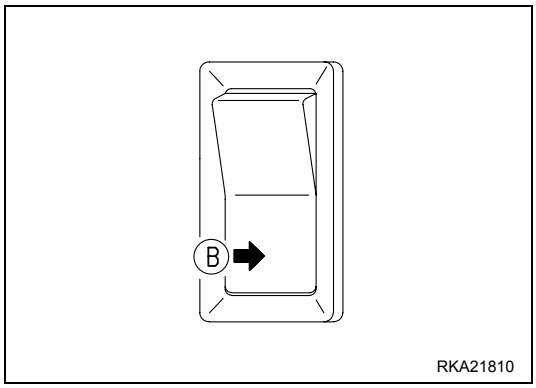
- **Windshield wiper only**
  Press the switch to position (B) to start the windshield wiper.
- Position (A): windshield wiper off.
- Position (B): windshield wiper on.



- **Windshield wiper/washer**
  When the windshield wiper/washer is in operation and the switch, which is in position (B), is pressed, the detergent is sprayed out. Upon release of the switch, only the windshield wiper works.

NOTE

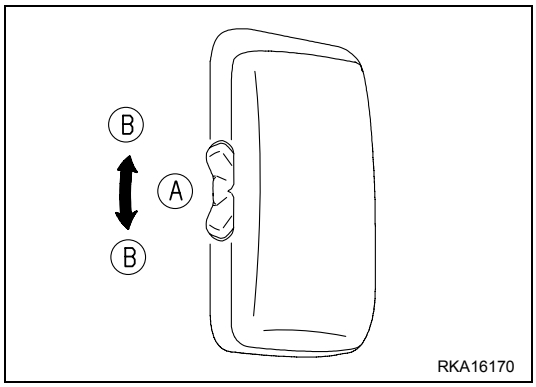
- When the windshield washer is in operation, pay attention to the following. Do not keep the switch pressed in spraying position for more than 10 consecutive seconds. Do not press the switch to spray detergent if the reservoir is empty.



7. Overhead light switch (machines with cab)

Use this switch (7) to switch on the overhead light.

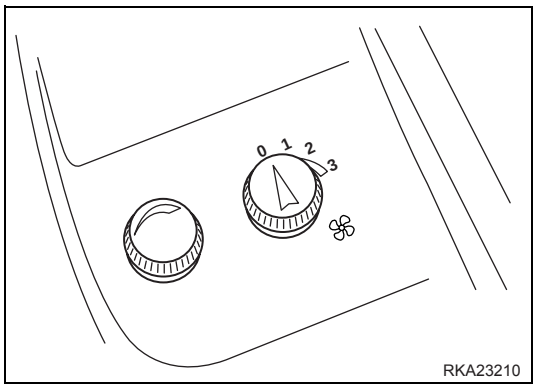
- Position (A): light off.
- Position (B): light on.



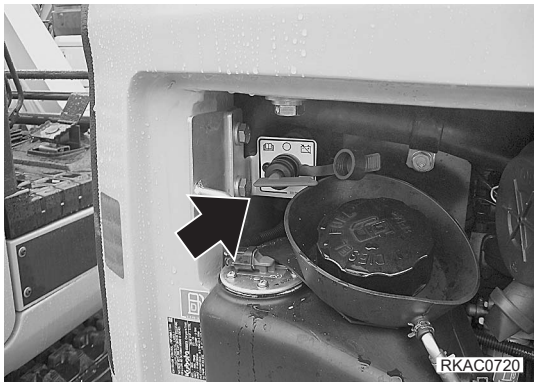
8. Cab heating and ventilation switch (machines with cab)

It is a three-speed switch and operates the fan motor. Turn the switch (8) clockwise to increase the fan speed. When it is activated after the cock placed on the heater is opened, it causes hot air to circulate performing the heating function (See "3.5.2 VENTILATION AND HEATING".

The temperature of the air delivered by the heater is adjusted by the knob placed next to the switch. Turn the switch clockwise to increase the temperature or anticlockwise to lower it.

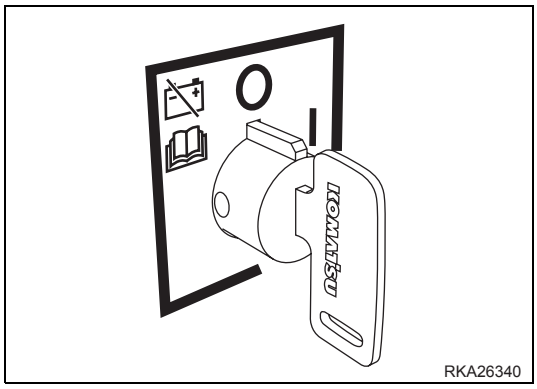


9. Battery main switch (if installed)



The battery main switch is located inside the engine compartment and can be reached by opening the engine bonnet (see "3.2.6 ENGINE HOOD").
Turn the key anticlockwise, to (O) OFF, to interrupt the current supplied by the battery to the electrical system; for safety reasons, extract the key after turning the switch to OFF.

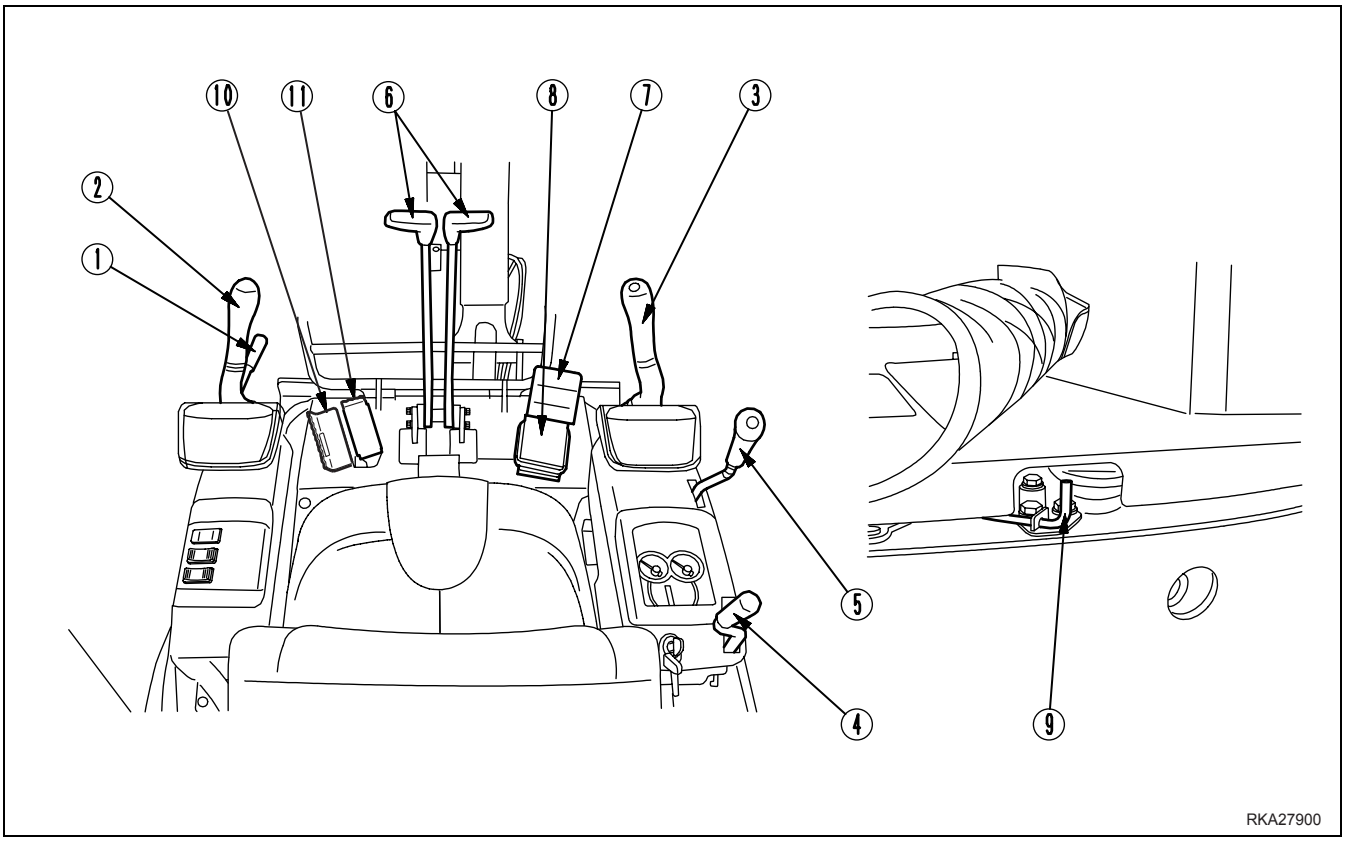
- Position (O) OFF:
  Power supply interrupted.
  The key can be extracted in this position.
- Position (I) ON:
  All electric circuits are powered.
  Make sure that the switch is at this position before starting the engine.



IMPORTANT

- **The battery main switch must always be set to ON, except in the following cases:**
  - **When the machine is not going to be used for a long period or when the machine is prepared for prolonged inactivity.**
  - **When the electric circuits need to be fixed.**
  - **When arc welding.**
  - **When the battery is removed.**
  - **When a fuse is replaced.**
- **Before turning the battery main switch to OFF, wait at least one minute after shutting off the engine. Never turn the switch to OFF while the engine is running as the electric circuits may be seriously damaged.**
- **When the battery is disconnected, all electric circuits remain powerless, risking losing all data stored regarding time adjustment or radio channels selection and other functions.**

3.2.3 CONTROL LEVERS AND PEDALS



(1) Safety device control lever (control locking)
(2) Left work equipment control lever
(3) Right work equipment control lever
(4) Accelerator lever
(5) Blade/adjustable track gauge lever
(6) Travel levers
(7) Boom swing control pedal locking device
(8) Boom swing control pedal
(9) Cab floor locking lever
(10) Control pedal locking device optional tools
(11) Optional equipment control pedal

1. Safety lever (control locking lever)

⚠ WARNING

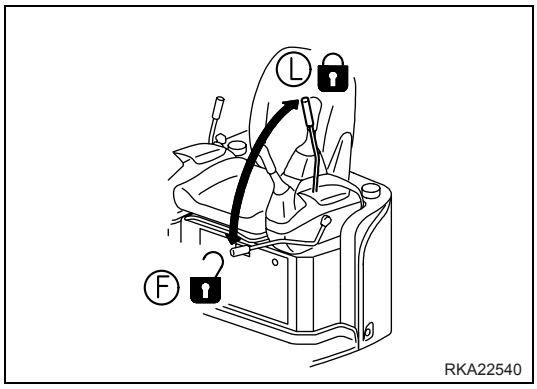
- **Before leaving the driver seat, lower the equipment to the ground and shift the safety lever to the "locked" position (L). If the safety lever is not in the "locked" position (L) and the control levers are touched by mistake, this may lead to serious injury.**
- **If the safety lever is not in the "locked" position (L), the control levers may move, causing accidents or serious injury. Always make sure that the lever is in the "locked" position (L), as shown in the figure.**
- **Even if the safety device lever is in locking position (L), the control of the scraper and the adjustable track is not locked.**
- **When shifting the safety lever, take care to avoid touching the equipment control levers.**

The lever activates the safety device to lock the working tools, rotation, travel and accessories (except for the scraper and the adjustable track). When the lever is pulled upwards, it is in locking position (L).
The safety device is hydraulic, so, even if control levers and pedals move, the working tools and the machine (except for the scraper and the adjustable track) do not move.

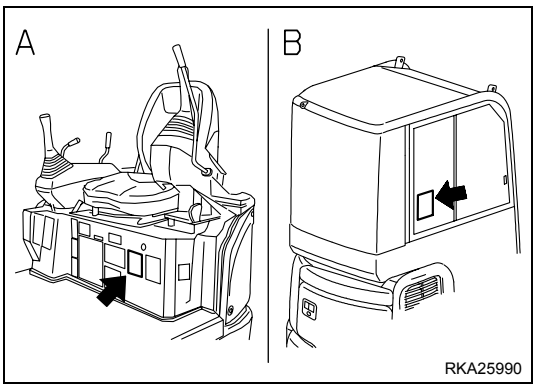
NOTE

- If the safety lever is not in position (L), the engine cannot be started. Before operating the ignition switch, always make sure that the safety lever is in the "locked" position. If the engine stops while the safety lever is in "free" position (F), shift the lever back to the "locked" position before operating the ignition switch.

(F): free
(L): locked



2. - 3. Work equipment control levers

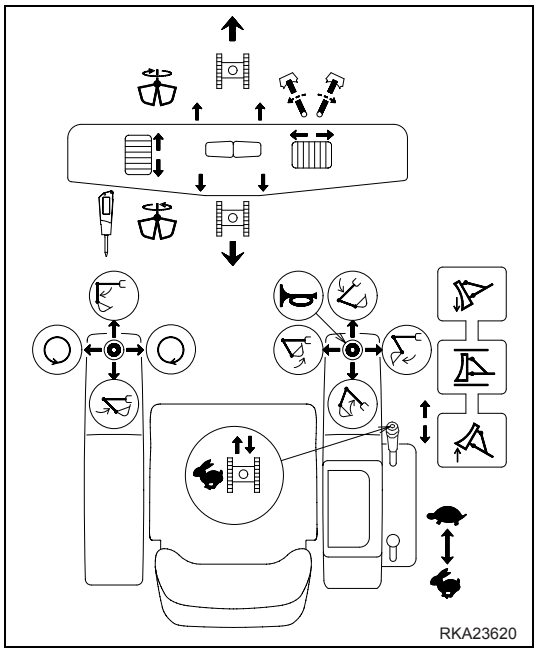


⚠ WARNING

- **Before carrying out any manoeuvre with these levers, the operator must seat in the work position and fasten the seat belt.**
- **Before leaving the driver seat, lower the equipment to the ground, lock the controls with the safety lever and stop the engine.**

IMPORTANT

- **The horn push button is positioned on the right lever grip and must be used to warn all the people in the vicinity before starting work and in case of danger.**
- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos: 1. Safety lever (control locking lever)").**



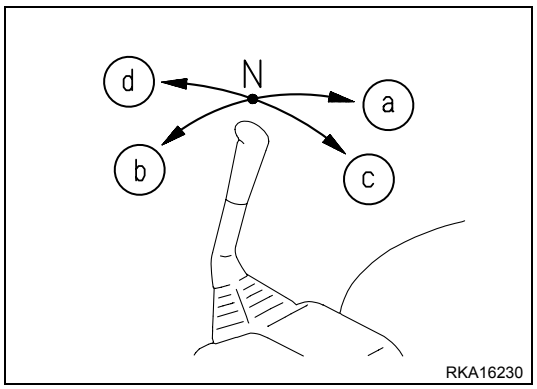
A: Version with canopy

B: Version with cab

The control lever (2) is positioned on the operator’s left and controls the arm and the revolving frame swing.

- Swing function
  (a) Swing to the right
  (b) Swing to the left
- Arm
  (c) Fold
  (d) Extend

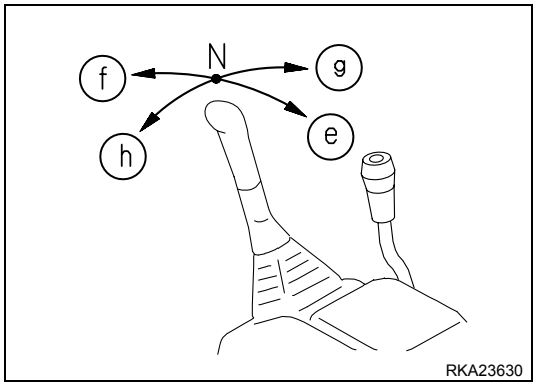
N (Neutral): the revolving frame and the arm are held in the position where they stopped.



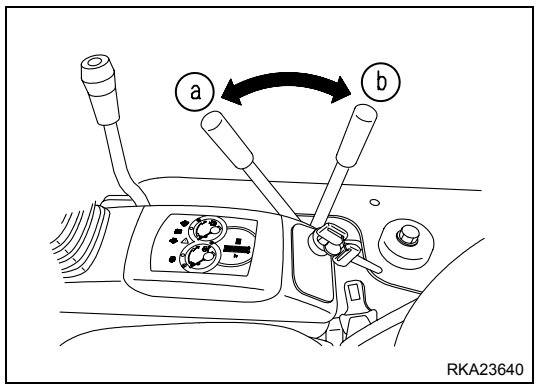
The control lever (3) is positioned on the operator’s right and controls the boom and the bucket.

- Boom
  (e) Lift
  (f) Lower
- Bucket
  (g) Open
  (h) Fold

N (Neutral): the boom and the bucket are held in the position where they stopped.



4. Accelerator lever



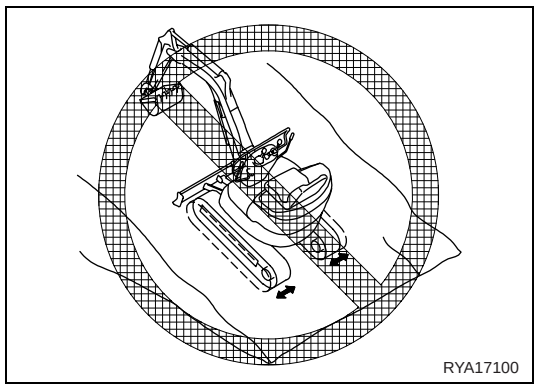
This lever is used to control the engine speed and power.

(a) Minimum: push the lever completely forward.

(b) Maximum: pull the lever completely backward.

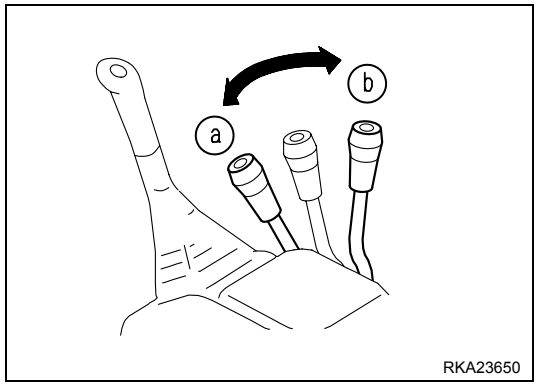
Use the accelerator with care, especially when the machine is under strain or is working in difficult conditions. Avoiding useless accelerations means reducing consumption and extending the service life of both the engine and the machine.

5. Blade/adjustable track gauge lever



⚠ WARNING

- **Narrow the track gauge only when it is necessary to travel or to carry out digging operations in small spaces. In any other condition, always select the wide track gauge.**
- **Avoid adjusting the track gauge when the machine is working on a slope. This may affect the lateral stability of the machine.**
- **Widen or narrow the track gauge with the machine resting on a firm and level surface and the tracks slightly raised from the ground, in order to avoid damaging the tracks and the hydraulic motors.**
- **This lever is not locked even if the safety device lever is in locking position. Therefore, do not touch the control lever of the scraper and the adjustable track if no operations with the scraper or the adjustable track are being carried out .**
- **Before using the scraper/adjustable track control lever, check the switch position.**



This lever is used to control the movements of the blade or to adjust the track gauge, depending on the position of the switch (see "3.2.2 pos: 5. Blade/adjustable track gauge selection switch").

Blade

(a) Lower

(b) Lift

Adjustable track gauge

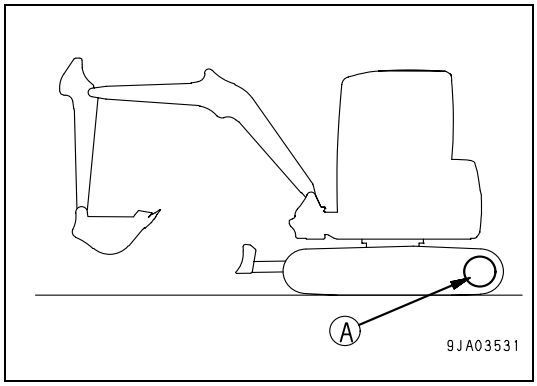
(a) Narrow track gauge

(b) Wide track gauge

IMPORTANT

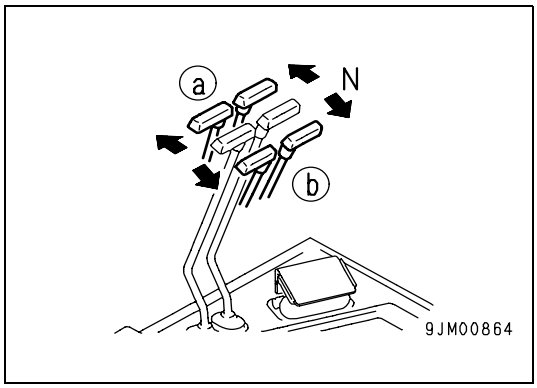
- **When carrying out digging operations that require the blade to be used for more than one hour without interruption, pay attention to the engine coolant temperature, since this may increase excessively.**
- **The translation speed selector switch is fitted on the lever grip. For information on its operation, see "3.2.2 pos: 4. Travel speed selection switch".**

6. Travel levers



⚠ WARNING

- **Before carrying out any manoeuvre with these levers, the operator must seat in the work position and fasten the seat belt.**
- **Before moving the machine, make sure that the sprocket (A) is positioned at the rear of the machine and that the safety locks are engaged; if the revolving frame is rotated by 180°, the controls are inverted (see "3.3.4 HOW TO MOVE THE MACHINE" e "3.3.5 STEERING THE MACHINE").**
- **Non-compliance with these rules may lead to serious accidents.**



These levers are used to operate the travel motors (right and left) and control the forward and reverse travel according to the movements indicated.

(a) FORWARD: levers pushed forward

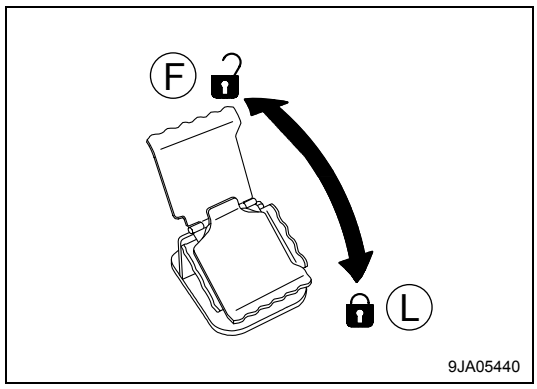
(b) REVERSE: levers pulled towards the operator

N (Neutral): machine at rest.

IMPORTANT

- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos: 1. Safety lever (control locking lever)").**

7. Boom swing control pedal locking device



WARNING

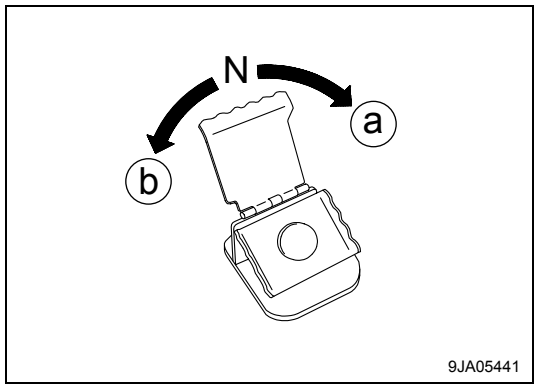
- **Always shift the safety lever to position (L) when the boom swing is not required, during travel and when parking the machine. If the control pedal is inadvertently pressed, this may cause serious accidents.**

This device is used to lock the movements of the boom swing control pedal and has two positions.

(F): free

(L): locked

8. Boom swing control pedal



This pedal controls the boom swing to the right and to the left, according to the movements indicated below.

(a): swing to the right

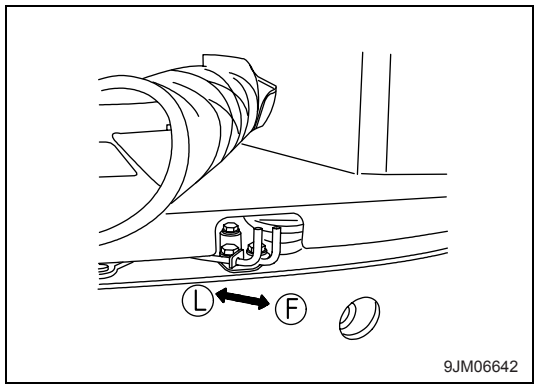
(b): swing to the left

N (Neutral): boom at rest.

IMPORTANT

- **When the safety lever is in the “locked” position, all the movements are inhibited (see "3.2.3 pos: 1. Safety lever (control locking lever)").**
- **The boom swing is useful to displace the digging line beyond the track outline; do not use this function during the work cycle.**

9. Cab floor locking lever



WARNING

- **Always keep to the warnings when tilting or closing the cab floor. Any operation carried out incorrectly may cause serious injury. Do not tilt or close the cab floor on slopes or if there is a strong wind.**

To tilt or close the cab floor, pull the lever to the “free” position (F). After tilting or closing the cab floor, release the lever, which will automatically return to the “locked” position (L).

(F): free

(L): locked

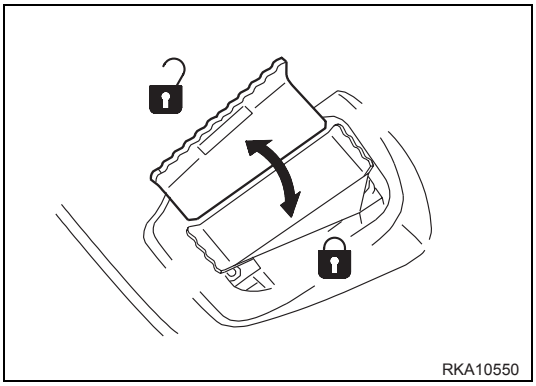
For further details on how to tilt the cab floor, see "3.2.9 TILTING THE CAB FLOOR".

10. Control pedal locking device optional tools

WARNING

- **Always lock the optional equipment control pedal when the use of this control is not required, during travel and when parking the machine. If the control pedal is inadvertently pressed, this may cause serious accidents.**

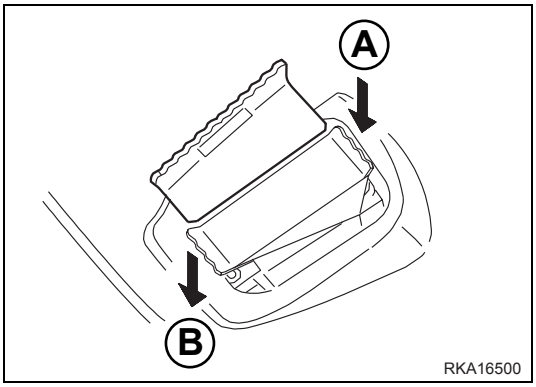
The safety device is used to lock the optional equipment control pedal.



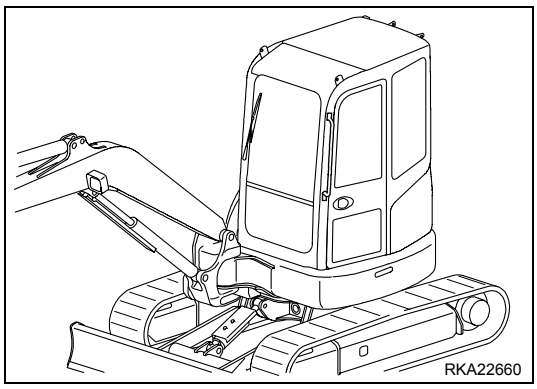
11. Optional equipment control pedal

The pedal controls oil delivery to and return from the optional equipment.

- Upper part of the pedal (A) pressed:
  The oil flows to the right side of the arm (hydraulic tank side).
- Lower part of the pedal pressed (B):
  The oil flows to the left side of the arm (operator seat side).



3.2.4 CAB (if provided)

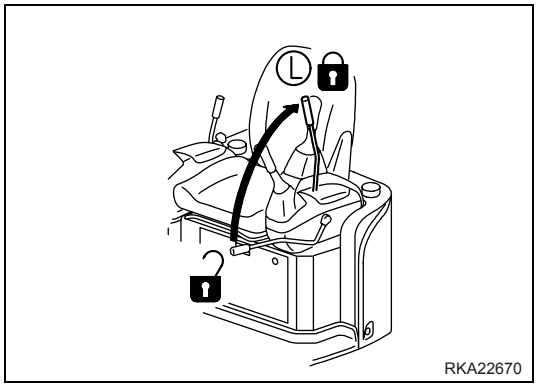

RKA22660

⚠ WARNING

- **The cab is a ROPS/FOPS safety element (Operator protection in case of machine overturn or falling objects) according to current standards (ROPS/FOPS level 1). If there is a collision against the machine, or in case it turns over, have a Komatsu Distributor check that the cab complies with the stiffness and active safety standards the operator needs.**

The cab has a sliding door and the front upper windscreen opens so it can be fixed under the cab roof. A partial opening can be obtained by sliding the glasses to the right.
These features are particularly useful during the hot season since they allow constant air ventilation, which protects the Operator against psychophysical strain.

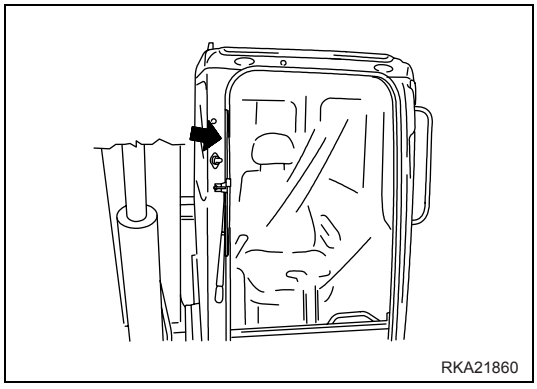
3.2.4.1 WINDSCREEN (machines with cab)



RKA22670

⚠ WARNING

- **When the upper windscreen or the cab door is opened or closed, always take the safety device lever to the locking position (L). If the control levers are not locked and are inadvertently operated, there is the risk of serious accidents.**
- **Before opening or closing the windshield, stop the machine on a level surface, lower the work equipment completely to the ground and stop the engine.**
- **When opening the windshield, hold it firmly with both hands, pull upward and do not leave hold until the automatic retainer is locked.**
- **When closing the windshield, hold the handle with both hands and close securely.**

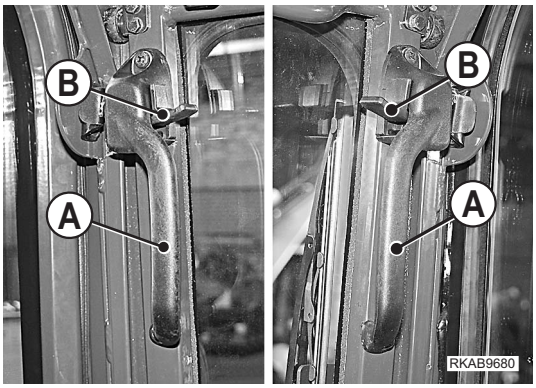

RKA21860

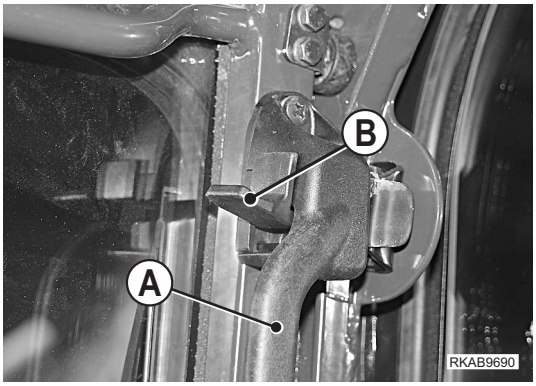
The upper windshield can be positioned under the cab roof.

Opening

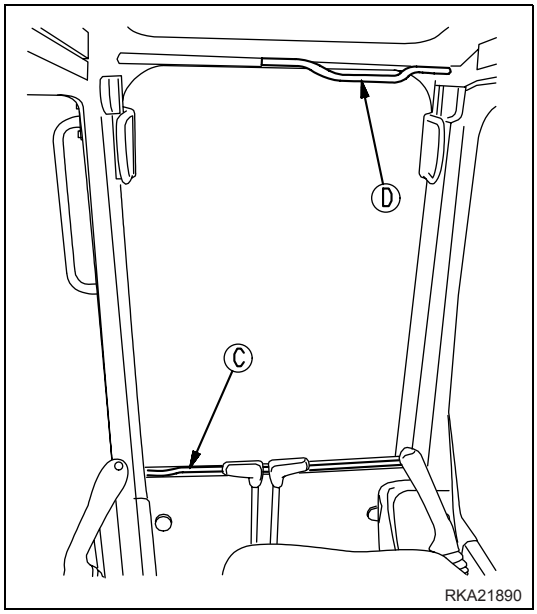
1. Stop the machine on a level surface, lower the equipment completely to the ground, then stop the engine.
2. Shift the safety lever to the “locked” position.
3. Make sure that the windshield wiper is positioned correctly.

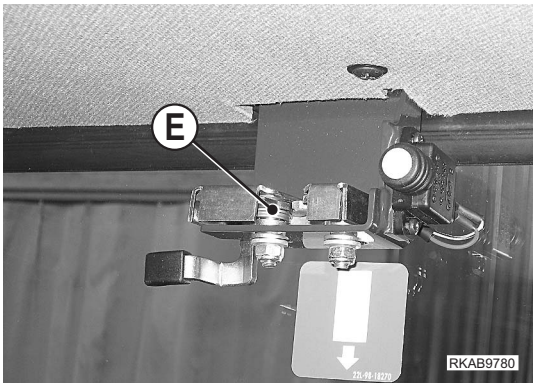
4. Seize the handles (A) at the right or left top of the front windscreen and push the locking levers (B) down to release the windscreen.

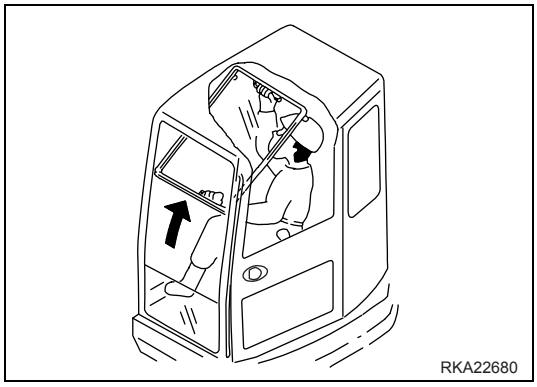




5. Seize the handles (C) and (D), pull up the windscreen and push it until the lock (E) is tripped.





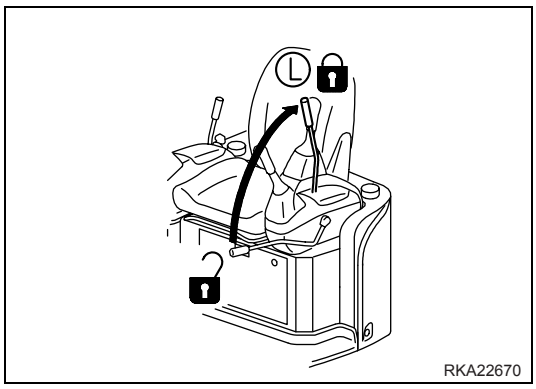


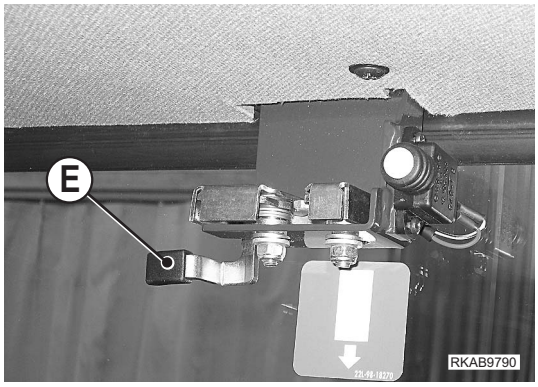
Closing

⚠ WARNING

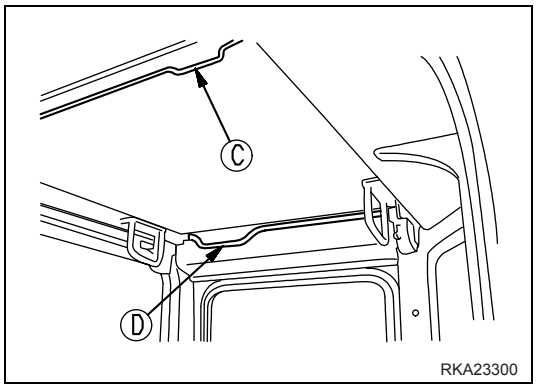
- **When closing the windshield, lower it slowly and pay attention to your hands.**

1. Stop the machine on a level surface, lower the equipment completely to the ground, then stop the engine.
2. Shift the safety lever to the “locked” position.
3. Release the windscreen by means of the upper lock (E) lever.

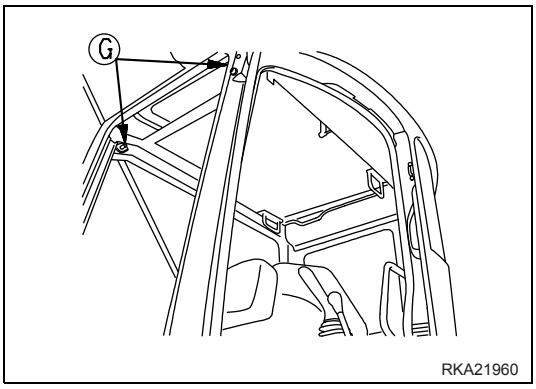


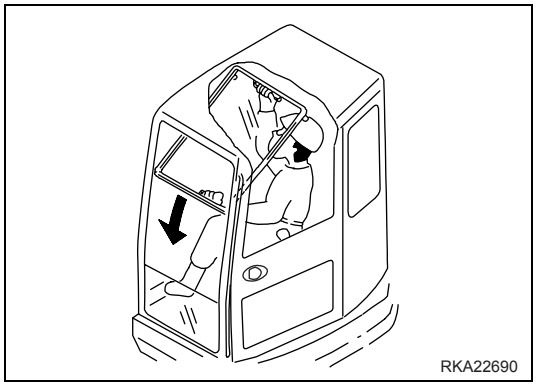


4. Seize the handles (C) and (D), push the windscreen forwards and lower it slowly.

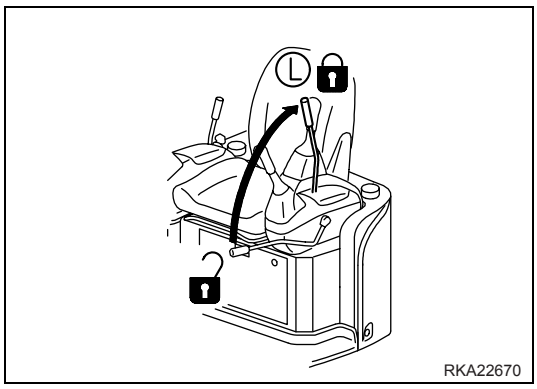


5. When the windscreen lower part reaches the upper part of the lower glass, push the windscreen upper section forwards against the locking catches (G).





3.2.4.2 DOOR (machines with cab)



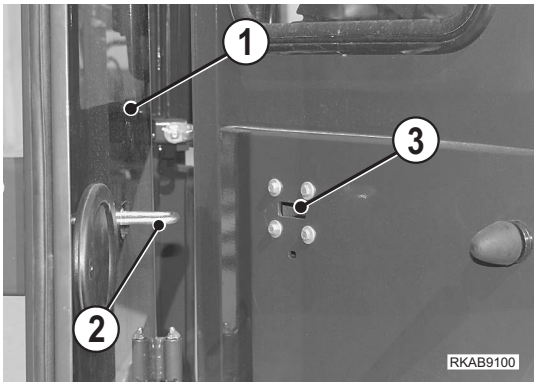
⚠ WARNING

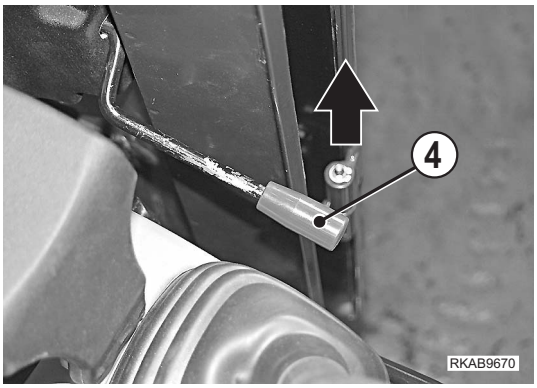
- **When the cab door is opened or closed, always take the safety device lever to the locking position (L). If the control levers are not locked and are inadvertently operated, there is the risk of serious accidents.**
- **Make sure that the door is locked whether it is opened or closed.**
- **Always stop the machine on a level surface when it is necessary to open or close the door.**
  If the door is opened or closed on a slope, the operating effort may change suddenly. Do not open or close the door on slopes.
- **Be careful to your hands, in order to prevent them from being caught between the door and the front or centre pillar.**
- **If there is anyone inside the cab, warn him/her before opening or closing the door.**

IMPORTANT

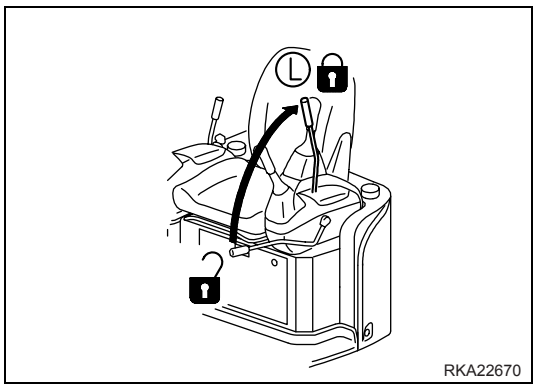
- **Always clean the step to access the cab. Possible mud or ice accumulation can cause slipping.**

The cab door (1) can be totally opened and held in place by the catch (2).
This catch is automatic and is activated when the door (1) stops against the buffer (3).
To release the door from the catch (2), take the lever (4) placed on the left side of the cab.





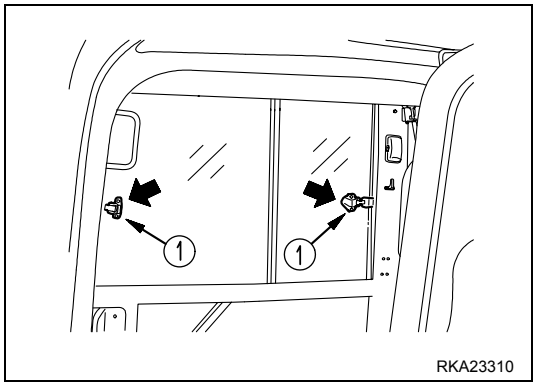
3.2.4.3 SIDE SLIDING WINDOW (machines with cab)



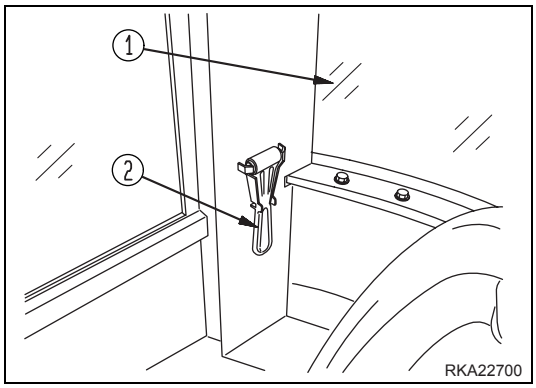
⚠ WARNING

- **When opening or closing the side window, always shift the safety lever to position "lock" (L). If the control levers are not locked and are inadvertently operated, there is the risk of serious accidents.**
- **Keep hands and head must remain inside the cab window during translation or when digging operations are carried out.**

The cab right side sliding window is designed to be partially open. To open or close the window, release and draw the handle (1) to slide the window.



3.2.4.4 EMERGENCY EXIT HAMMER (machines with cab)



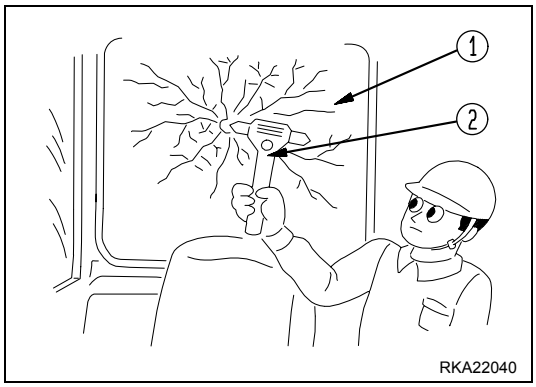
⚠ WARNING

- **When it is necessary to break the window with the hammer, pay attention not to get injured by glass chips.**
- **Before leaving the operator cab, remove any glass fragments from the window edges and take care not to injure yourself. Be careful not to slip on the glass fragments scattered on the ground.**

On machines equipped with cab, the emergency exit is marked on the rear glass (1).
In case of emergency, exit the cab breaking the glass with the hammer (2).

IMPORTANT

- **The hammer should always be in the cab, fixed to the right side upright.**



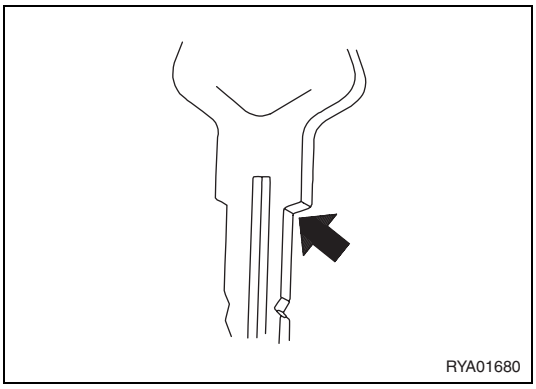
3.2.5 COVERS WITH LOCK

OPENING AND CLOSING THE COVERS WITH LOCK

Use the start-up key to open or close the cases with locks.

For details regarding the position of the cases with locks, see section "3.3.17 LOCKING THE MACHINE".

Introduce the key completely (6 mm from the point where the key narrows), then turn it. If the key is turned when it is inserted only partially into the lock, it may break.



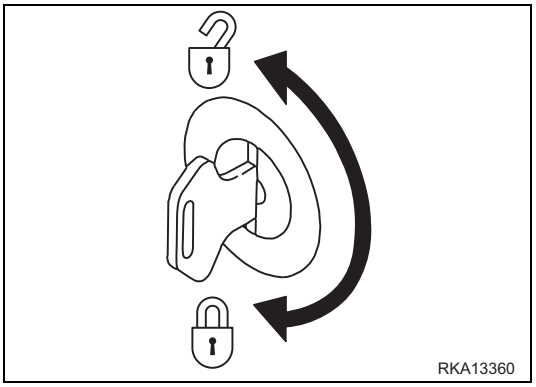
LOCKED COVERS AND CAB DOOR

Opening

1. Insert the key into the lock.
2. Turn the key anticlockwise and pull the cab door cover or handle to open.

Closing

1. Close the cab door cover or door and insert the key into the lock.
2. Turn the key clockwise and extract it.



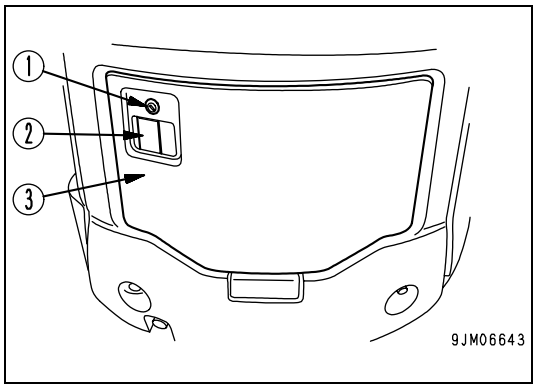
3.2.6 ENGINE HOOD

⚠ WARNING

- **Do not open the engine hood when the engine is running.**
- **Do not use the machine without engine hood and do not start the engine when the hood is open, unless this is expressly prescribed for certain maintenance operations.**
- **When carrying out an inspection or maintenance operation inside the engine hood, always open it completely and make sure that it is kept open by the apposite rod.**
- **Non-compliance with these rules may lead to serious accidents.**

IMPORTANT

- **If it is not necessary to open the cover, always keep it locked.**
- **When the hood is locked, the handle (2) cannot move.**

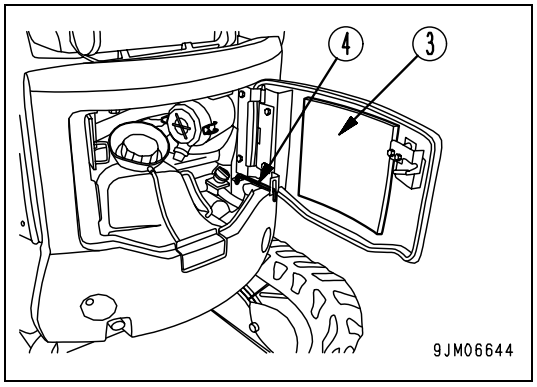


OPENING THE BATTERY COVER

1. Release the engine hood lock (1) (see "3.2.5 COVERS WITH LOCK").
2. Pull the handle (2) of the engine hood (3) and open it completely. The cover (2) is kept open by the apposite rod (3).

CLOSING THE COVER

1. Lift the rod (4) and partially close the hood (3) until the rod comes out of the groove.
2. Close the hood completely and lock it.



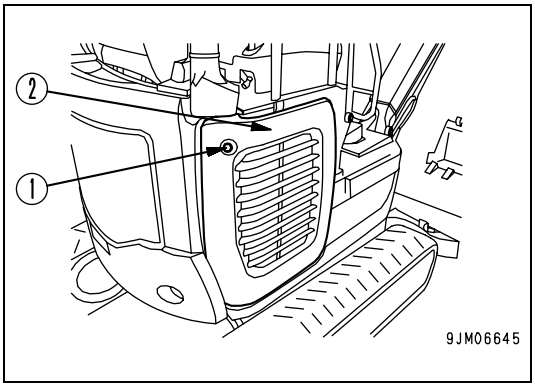
3.2.7 RADIATOR COVER

⚠ WARNING

- **When carrying out an inspection or maintenance operation inside the radiator cover, always open it completely and make sure that it is kept open by the apposite rod.**

OPENING THE BATTERY COVER

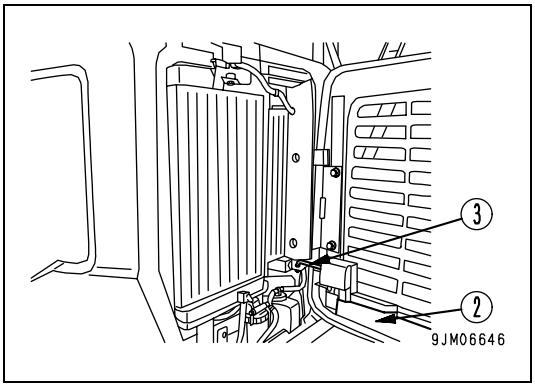
1. Release the radiator cover lock (1) (see "3.2.5 COVERS WITH LOCK").



2. Pull the radiator cover (2) and open it completely. The cover (2) is kept open by the apposite rod (3).

CLOSING THE COVER

1. Lift the rod (3) and close the cover (2) without exerting too much pressure. When the rod comes out of the groove, close the cover completely and lock it.



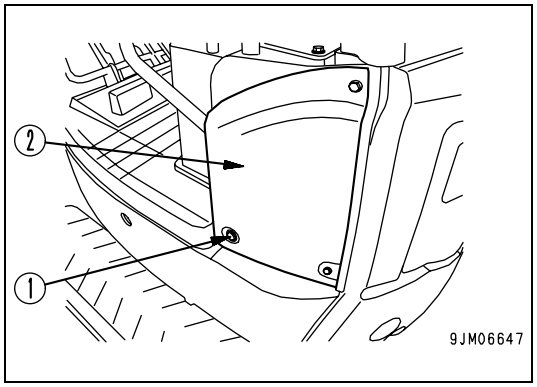
3.2.8 BATTERY COVER

⚠ WARNING

- **When carrying out an inspection or maintenance operation inside the battery cover, always open it completely and make sure that it is kept open by the apposite rod.**

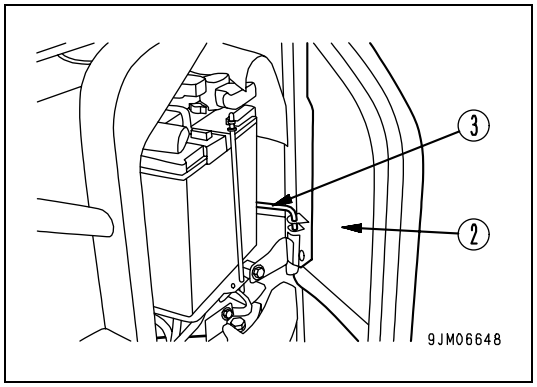
OPENING THE BATTERY COVER

1. Release the battery cover lock (1) (see "3.2.5 COVERS WITH LOCK").
2. Pull the battery cover (2) and open it completely. The cover (2) is kept open by the apposite rod (3).



CLOSING THE COVER

1. Pull the rod (3) and close the cover (2) without exerting too much pressure. Remove the rod (3) from the groove and close the cover completely.
2. Lock the cover.



3.2.9 TILTING THE CAB FLOOR

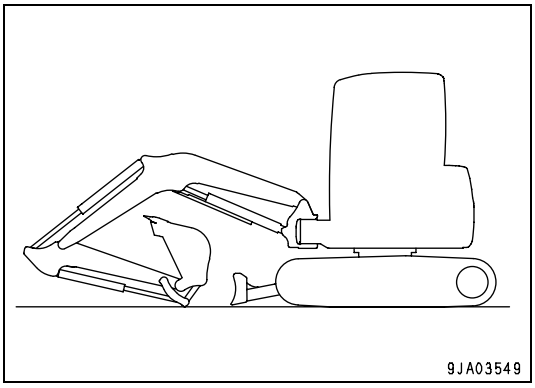
⚠ WARNING

- **Always keep to the warnings when tilting or closing the cab floor. Any operation carried out incorrectly may cause serious injury.**
- **Do not tilt or close the cab floor on slopes or if there is a strong wind.**
- **Do not get too near the cab floor tilting or closing area and do not enter the cab when the cab floor is tilted.**
- **Do not start the engine when the cab floor is tilted.**
- **After lifting the platform, always attach the safety stop.**
- **Do not carry out any operation on the machine without having first attach the safety stop.**
- **If there is something wrong in the locking function when the cab floor is tilted, interrupt work and have the necessary repairs carried out by your Komatsu Distributor.**
- **Always fasten the platform fixing screws to the torque in compliance with the values included in the section "4.5.1 STANDARD TIGHTENING TORQUES FOR SCREWS AND NUTS".**

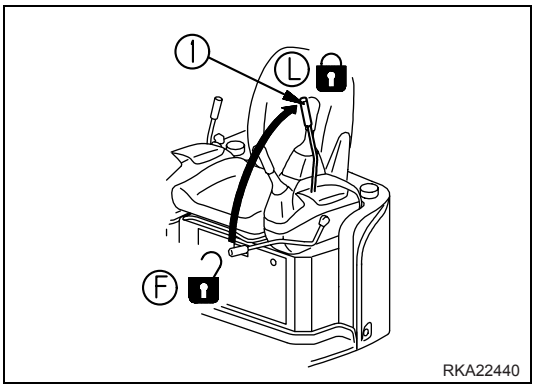
3.2.9.1 MACHINES EQUIPPED WITH CANOPY

Tilting the cab floor

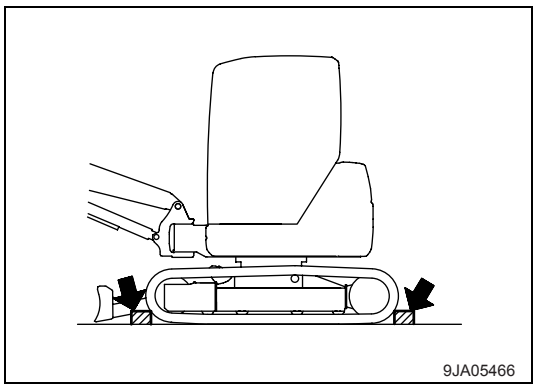
1. Lower the blade.
2. Extend the bucket and arm cylinders completely, then lower the boom slowly.



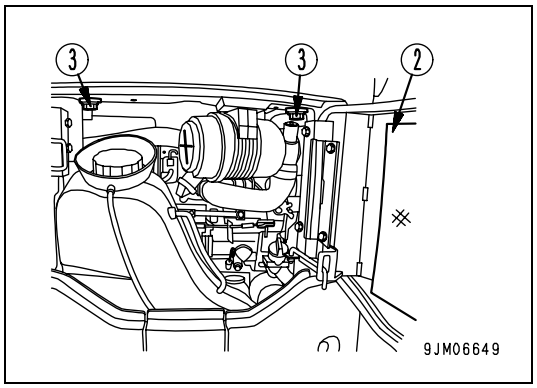
3. Shift the safety lever (1) to the “locked” position (L), then stop the engine.



4. Position blocks under the tracks in order to prevent the machine from moving.



5. Open the engine hood (2) completely and make sure that it is kept open by the apposite rod (for further details, see "3.2.6 ENGINE HOOD").
6. Loosen the fastening screws of the cab floor (3).



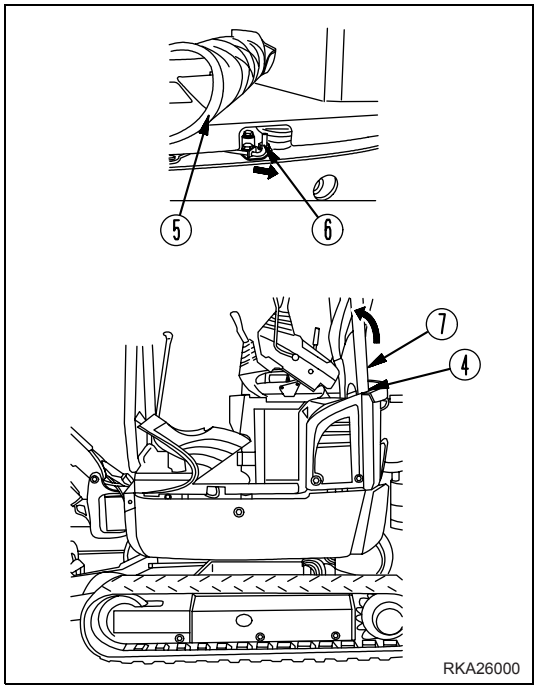
7. Remove the screws (4) fastening the roof to the rear ballast.
8. Lift the mat (5), pull the release lever (6) in the direction indicated by the arrow and simultaneously push the platform (7) upward in the direction indicated by the arrow (by approx. 45°).

IMPORTANT

- **When tilting or closing the cab floor, be extremely careful, and keep away from the area under the cab floor.**

NOTE

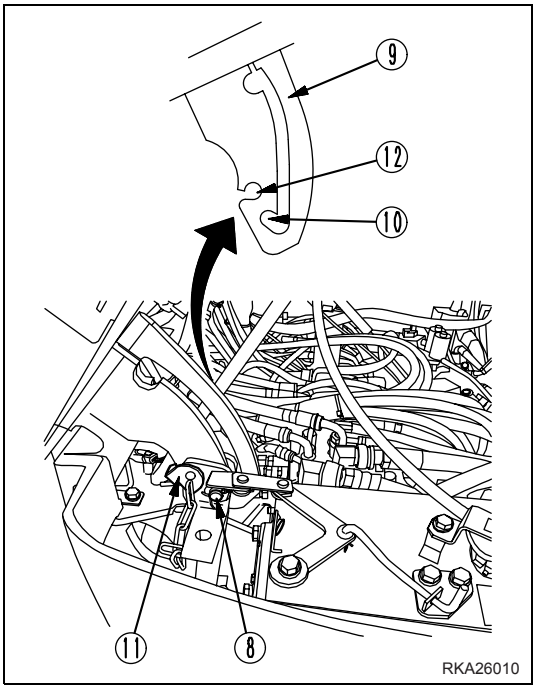
- The cab floor tilts thanks to the operation of a gas cylinder, so when the ambient temperature is low, the operating effort increases.

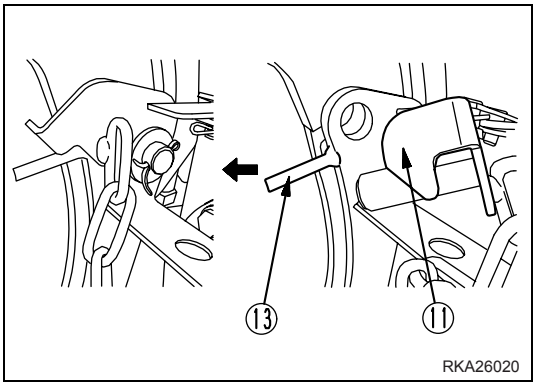


9. After tilting the floor open, make sure that the locking pin (8) is inserted in the groove (10) of the locking plate (9).
10. Insert the safety pin (11) into the hole (12) from the outside.
11. Turn until the coupling at the end of the safety pin (11) is completely engaged with the pin (13).

NOTE

- Make sure that the safety pin (11) is correctly engaged with the pin (13).





Closing

IMPORTANT

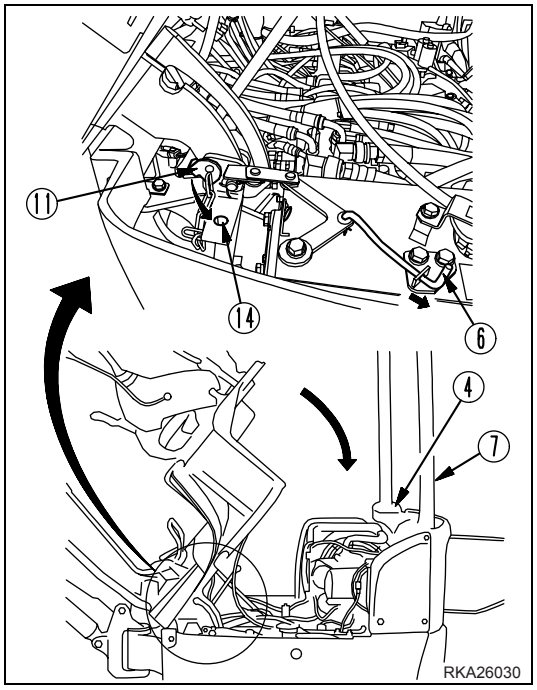
- **Before closing the cab floor, check that there is no damage or anomaly in the wiring or piping located in the compartment under the floor. If any damage or anomaly is observed, have the necessary repairs carried out by your Komatsu Distributor.**

1. Remove the safety pin (11) and store it into the apposite hole (14).

NOTE

- If the safety pin (11) cannot be loosen, facilitate the operation by pushing the platform (7) at the same time.

2. Pull the platform release lever (5) in the direction indicated by the arrow and simultaneously pull the platform (7) downward in the direction indicated by the arrow (by approx. 45°).



IMPORTANT

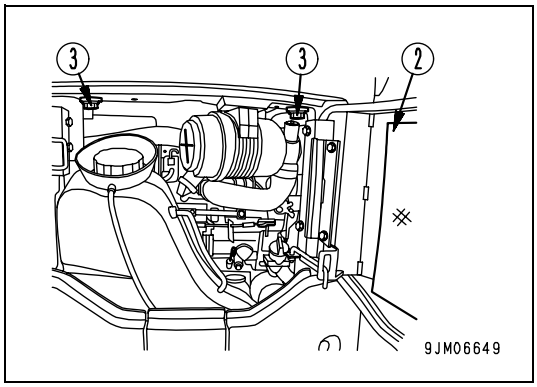
- **Lower the cab floor slowly and make sure that the wires and pipes located under it are neither damaged nor twisted.**
- **When tilting or closing the cab floor, be extremely careful, and keep away from the area under the cab floor.**

3. Tighten the screws (4) fastening the roof to the rear ballast to the correct torque. Driving torque: from 98 to 120 Nm
   Tighten the cab floor fastening screws (3) applying the required torque.
   Tightening torque: 156.8 to 196 Nm

NOTE

- If any screw is damaged, replace it with an original Komatsu part having the same size.

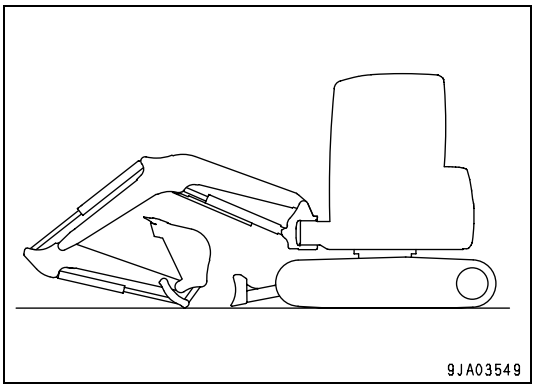
4. Close the engine hood (2).



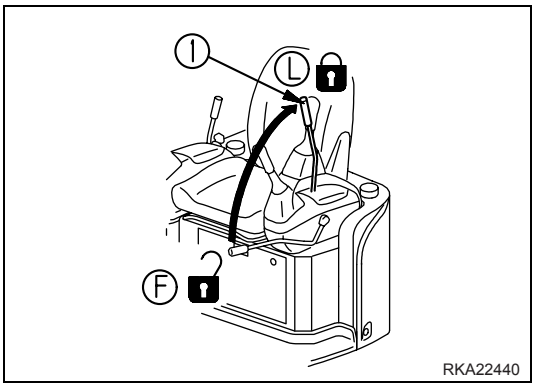
3.2.9.2 MACHINES WITH CAB

Tilting the cab floor

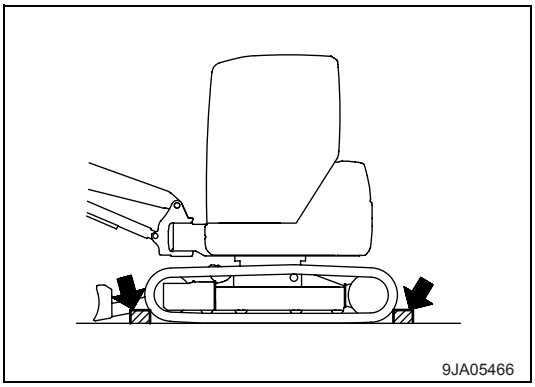
1. Lower the blade.
2. Extend the bucket and arm cylinders completely, then lower the boom slowly.



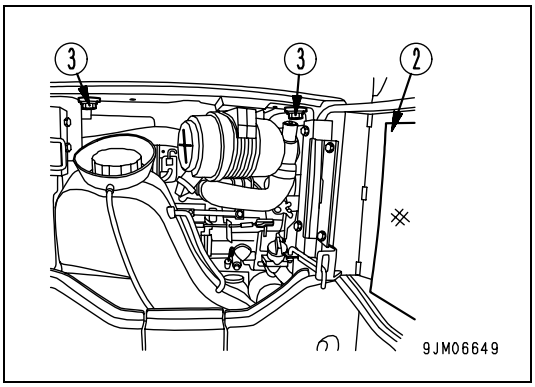
3. Shift the safety lever (1) to the “locked” position (L), then stop the engine.



4. Position blocks under the tracks in order to prevent the machine from moving.



5. Open the engine hood (2) completely and make sure that it is kept open by the apposite rod (for further details, see "3.2.6 ENGINE HOOD").
6. Loosen the fastening screws of the cab floor (3).



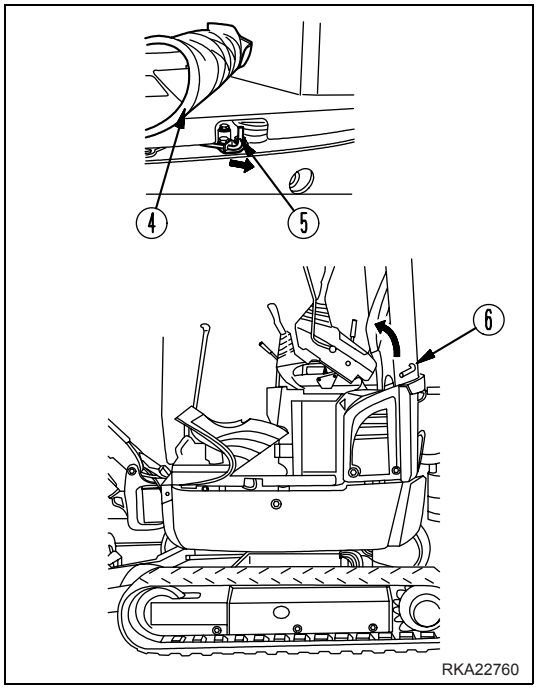
7. Raise the mat (4), pull the cab floor release lever (5) in the direction indicated by the arrow and at the same time push the handle (6) upwards in the direction indicated by the arrow (approx. 45°).

IMPORTANT

- **If the cab floor does not tilt, pull the handle (6) downwards and repeat the procedure described above.**
- **When tilting or closing the cab floor, be extremely careful, and keep away from the area under the cab floor.**

NOTE

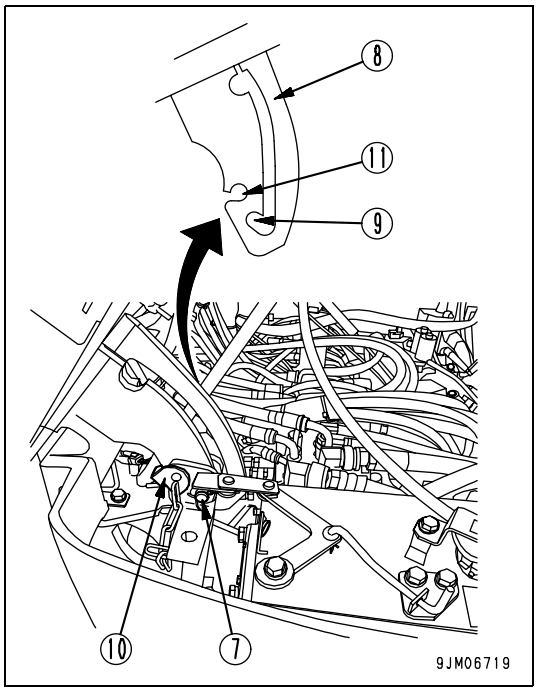
- The cab floor tilts thanks to the operation of a gas cylinder, so when the ambient temperature is low, the operating effort increases.

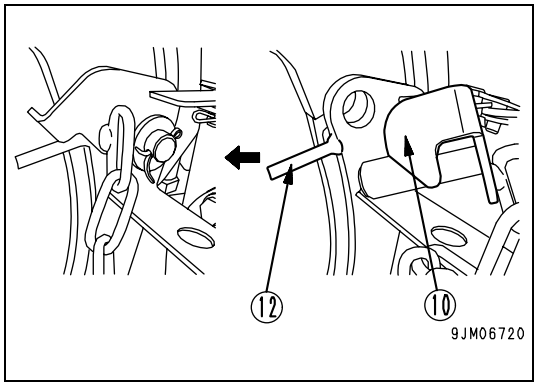


8. After tilting the floor open, make sure that the locking pin (7) is inserted in the groove (9) of the locking plate (8).
9. Insert the safety pin (10) into the hole (11) from the outside.
10. Turn until the coupling at the end of the safety pin (10) is completely engaged with the pin (12).

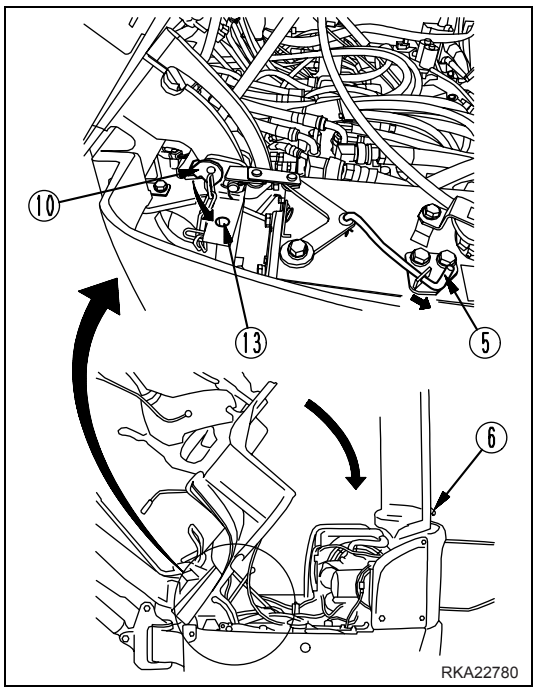
NOTE

- Make sure that the safety pin (10) is correctly engaged with the pin (12).





Closing the cab floor



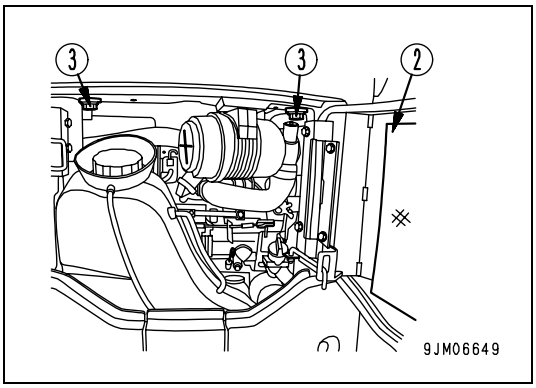
IMPORTANT
- **Before closing the cab floor, check that there is no damage or anomaly in the wiring or piping located in the compartment under the floor. If any damage or anomaly is observed, have the necessary repairs carried out by your Komatsu Distributor.**

1. Remove the safety pin (10) and store it into the apposite hole (13).

NOTE
- If the safety pin (10) does not come out, try again by pushing the handle (6) at the same time.

2. Pull the cab floor release lever (5) in the direction shown by the arrow and at the same time pull the handle (6) downwards in the direction indicated by the arrow (approximately 45°).

IMPORTANT
- **Lower the cab floor slowly and make sure that the wires and pipes located under it are neither damaged nor twisted.**
- **When tilting or closing the cab floor, be extremely careful, and keep away from the area under the cab floor.**

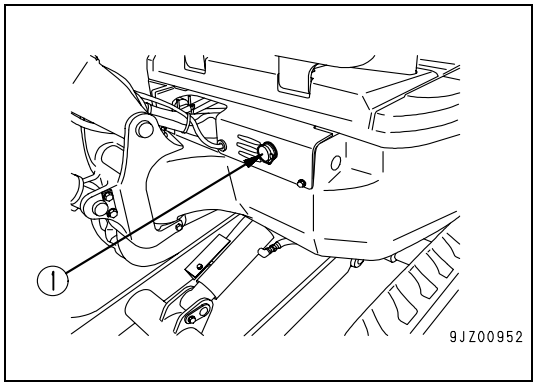


3. Tighten the cab floor fastening screws (3) applying the required torque.
   Tightening torque: 156.8 to 196 Nm

NOTE
- If any screw is damaged, replace it with an original Komatsu part having the same size.

4. Close the engine hood (2).

3.2.10 AUXILIARY POWER OUTLET

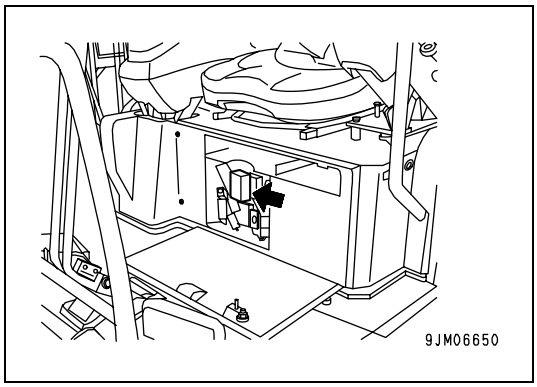


Power outlet 12V

A power outlet (1) is positioned on the front part of the machine for the connection of a lamp for routine and maintenance operations.
It is a two-pole outlet and is in compliance with the ISO 4165-1979 standard. Power supply 12 V.

Use only this socket when engine is running.

3.2.11 FUSES



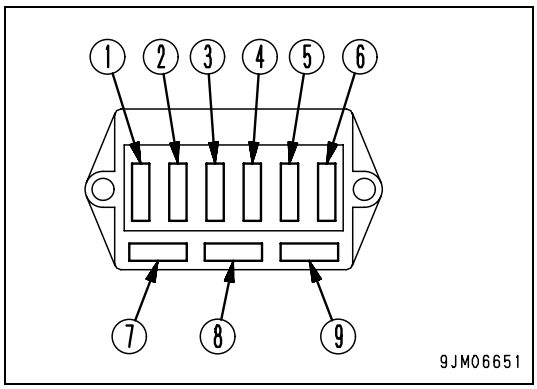
IMPORTANT

- **Before replacing fuses, be sure to first turn the starting switch to the OFF position, wait for over one minute, then switch the battery disconnect switch to OFF and take out the battery disconnect switch key.**
- **If the fuses are oxidized, corroded or do not fit perfectly in their seat, replace them only with new fuses having the same capacity.**

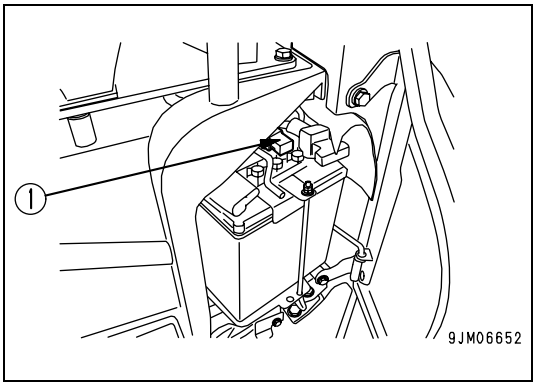
The fuses are bundled on a unique base placed inside the seat support and can be accessed once the door (1) is open. If a fuse is corroded, covered with white powder, or loose in the fuse holder, change it.
Replace the fuse with a new one having the same capacity.

Fuse capacity and circuits involved

No.	Fuse capacity	Circuit
(1)	10A	Overhead lamp, radio, PPC solenoid, Battery
(2)	30A	Fuel pump, work light
(3)	30A	Engine stop solenoid
(4)	20A	Indicator and warning light display, travel alarm solenoid, adjustable track solenoid
(5)	20A	Horn, travel sound alarm, optional power take-off
(6)	30A	Heating, windscreen wiper, radio
(7)	10A	Free
(8)	20A	Free
(9)	30A	Free



3.2.12 MAIN FUSE



IMPORTANT

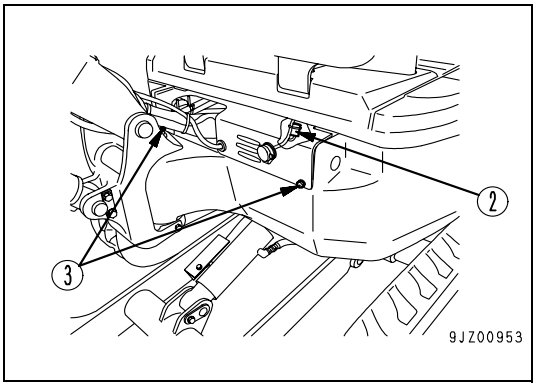
- **Before replacing fuses, be sure to first turn the starting switch to the OFF position, wait for over one minute, then switch the battery disconnect switch to OFF and take out the battery disconnect switch key.**
- **If the engine does not start when the start-up key is set to START, check the mains fuse and replace it, if necessary.**

If the starter does not run when the ignition switch is turned to position START, the fuse (1) may have blown. Open the battery cover on the left hand side of the machine, check the fuse and replace if necessary. The mains fuse (45A) is located above the battery. For instructions for opening and closing the battery cover, see "3.2.8 BATTERY COVER".

NOTE

- The main fuse is the high-capacity fuse installed to protect the electric components and the wiring.

3.2.13 12V OUTLET FUSE



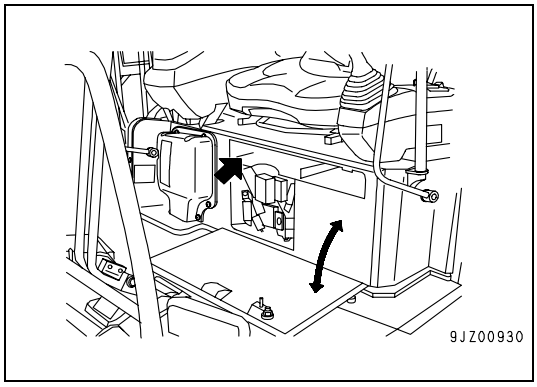
IMPORTANT

- **Before replacing fuses, be sure to first turn the starting switch to the OFF position, wait for over one minute, then switch the battery disconnect switch to OFF and take out the battery disconnect switch key.**

The fuse (2), with 12V power outlet protection, is fixed to the horn wiring located on the machine rear left side.
Loosen the screws (3) and remove the cover to access the fuse. Always replace the fuse with one of the same capacity.

10A fuse capacity

3.2.14 TECHNICAL DOCUMENTATION COMPARTMENT



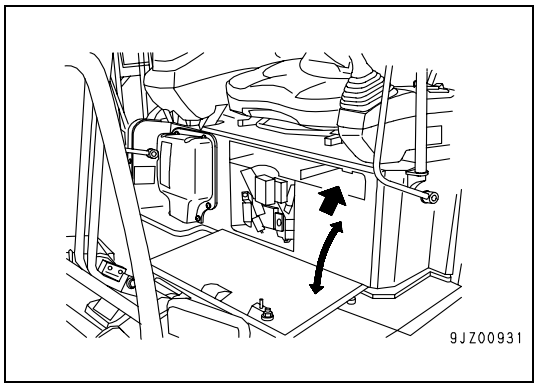
CAUTION

- **The use and maintenance manual is an integral part of the machine and must accompany it even in case of resale.**

The use and maintenance manual must be stored with care and always kept on board the machine, so that it can be consulted at any moment; it must be placed in the technical documentation compartment inside the seat support.

3.2.15 TOOL BOX

The tool box is positioned inside the seat support and can be reached by opening the front panel.



3.3 USE OF THE MACHINE AND RELATED CONTROLS

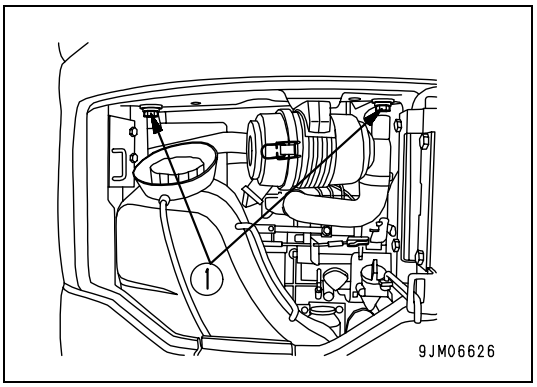
3.3.1 BEFORE STARTING THE ENGINE

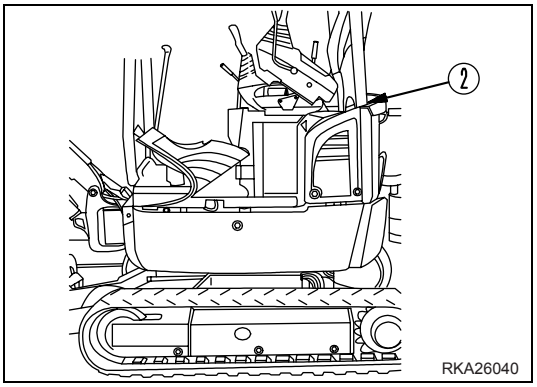
3.3.1.1 VISUAL CHECKS

Before starting the engine, look around the machine and under the machine to check for loose nuts or bolts, oil, fuel or coolant leakages, and check the conditions of the work equipment and the hydraulic system. Check also for loose wires, excessive gaps, and accumulation of dust in places that reach high temperatures.

⚠ WARNING

- **When opening the engine hood, the radiator cover and the battery cover to carry out inspection or maintenance operations, always open them completely and secure them in the correct position with the apposite retainer.**
- **Immediately remove any flammable materials that may have accumulated around the battery, the exhaust silencer or other hot parts of the engine. Any oil or fuel leaks may cause fire in the machine. Always perform thorough checks and carry out the necessary repairs; if any fault occurs repeatedly, contact your Komatsu Distributor.**
- **Ensure that the platform is fastened with screws (1) and, on versions with roof, also with screws (2). If it is not secured properly, it may cause serious injury. Carry out this check with the machine parked on level ground. If the machine is inclined, position it horizontally before carrying out the check.**



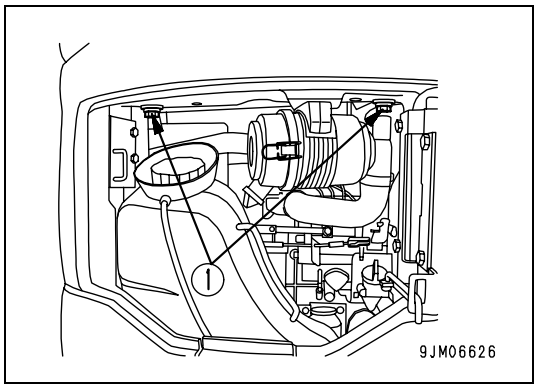


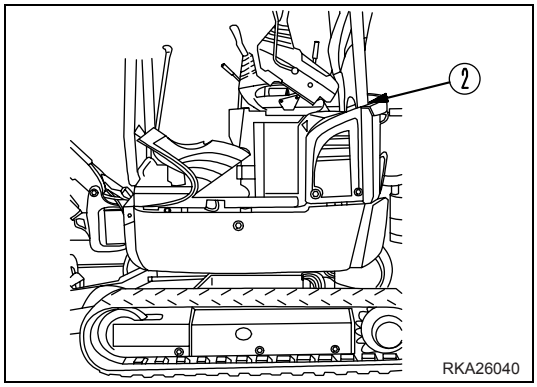
Carry out the following inspection and cleaning operations every day before starting the engine.

1. Check the work equipment, the cylinders, the articulations and the pipes for damage, wear, excessive play. If any anomaly is observed, provide for the necessary repairs.
2. Remove dirt and dust from around the engine, the battery, and the radiator.
   Check that there is no dirt or dust accumulated around the engine or the radiator. Check also that there is no flammable material (dry leaves, twigs, etc.) accumulated around the exhaust silencer, the hot parts of the engine or around the battery. Remove all dirt, dust, and flammable materials.
3. Make sure that there are no water or oil leakages around the engine.
   Make sure that there are no oil leakages from the engine or coolant leakages from the cooling system. If any anomaly is observed, provide for the necessary repairs.
4. Check the fuel supply line for fuel leaks. Make sure that there are no fuel leaks or damage in fuel supply pipes. If any anomaly is observed, provide for the necessary repairs.
5. Make sure that there are no oil leakages from the hydraulic system, the hydraulic tank, pipes, and joints. Make sure that there are no oil leakages. If any anomaly is observed, provide for the necessary repairs.

6. Check the components of the undercarriage.
   Check the tracks, the sprocket, the idler roller, and the guards for damage, wear, loose bolts, and make sure that there are no oil leakages from the rollers, etc.
   If any anomaly is observed, provide for the necessary repairs.
7. Check the driver's post access handles and the steps to get on the machine.
   Check that no bolt is damaged or loosened, repair the damaged parts and tighten any loosened bolt.
8. Make sure that there are no faults in the gauges and the warning lights.
   If any anomaly is observed, provide for the necessary repairs. Clean any dirty surface.
9. Check the seat belt and the relevant couplings.
   If there is any damage or anomaly, change them with new ones.
10. Check the cab floor fastening screws.
    - Open the engine cover and check that the screws fastening the platform (1) are securely tightened.
      On machines with roof, also check that the fastener screws (2) are tightened correctly.

Every time there are abnormal situations related to platform, restore the correct conditions proceeding personally or contact your Komatsu Distributor for repairs.





3.3.1.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

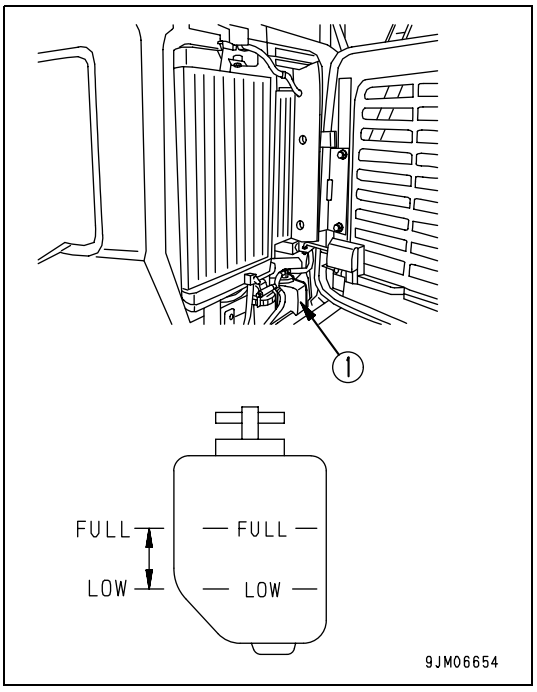
Carry out the checks listed below every day before starting the engine.

CHECKING THE COOLANT LEVEL AND TOPPING UP

⚠ WARNING

- **Do not remove the radiator cap, unless such operation is absolutely necessary. Before checking the coolant level, wait for the engine to cool down and check the expansion tank.**
- **Immediately after the engine has stopped, the coolant is very hot and under pressure. Removing the cap in these conditions to check the coolant level may cause a burn hazard. Before removing the cap, wait until temperature is reduced and loosen the cap slowly to release the remaining pressure.**

1. Open the radiator cover. For details, see paragraph "3.2.7 RADIATOR COVER"
2. Make sure that the coolant level is included between the FULL and LOW marks on the expansion tank (1). If the level is low, top up through the filler neck of the tank (1), until reaching the FULL mark.
3. Put back the cap after topping up.
4. If the expansion tank is empty, make sure that there are no leakages and check the coolant level in the radiator. If necessary, add coolant in the radiator and also in the expansion tank.



CHECKING THE ENGINE OIL LEVEL AND TOPPING UP

⚠ WARNING

- **Soon after the machine has been stopped the engine is very hot and may cause burns; let the engine cool down to 40-45°C before carrying out any check.**

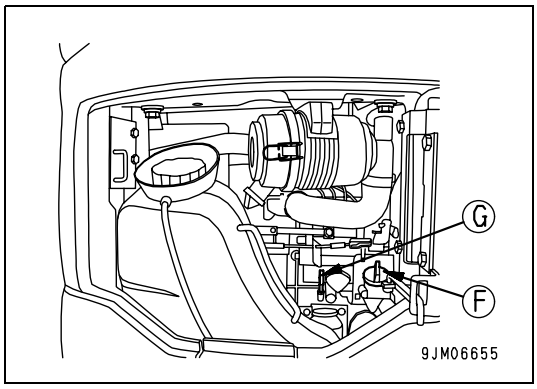
⚠ CAUTION

- **When carrying out an inspection or maintenance operation inside the engine hood, always open it completely and make sure that it is kept open by the apposite rod.**

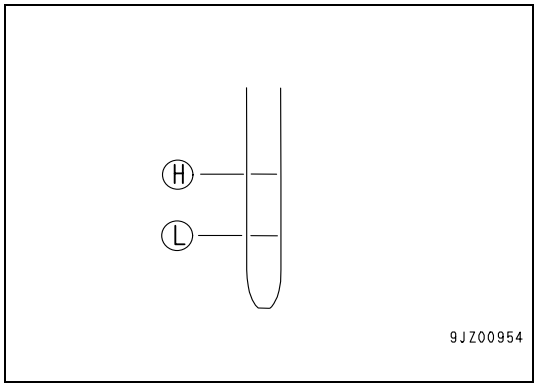
NOTE

- If the machine is inclined, position it horizontally before carrying out the check.
- If the engine has just been stopped, before checking the engine oil level wait approximately 15 minutes, in order to allow the engine to cool down.

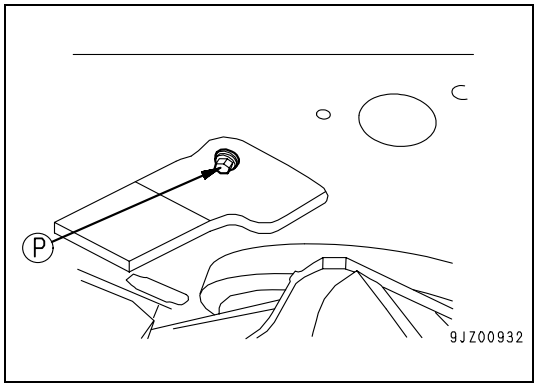
1. Open the engine hood. For details, see paragraph "3.2.6 ENGINE HOOD"
2. Remove the dipstick (G) and wipe it with a cloth.
3. Insert the dipstick (G) completely into the oil filler pipe, then remove it and check the oil level.



4. Oil level must be between references H and L;
   if the oil level is close to reference L, top up through the filler (F) with the oil adapted to ambient temperature indicated in the table of lubricants (see "4.4 FUEL, COOLANT AND LUBRICANTS").



5. If the oil level is above the H mark, drain the excess oil through the drain plug (P), and check the oil level again.
6. If the oil level is correct, tighten the oil filler, then close the engine hood.

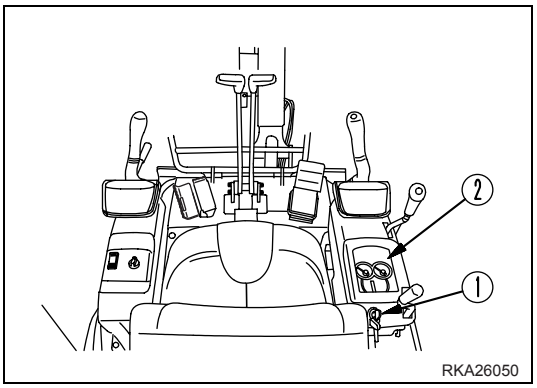


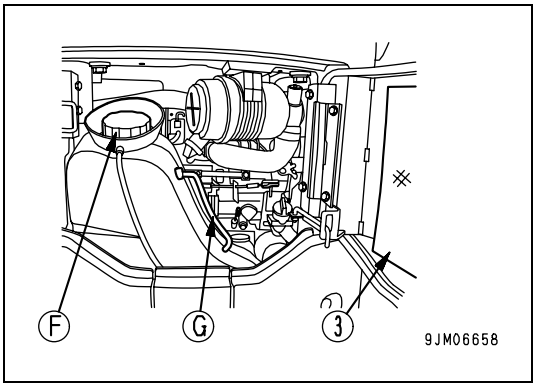
CHECKING THE FUEL LEVEL AND REFUELLING

⚠ WARNING

- **When refuelling, avoid spilling fuel, since this may cause a fire hazard. If fuel is spilled, wipe it up immediately.**
- **Fuel is highly flammable; do not use naked flames and do not smoke when refuelling. Hold the fuel gun constantly in contact with the filler.**

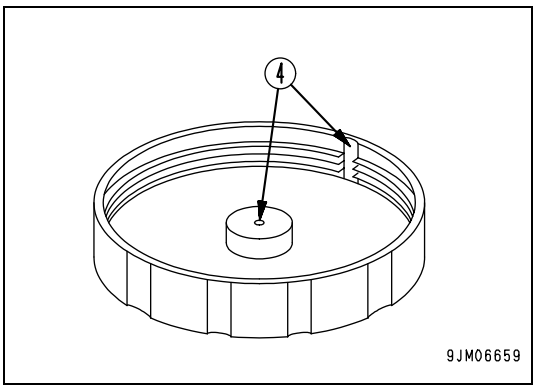
1. Insert the key in the ignition switch (1) and turn in to position ON to light up the dashboard.
2. Check the fuel level on the fuel gauge (2). If the fuel level is low, open the engine hood (3) (for details, see "3.2.6 ENGINE HOOD"), remove the cap and refuel through the filler (F). While refuelling, check the fuel level on the sight gauge (G).
   Tank capacity: 19 l
3. Avoid filling the tank completely and leave enough space for the fuel to expand.
4. After refuelling, tighten the cap thoroughly and close the engine hood.





IMPORTANT

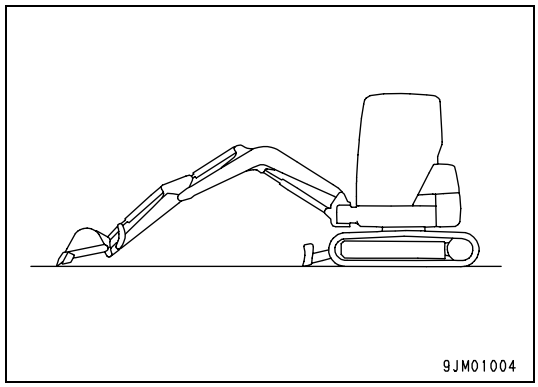
- **It is advisable to refuel after work, in order to avoid the formation of water condensate.**
- **If the breather hole (4) is clogged, the pressure in the tank will drop and the fuel may not flow smoothly. Clean the breather hole (4) frequently and make sure that it is not clogged.**



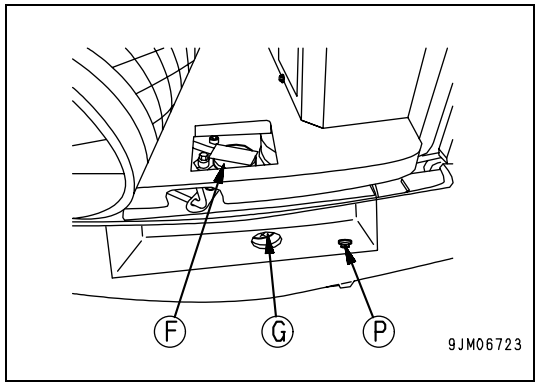
CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP

⚠ WARNING

- **Carry out this check when the oil is cold, with the machine positioned on level ground, bucket and arm cylinders retracted and bucket teeth resting on the ground.**
- **Before topping up, stop the engine and eliminate the residual pressure from the equipment circuits (by shifting the controls more than once) and from the tank by slowly loosening the filling cap.**



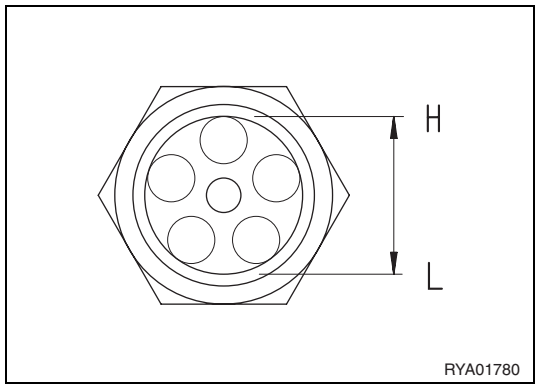
1. If the work equipment is not in the conditions shown in the diagram on the right, start the engine and run it at high idling speed, retract the arm and bucket cylinders completely and lower the boom until the bucket teeth touch the ground. Stop the engine.



2. Make sure that the oil level is included between the H and L marks on the sight gauge (G).

IMPORTANT

- **Do not exceed the max. level mark (H). This would damage the hydraulic circuit and cause the oil to overflow.**
- **If too much oil is added and this exceeds the level (H) on the gauge, turn the revolving frame so that the drain plug (P) is positioned between the tracks, stop the engine, wait for the hydraulic oil to cool down and drain the excess oil through the drain plug (P).**



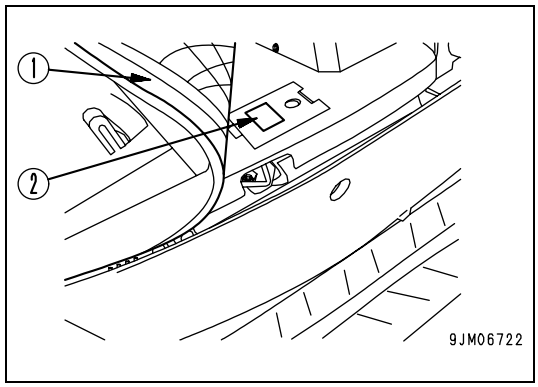
3. If the oil does not reach the level (L), lift the mat (1), remove the cover (2) and the cover on the filler neck (F), then top up through the filler neck (F) using the oil recommended in the lubricant chart (see "4.4 FUEL, COOLANT AND LUBRICANTS").

NOTE

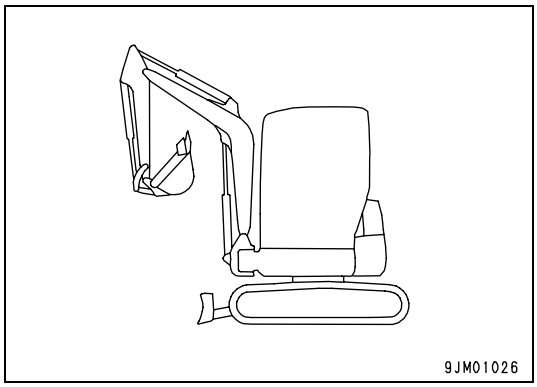
- The oil level varies according to its temperature. Then keep to the following instructions:

  Before operation: near level (L)
  (Oil temperature ranging from 10°C to 30°C)

  Normal operation: near level (H)
  (Oil temperature ranging from 50°C to 80°C)



4. Extend the boom, arm and bucket cylinders completely, as shown in the diagram on the right, and remove the filler cap. Put back the cap and pressurize the tank, lowering the equipment to the ground.

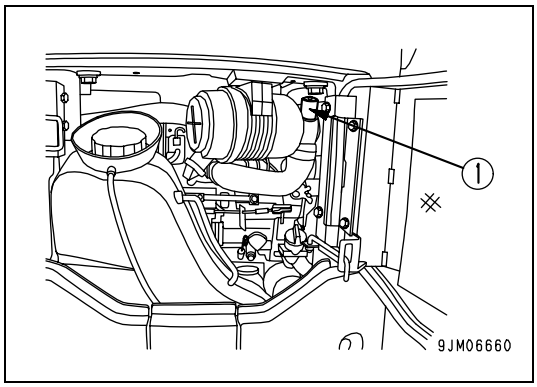


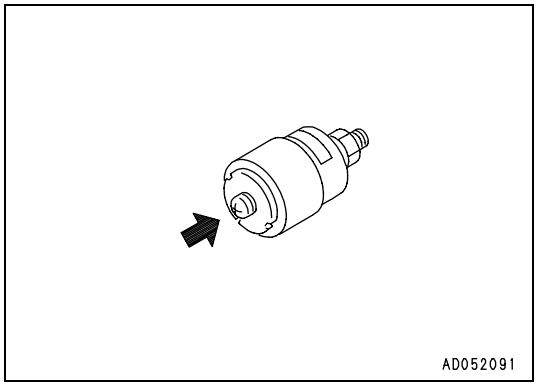
IMPORTANT

- **Make sure that the hydraulic tank is pressurized. If the tank isn't under pressure, the pump will suck in air and this will damage the equipment.**
- **If a constant or abnormal decrease in the oil level is observed, thoroughly check the hydraulic circuit, the pistons and the pump for leaks.**

CHECKING THE AIR FILTER CLOGGING INDICATOR

1. Open the engine hood. For further details, see paragraph "3.2.6 ENGINE HOOD".
2. Check if the red piston is visible in the transparent portion of the filter clogging indicator (1).
3. If the red piston is visible, clean or replace the filtering element immediately.
   For further details on how to clean the filtering element, see "4.9.1.a CHECKING, CLEANING OR CHANGING THE AIR FILTER CARTRIDGE".
4. After checking, cleaning or replacing the filtering element, press the knob on the indicator (1), so that the red piston returns to its original position.





CHECKING THE WATER SEPARATOR

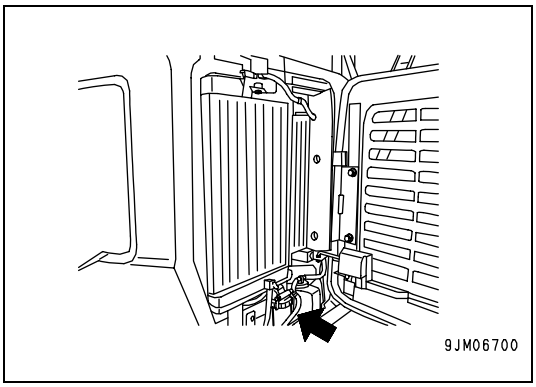
⚠ WARNING

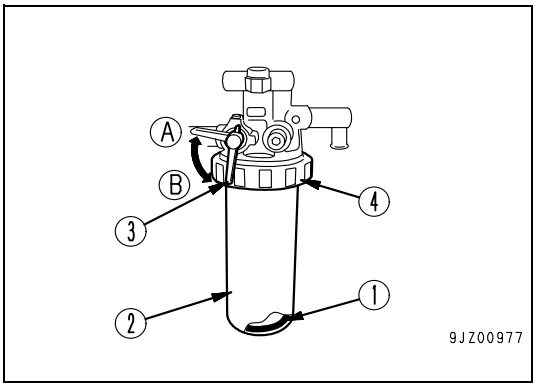
- **Fuel is flammable; do not use naked flames and do not smoke while draining the water separator.**
- **If fuel is spilled, wipe it up immediately.**

If the decanting device red ring (1) is at the bottom of the container (2), it means that there is no water.

If the ring (1) floats, it means that there is water up to the ring lower surface; therefore, it is necessary to drain water following the procedure below.

1. Open the radiator cover. For details, see paragraph "3.2.7 RADIATOR COVER"
2. Turn the lever (3) to the closed position (A).
3. With a filter wrench, loosen the metal ring (4), remove the casing (2) and eliminate the water contained inside it.
4. Put back the casing (2) and tighten the metal ring (4).
5. Turn the lever (3) to the “open” position (B).
6. Drain any water or sediment from the fuel tank. For details, see paragraph "4.9.1.d DRAINING THE FUEL TANK"





CHECKING THE WIRING SYSTEM

⚠ WARNING

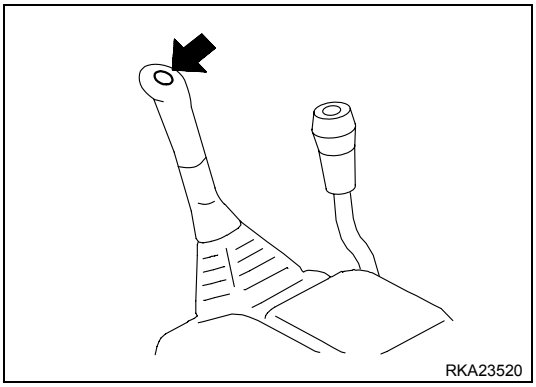
- **If fuses are corroded, rusted or do not hold well in place, replace them with fuses featuring the same rating; before replacing a fuse, make sure that both the starter key and the battery main switch are turned to OFF.**
- **If the wirings show traces of short circuits, contact your Komatsu Distributor, who will locate the fault and carry out any necessary repairs.**
- **Before checking the wiring, take all the necessary safety precautions.**
- **Always keep the battery surface clean and make sure that the charge level warning light is always visible.**

Make sure that the fuses are not damaged, that fuses with the required capacity are used, that there are no disconnected, broken, or short-circuited wires; furthermore, check the terminals, and tighten any loose ones.

Check the wiring of the battery, the starter and the alternator carefully.
In addition, remove any flammable material that may have accumulated around the battery.
For troubleshooting and repairs, contact your Komatsu Distributor.

CHECKING THE HORN

1. Turn the ignition switch to position ON.
2. Press the button positioned on the right lever and make sure that the horn functions correctly.
   If the horn does not sound, contact your Komatsu Distributor, who will carry out the necessary repairs.

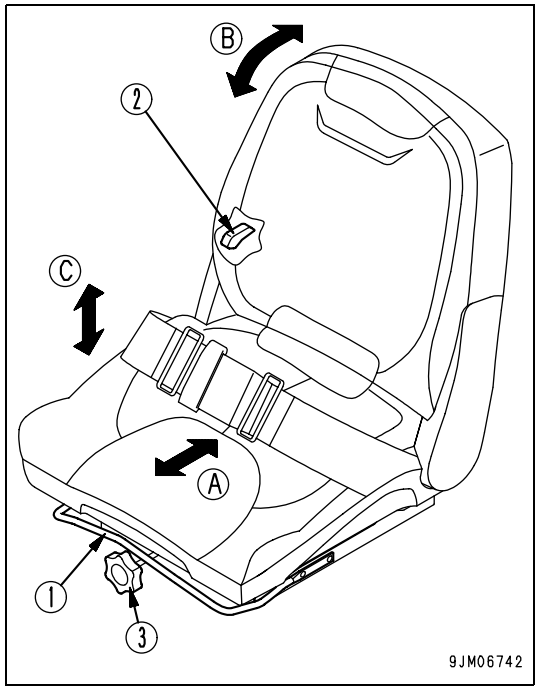


3.3.1.3 ADJUSTMENTS

⚠ WARNING

- **Adjust the position of the seat before starting work or when taking the place of another operator.**
- **Adjust the seat so that the control levers and the switches can be easily used by the operator seated with his back against the backrest.**

ADJUSTING THE SEAT



(A) Longitudinal adjustment

The seat may be moved forward and backward.

Shift the lever (1) upwards, move the operator seat to the desired position, then release the lever.

Longitudinal adjustment allowed: 100 mm.

Adjust the position of the operator seat according to the job to be carried out. For example, when it is necessary to carry out deep digging operations, make the seat slide forward in order to increase visibility on the area in front of the machine.

(B) Inclination

Pull the lever (2) forward and adjust the seat backrest into a comfortable working position, then release the lever.

During the adjustment operations, remain seated with the back against the backrest. If your back is not in contact with the seat backrest, the backrest can suddenly move forwards.

(C) Suspension

Rotate the hand wheel (3) positioned under the seat and adjust it to the desired position.

Weight can be set between 50 and 120 kg.

Turn the hand wheel (3) to the lightest weight to soften the suspension; to harden it, turn the hand wheel to a heavier weight. When working on uneven surfaces, adjust the seat to a harder setting.

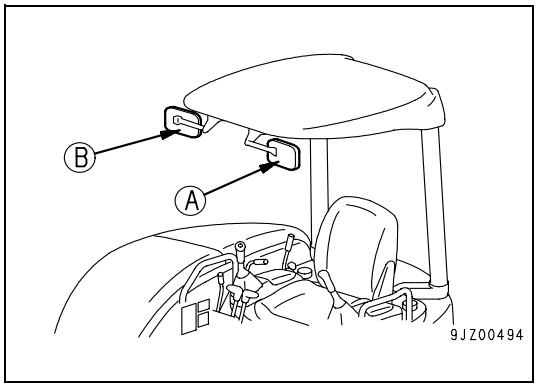
REAR-VIEW MIRRORS

⚠ WARNING

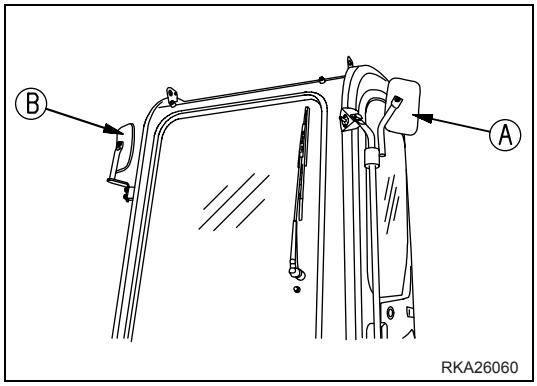
- **Always check the cleaning and correct orientation of the rear-view mirrors before starting to work; they must allow to control the rear area control without moving the log in relation to the normal working position.**
  If working with no control at the back of the machine, incautious people who may have entered into the working zone may be run down, or fixed obstacles or motor vehicles may be crashed during operation.
- **If rear-view mirrors shall be moved or broken during work, stop the machine immediately and fix or replace them.**

Adjust the inclination of the rear-view mirrors, so that the area behind the cab is well visible.

- Machine equipped with canopy

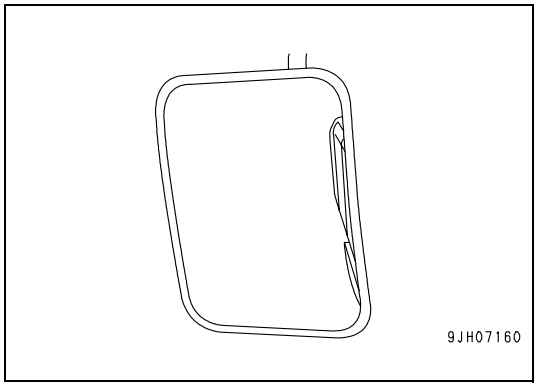


- Machine equipped with cab



Mirror (A) and (B)

- Adjust the angle so that the rear panel of the machine is reflected on the mirror.



SEAT BELT

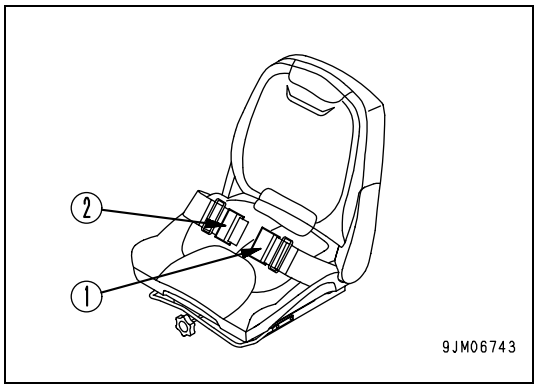
⚠ WARNING

- **Before fastening the seat belt, make sure that the fastening brackets or the belt itself do not show any anomaly. If there are damaged or worn parts, change the belt.**
- **The safety belt can be replaced also if there are not failures or wear signs according to the following program.**
  After 5 years from the production date indicated on the belt back or every 3 years from first use, whichever is the shortest period.
- **Adjust and fasten the seat belt before operating the machine.**
- **Make sure that none of the two parts of the belt is twisted.**

Make sure that the screws that fasten the belt to the frame are not loose. If necessary, apply a tightening torque of 24,5 ± 4,9 Nm (2,5 ± 0,5 kgfm).
If the surface of the belt is damaged or if the couplings are broken or deformed, change the belt assembly.

Fastening and unfastening the seat belt

1. Adjust the seat in such a way as to ensure that there is sufficient knee room when pressing the pedal thoroughly while seated, with the back resting against the backrest.
2. After adjusting the seat, seat correctly and insert the tang (2) in the buckle (1). Pull the belt to make sure that the tang is securely locked in the buckle.
3. To unfasten the belt, lift the upper part of the buckle (1) and release it.

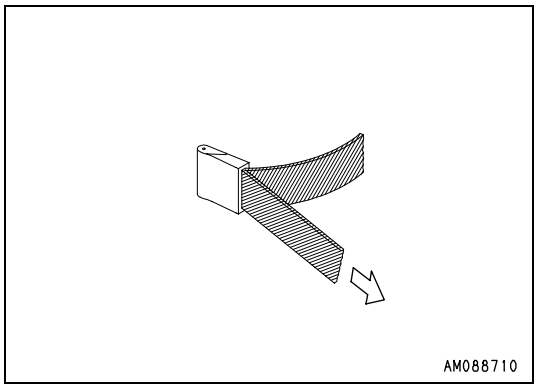


Fasten the belt without twisting it.
Adjust the belt length by proceeding as indicated below.

ADJUSTING THE SEAT BELT

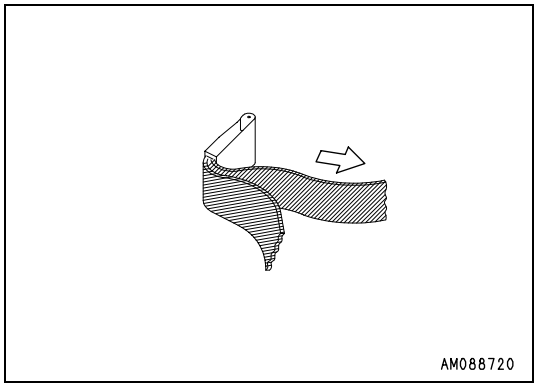
How to shorten the belt

Pull the free end of the belt on the tang side.



How to lengthen the belt

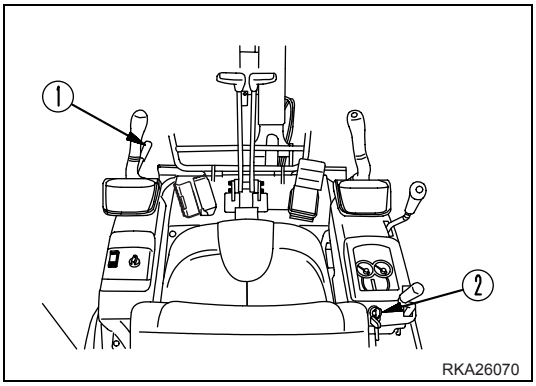
Pull the belt, keeping it perpendicular to the tang.



3.3.1.4 OPERATIONS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

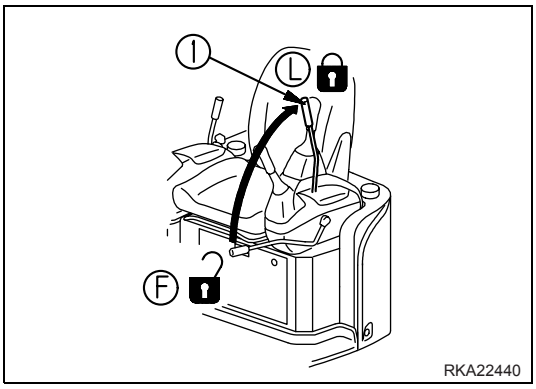
⚠ WARNING

- **When starting the engine, make sure that the safety lever is in the “locked” position.**
- **If the control levers are not locked and are inadvertently touched when the engine is started, the work equipment may move suddenly and cause serious accidents.**



1. Make sure that the safety lever (1) is in the “locked” position (L).

NOTE
- If the safety lever is not in position (L), the engine cannot be started.

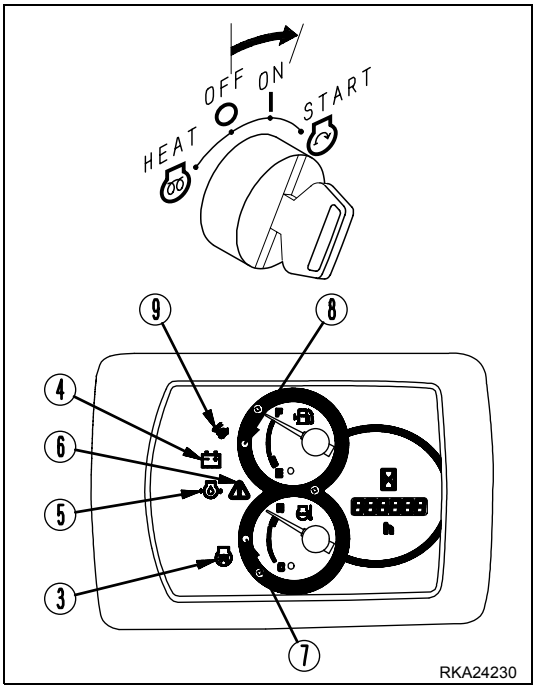


2. Check the position of each lever.
3. Insert the key in the start-up switch (2) and turn it to ON, then carry out the checks indicated below.

   1 - Check that the horn goes on for about 1 second and that the following warning lights are on for about 3 seconds.
   - Pre-heating warning light (3)
   - Battery charge level warning light (4)
   - Engine oil low pressure warning light (5)
   - Electrical system control warning light (6) (optional)
   - Engine coolant temperature warning light (7)
   - Fuel level warning light (8)
   - Travel speed increase warning light (9)

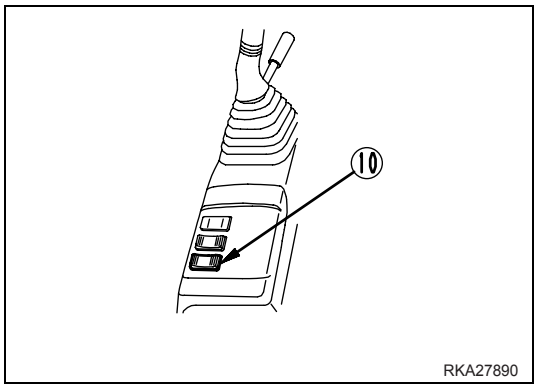
   If a warning light or indicator does not turn on, or the sound alarm does not go on, contact a Komatsu Distributor, who will carry out all the necessary repair operations.

   After approximately 3 seconds, only the following warning lights remain on. The other warning lights go out.
   - Battery charge level warning light (4)
   - Engine oil low pressure warning light (5)
   - Electrical system control warning light (6) (optional)

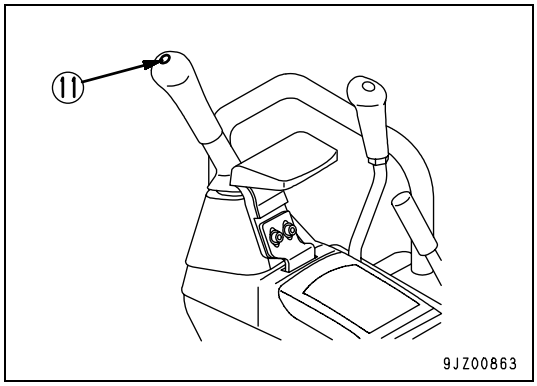


NOTE
- The control monitor of the electric system (6) lights up, but this machine does not have such function.
  The monitor only works when an optional controller is installed.

2 - Press the light switch (10) and ensure that the working headlamp switches on. If it does not turn on, contact a Komatsu Distributor, who will carry out all the necessary repair operations.



3)- Press the horn button (11) to make sure that the horn functions correctly.



3.3.1.5 STARTING THE ENGINE

Start-up with hot engine or mild weather

⚠ WARNING

- **Before starting the engine, carefully read the instructions and information regarding safety contained in this manual and make sure that you know the controls. Once the engine is started, the Operator is absolutely responsible for the damages deriving from false manoeuvres or failure to observe safety regulations..**
- **Do not attempt to start the engine by causing a short-circuit with the terminals of the starter. This may cause serious injury or even fires.**
- **Start the engine only while seated with fastened seat belt.**
- **Before starting the engine, make sure that there is no one within the operating range of the machine and sound the horn.**
- **Exhaust gas is toxic. When starting the engine in closed places, make sure that there is sufficient ventilation.**

IMPORTANT

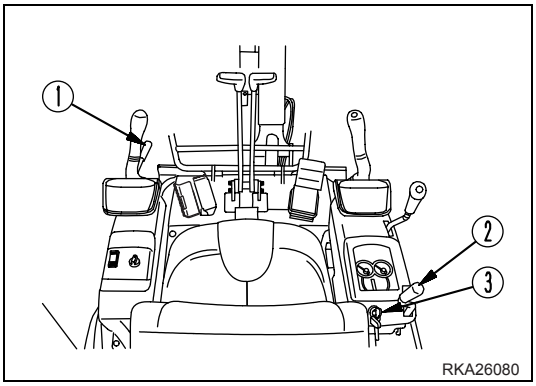
- **Do not make the starter run for more than 20 seconds without interruption. If the engine does not start, wait at least 2 minutes before trying again.**
- **Before starting the engine, make sure that the battery main switch is turned to ON (see "3.2.2 pos: 9. Battery main switch (if installed)").**

1. Make sure that the safety lever (1) is in the “locked” position (L).

NOTE

- If the safety lever is in working position (F), the engine does not start up.

2. Pull the accelerator lever (2) midway between the idling position (A) and the maximum speed position (B).
3. Turn the ignition key (3) to position START to start the engine.



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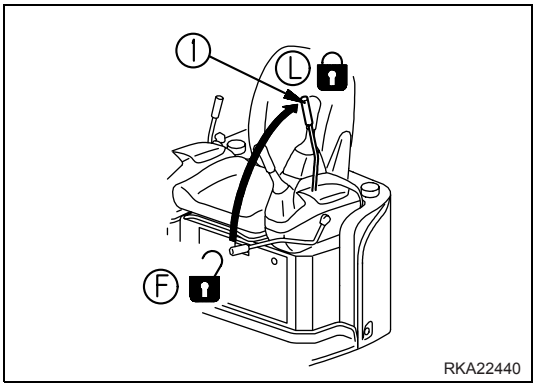

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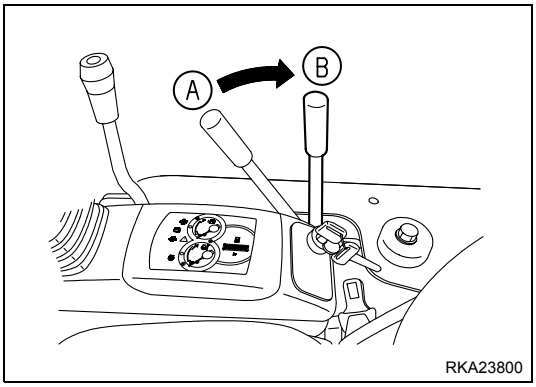

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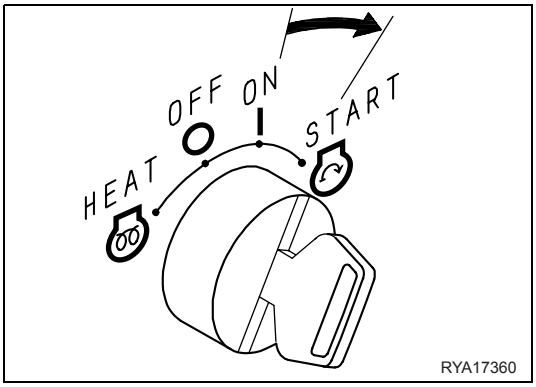
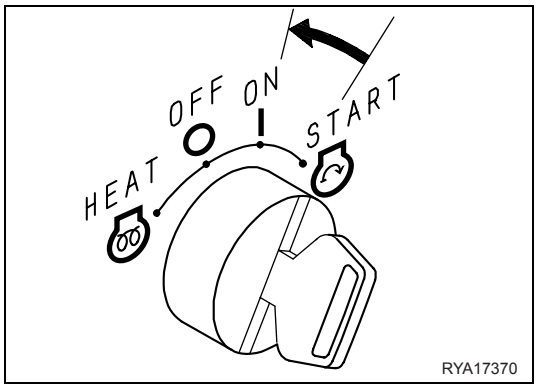


RYA17360

4. As soon as the engine starts, release the key (3), which will automatically return to position ON.



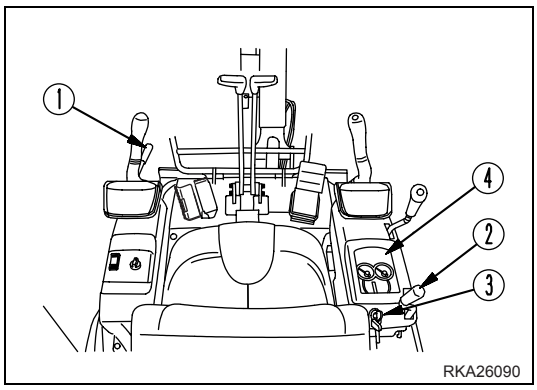
Starting with cold engine or in cold climates

⚠ WARNING

- **Before starting the engine, carefully read the instructions and information regarding safety contained in this manual and make sure that you know the controls. Once the engine is started, the Operator is absolutely responsible for the damages deriving from false manoeuvres or failure to observe safety regulations..**
- **Do not attempt to start the engine by causing a short-circuit with the terminals of the starter. This may cause serious injury or even fires.**
- **Start the engine only while seated with fastened seat belt.**
- **Before starting the engine, make sure that there is no one within the operating range of the machine and sound the horn.**
- **Never use starting aid fluids, as they may cause explosions.**
- **Exhaust gas is toxic. When starting the engine in closed places, make sure that there is sufficient ventilation.**

IMPORTANT

- **Do not make the starter run for more than 20 seconds without interruption. If the engine does not start, wait at least 2 minutes before trying again.**
- **Before starting the engine, make sure that the battery main switch is turned to ON (see "3.2.2 pos: 9. Battery main switch (if installed)").**

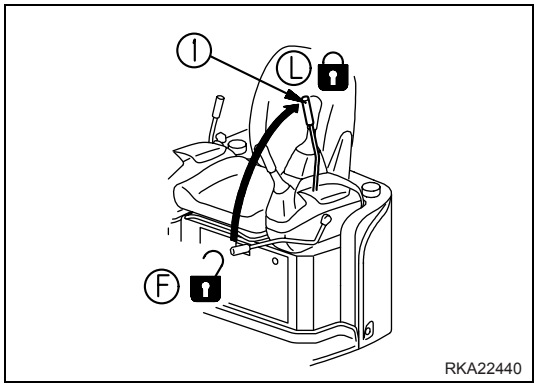


When starting the engine in cold climates, proceed as indicated below.

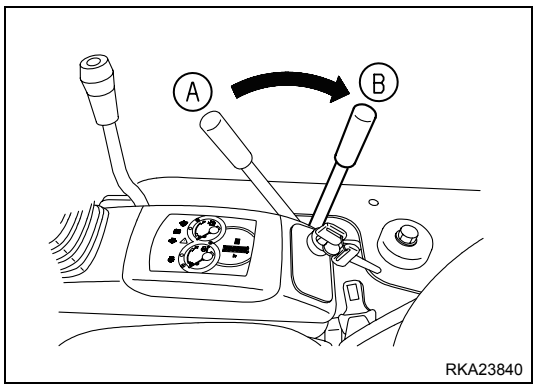
1. Make sure that the safety lever (1) is in the “locked” position (L).

NOTE

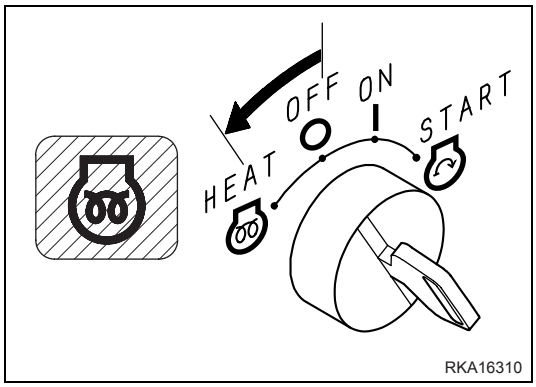
- If the safety lever is in working position (F), the engine does not start up.



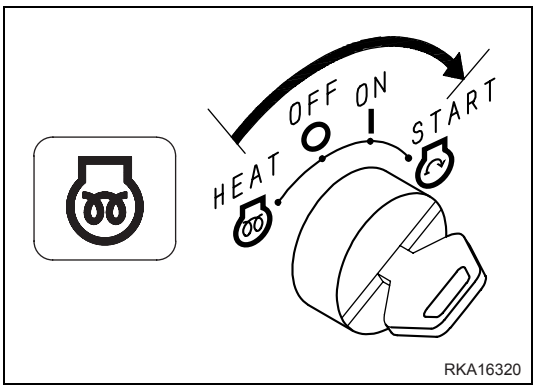
2. Pull the accelerator lever (2) completely, from the idling position (A) to the maximum speed position (B).



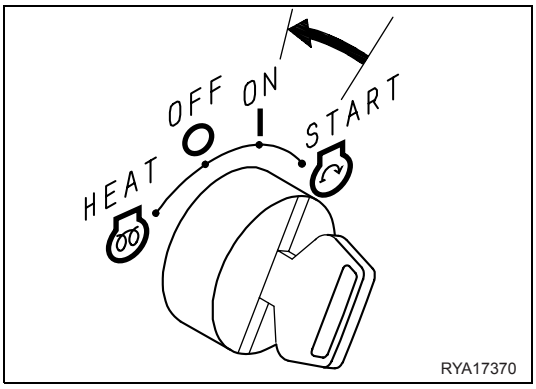
3. Turn the start-up key (3) to HEAT and make sure that the preheat warning light (4) is on.
   After about 18 seconds, once the preheating is complete, the warning light (4) turns off and the sound alarm goes on.



4. When the preheating warning light (4) goes out, turn the ignition key (3) directly to position START to start the engine.



5. As soon as the engine starts, release the key (3), which will automatically return to position ON.



3.3.2 AFTER STARTING THE ENGINE

⚠ WARNING

- **Emergency stop**
  If a failure has occurred or an anomaly has been observed, turn the ignition key to position OFF.
- **If the work equipment is operated without warming up the engine sufficiently, the response of the work equipment to the movements of the control lever will be slow, and the work equipment may not move as desired by the operator, so always carry out the warming up procedure. Particularly in cold areas, be sure to carry out the warming up procedure correctly.**

3.3.2.1 RUNNING-IN

⚠ CAUTION

- **Komatsu machines are adjusted and tested completely before shipment. However, operating the machine under severe conditions at the beginning can adversely affect the performance of the machine and shorten its life.**
  It is advisable to run in the machine for the first 100 hours of operation (as indicated by the hour meter). During the running-in period, follow the precautions indicated in this manual.

- After starting the engine, let it idle for 5 minutes.
- Avoid using the machine with excessive loads and avoid high speeds.
- Immediately after starting the engine, avoid sudden starts, sudden accelerations, unnecessary sudden stops, and sudden changes in direction.

3.3.2.2 ENGINE STARTING CAPACITY AND NOISE LEVEL CHECK

When the engine is started, check that this does not cause abnormal noise and that the engine can be simply and correctly started.
Check also there is no abnormal noise when the engine is in neutral or the speed is slightly increased.

- If there is abnormal noise when the engine is started and such condition continues, the engine may be damaged. In such case, contact your Komatsu Distributor as soon as possible to have the engine checked.

3.3.2.3 ENGINE ACCELERATION AND DECELERATION CHECK

Check that engine speed increases gradually when the fuel control lever is set from the minimum neutral position to the maximum (MAX) speed position after the heating phase.
Check also that the engine speed gradually increases when the fuel control dial is taken to the maximum level (Max).

- Carry out a check in a safe place; make sure that safety conditions are present in the surrounding area.
- When the engine performance is poor at low idle speed and when accelerating and if such condition persist, the engine may be damaged, the operator has not carry out an operation correctly or braking efficiency has been reduced; all these conditions can easily cause an unexpected accident. In such case, contact your Komatsu Distributor as soon as possible to have the engine checked.

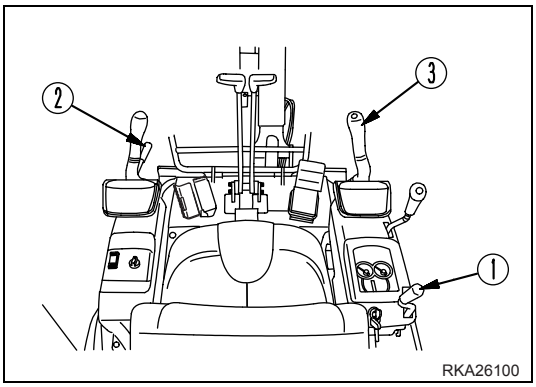
3.3.2.4 WARMING THE ENGINE

IMPORTANT

- **Do not carry out any operation and do not shift the levers suddenly when the hydraulic oil temperature is too low. Always carry out the warming up operations. This will lengthen the life of the machine.**
- **Do not accelerate abruptly before completing the warming-up operations. Do not let the engine run at low idling or high idling speed for more than 20 minutes without interruption. If it is necessary to let the engine idle, accelerate every now and then or increase the speed up to an intermediate value.**

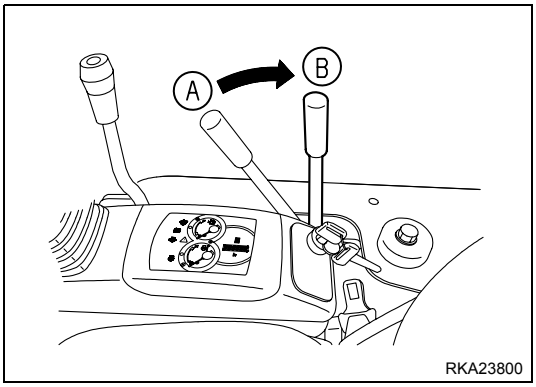
After starting the engine, let it warm up before starting work. Carry out the operations and checks indicated below.

1. Shift the accelerator lever (1) from the idling (A) to the intermediate speed position (B), and let the engine idle at medium speed for at least 5 minutes.

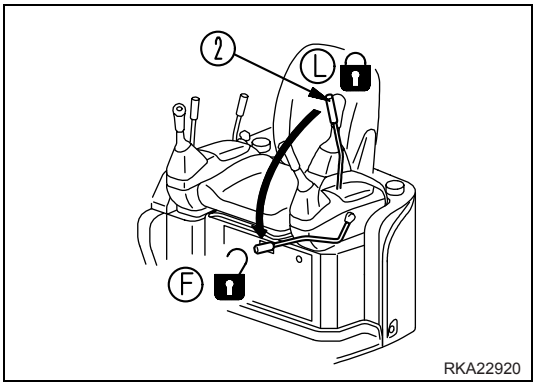


NOTE

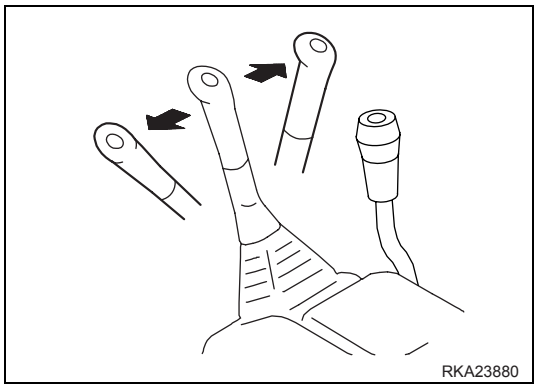
- When the ambient temperature is below 0°C, let the engine run at low idling speed during the warming-up operations.
- Do not accelerate completely or abruptly until the coolant temperature has reached at least 60°C.



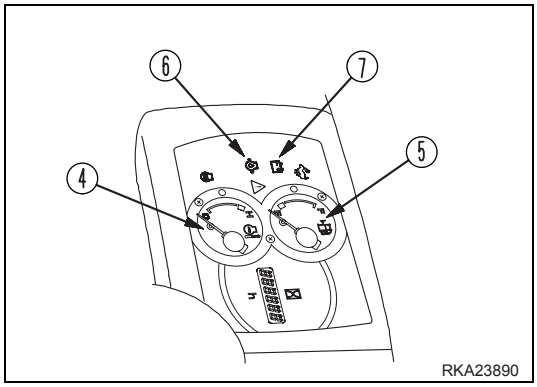
2. Move the safety lever (2) to working position (F) and lift the bucket from the ground.



3. Operate the right work equipment control lever (3) slowly, stop the bucket, and hold it in the stop position for 5 minutes.

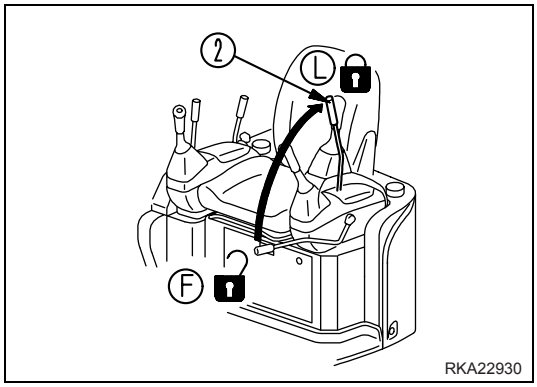

RKA23880

4. After carrying out the warming-up operations, make sure that the warning lights and gauges are in the conditions described below. If any anomaly is observed, carry out the necessary maintenance operations and repairs.
   - Engine coolant temperature warning light (4): indicator in the correct position
   - Fuel gauge (5): indicator in the correct position
   - Engine oil low pressure warning light (6): warning light off
   - Battery charge level warning light (7): warning light off
5. Make sure that the colour of the exhaust gases is normal and that there are no strange noises or vibrations. If any anomaly is observed, contact your Komatsu Distributor.



RKA23890

6. Shift the safety lever (2) to the “locked” position (L), then make sure that the machine does not move even when the levers and pedals are operated.
   1) The work equipment and the swing must be inhibited even when the left and right control levers are operated.
   2) The machine must not move even if the travel levers are operated.
   3) In this condition it should not be possible to use the blade or to adjust the track gauge, not even by operating the blade/adjustable track gauge lever.
   4) The boom swing must be inhibited even when the boom swing control pedal is operated.



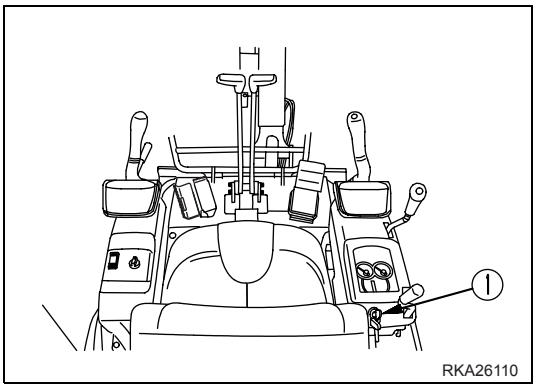
RKA22930

3.3.3 STOPPING THE ENGINE

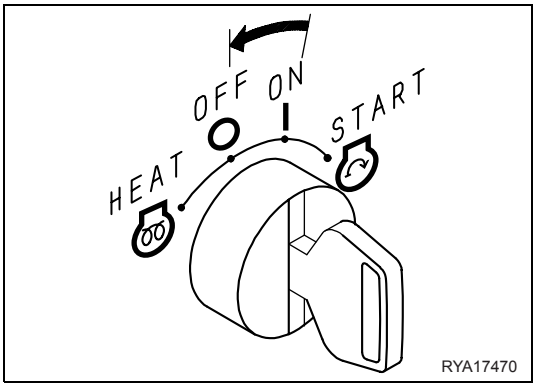
IMPORTANT

- **The sudden stop of the engine while it is running shortens its life.**
- **Do not stop the engine suddenly, except in case of emergency. It is likewise recommended not to stop the engine suddenly if it has been running for a long period and is still hot; in this case, let the engine run at low idling speed for about 5 minutes, in order to allow it to cool down gradually before stopping it.**

1. Run the engine at low idling speed for about 5 minutes, in order to allow it to cool down gradually.



2. Turn the ignition key (1) to position OFF to stop the engine.
3. Remove the key (1).



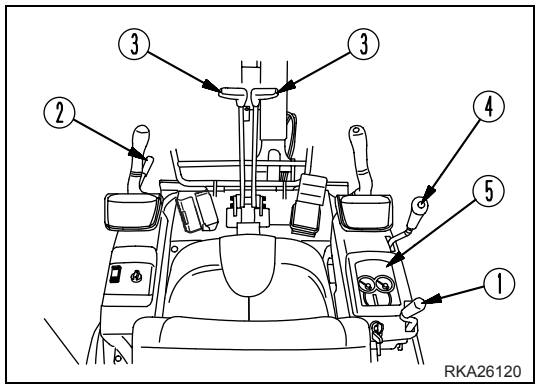
3.3.4 HOW TO MOVE THE MACHINE

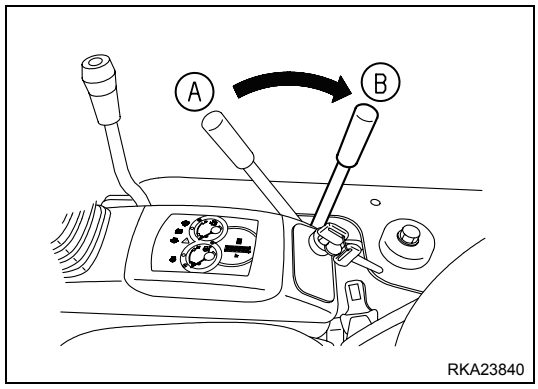
⚠ WARNING

- **Before moving the machine, make sure that you perfectly know the control functions and all the relevant safety regulations.**
- **The operator must be seated in the driving position with fastened seat belt.**
- **Before operating the travel levers, check the direction of the undercarriage. If the sprocket is at the front, the operation of the travel levers is inverted.**
- **Before moving the machine, make sure that there is no one within its operating range and that there are no obstacles in the surrounding area.**
- **Be extremely careful when reversing, and make sure that there are no persons, other equipment or obstacles in the way.**
- **Avoid any travel manoeuvre or change of direction with the accelerator at maximum speed, since manoeuvres carried out in these conditions may cause abrupt and dangerous movements.**
- **Do not use the speed increase function when changing direction or carrying out a counter-rotation.**

3.3.4.1 PRELIMINARY OPERATIONS TO BE CARRIED OUT BEFORE MOVING THE MACHINE

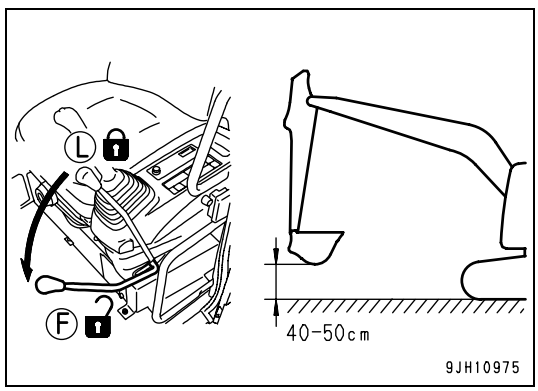
1. Pull the accelerator lever (1) towards the maximum speed position to increase the engine speed.
   (A): idling
   (b): max. speed



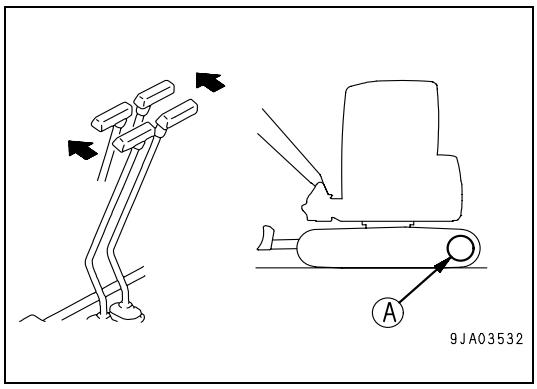


3.3.4.2 MOVING THE MACHINE FORWARD

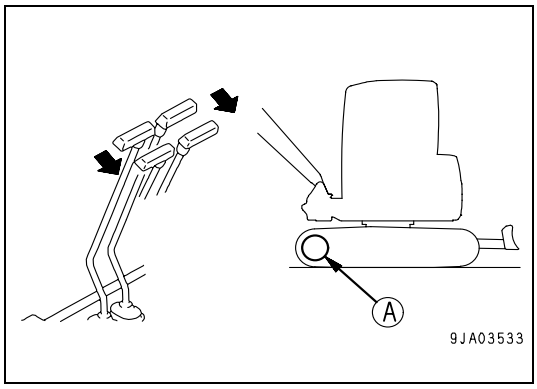
1. Move the safety lever (2) to working position (F), then lift the working tools 40-50 cm off the ground.
2. Lift the blade.
3. Opearate both travel levers (3) as explained below.



- When the sprocket (A) is at the rear of the machine, push the levers (3) slowly forward to move the machine off.

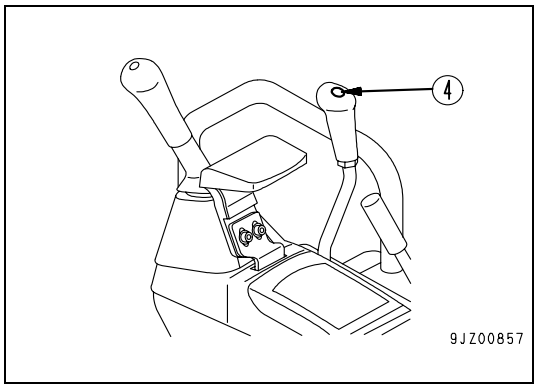


- When the sprocket (A) is at the front of the machine, pull the levers (3) slowly backward to move the machine off.

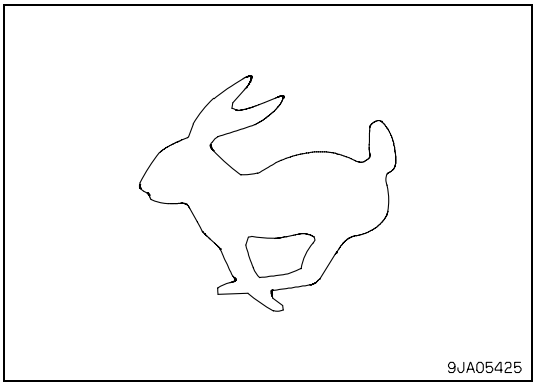


4. Switch over the travel speed by proceeding as follows.

- Press the translation speed selector switch (4), positioned on the blade control lever grip, to go from low to high translation speed and vice versa. The changeover from high to low speed or vice versa takes place whenever the switch is pressed.



- When the machine is travelling at high speed, the travel speed increase warning light (5) comes on.
  For details on the travel speed, see paragraph "5.1 TECHNICAL SPECIFICATIONS".



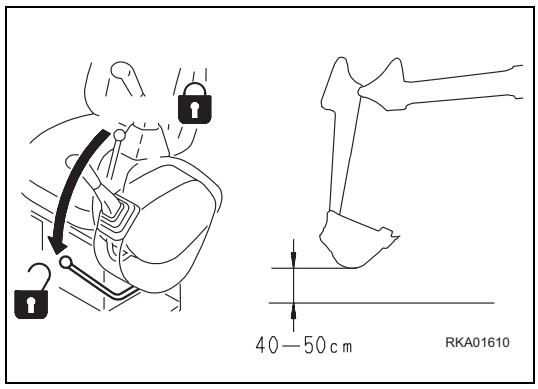
NOTE

- When the engine is started, the low speed is automatically selected.
- When the machine travels at high speed on soft ground or up a slope and the load increases, the low speed is automatically selected, but the travel speed increase warning light remains on. When the load is reduced, the travel system automatically changes over to high speed.

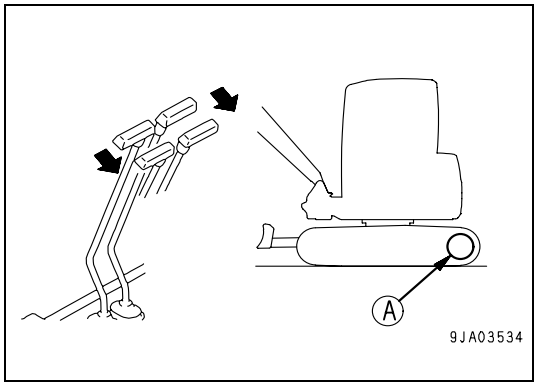
5. On machines with translation warning alarm, check that the alarm works correctly.
   If the alarm does not sound, contact your Komatsu Distributor for repairs.

3.3.4.3 MOVING THE MACHINE IN REVERSE

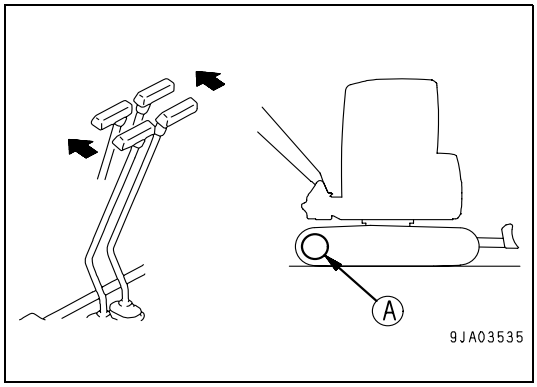
1. Move the safety lever (2) to working position (F), then lift the working tools 40-50 cm off the ground.
2. Lift the blade.
3. Opearate both travel levers (3) as explained below.



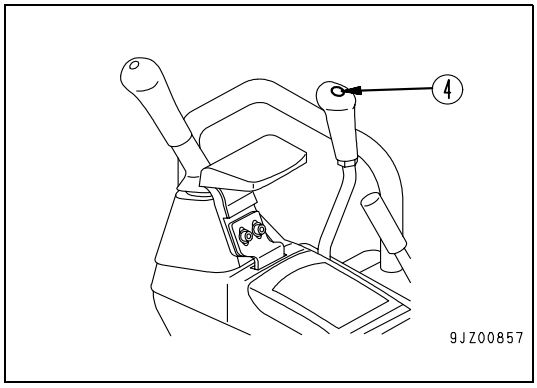
- When the sprocket (A) is at the rear of the machine, pull the levers (3) slowly backward to start moving in reverse.



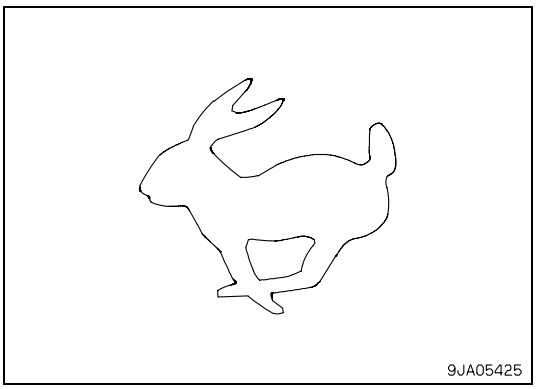
- When the sprocket (A) is at the front of the machine, push the levers (3) slowly forward to start moving in reverse.



4. Change the travel speed by proceeding as follows.
   - Press the translation speed selector switch (4), positioned on the blade control lever grip, to go from low to high translation speed and vice versa. The changeover from high to low speed or vice versa takes place whenever the switch is pressed.



• When the machine is travelling at high speed, the travel speed increase warning light (5) comes on.
For details on the travel speed, see paragraph ."5.1 TECHNICAL SPECIFICATIONS"



NOTE
- When the engine is started, the low speed is automatically selected.
- When the machine travels at high speed on soft ground or up a slope and the load increases, the low speed is automatically selected, but the travel speed increase warning light remains on. When the load is reduced, the travel system automatically changes over to high speed.

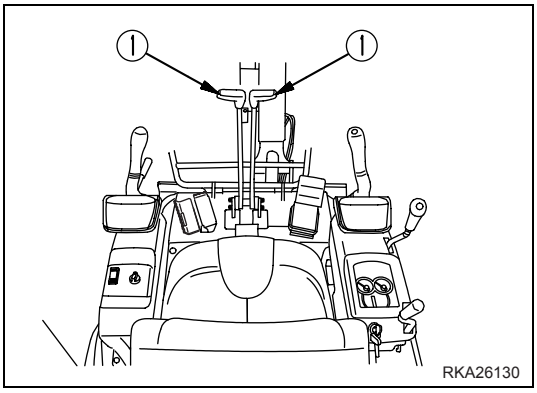
5. On machines with translation warning alarm, check that the alarm works correctly.
If the alarm does not sound, contact your Komatsu Distributor for repairs.

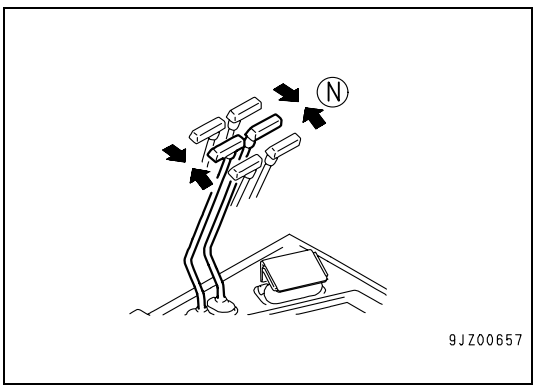
3.3.4.4 STOPPING THE MACHINE

⚠ WARNING

- **Avoid stopping the machine abruptly. Always calculate a sufficient safety distance when stopping.**

1. Shift the left and right travel levers (1) to the NEUTRAL position, then stop the machine.





3.3.5 STEERING THE MACHINE

3.3.5.1 STEERING (CHANGING DIRECTION)

⚠ WARNING

- **Before operating the travel control levers, check the position of the sprocket. If the sprocket is at the front, the operation of the travel levers is inverted.**
- **Avoid abrupt changes of direction as much as possible. Carry out counter rotations with the machine at rest.**
- **Due to the strong friction generated by changes of direction, do not use the travel speed increase control.**

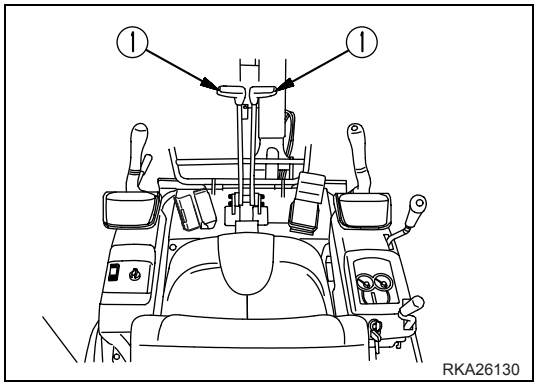
NOTE

- When the machine travels at high speed and the load increases, the low speed is automatically selected, and the machine slows down. When the load is reduced, the travel system automatically changes over to high speed.

Use the travel levers to change direction.

Avoid abrupt changes of direction as much as possible. In particular, when carrying out a counter-rotation, stop the machine before steering.

Operate the two travel levers (1) as follows.



CHANGING DIRECTION WITH THE MACHINE AT REST

When steering to the left:

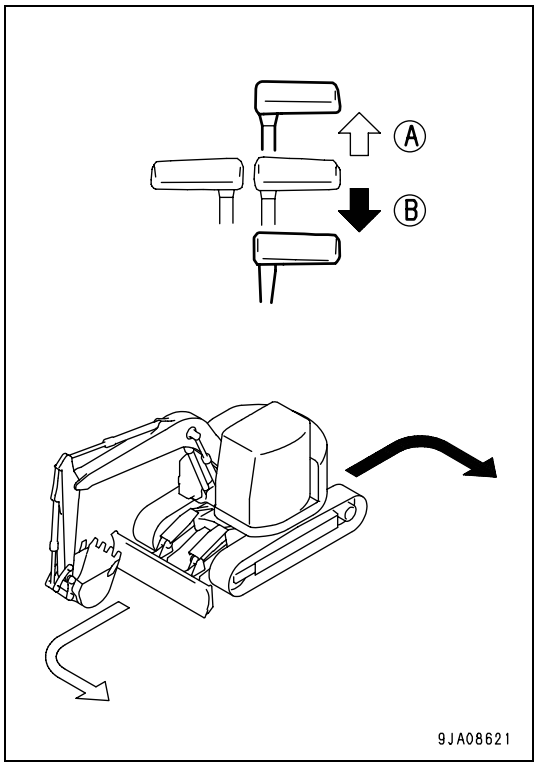
Push the right travel lever forward to steer to the left if the machine must travel forward; pull the lever backward to steer to the left if the machine must travel in reverse.

(A): Left forward steering

(B): Left reverse steering

NOTE

- To steer to the right, operate the left travel lever in the same way.



STEERING (CHANGING DIRECTION)

When steering to the left:

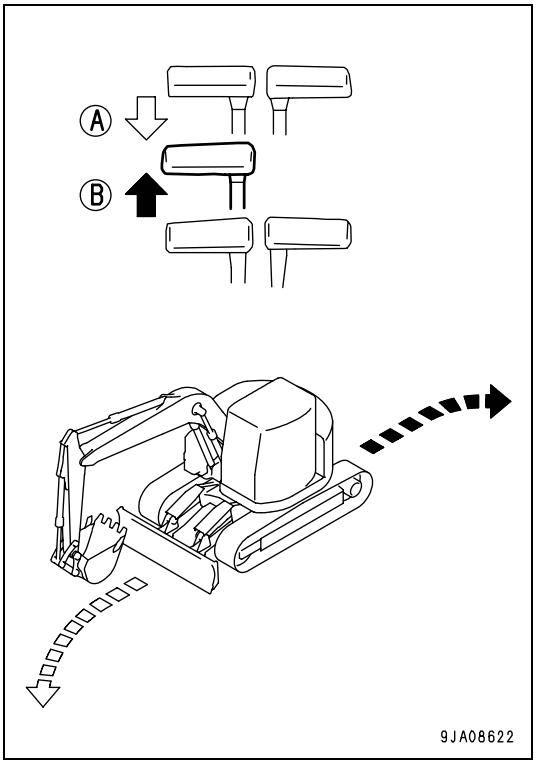
If the left travel lever is shifted back to the neutral position, the machine will steer to the left.

(A): Left forward steering

(B): Left reverse steering

NOTE

- To steer to the right, operate the right travel lever in the same way.

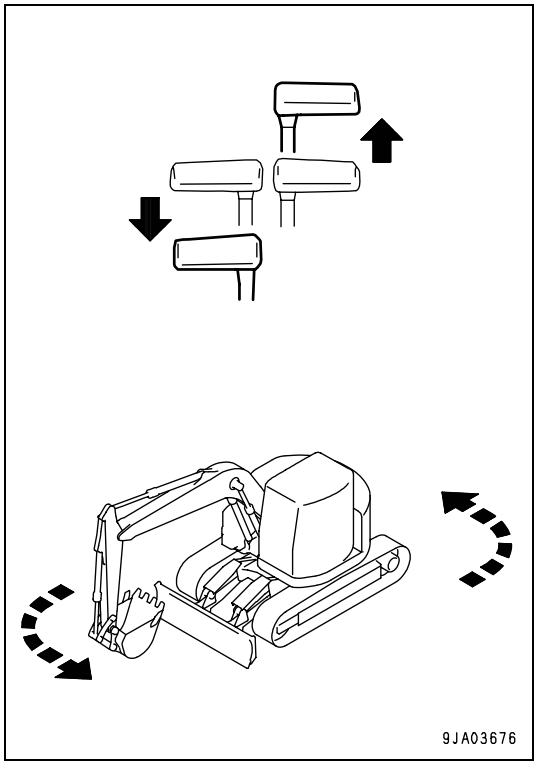


HOW TO CARRY OUT COUNTER-ROTATIONS (SPIN TURN)

To carry out a counter-rotation to the left, pull the left travel lever backward and push the right travel lever forward.

NOTE

- To carry out a counter-rotation to the right, pull the right travel lever backward and push the left travel lever forward.



3.3.6 SWINGING THE REVOLVING FRAME

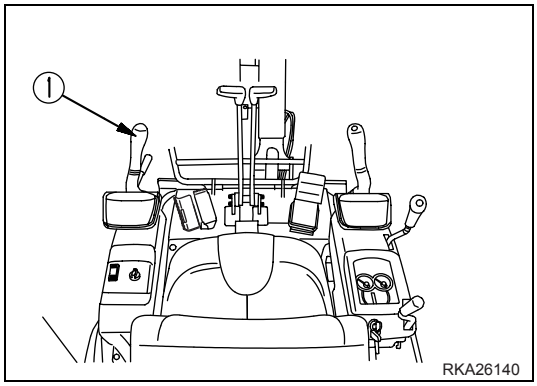
⚠ WARNING

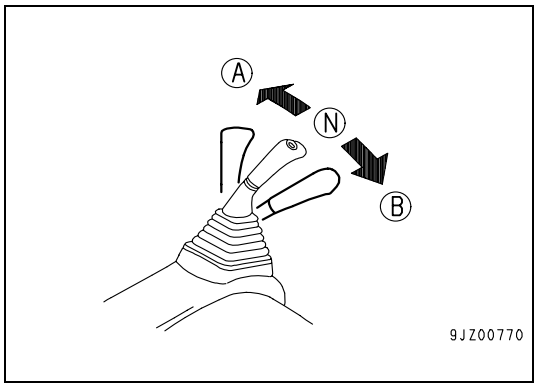
- **Before swinging the revolving frame, make sure that the area around the machine is safe.**

1. To swing the revolving frame, use the left work equipment control lever (1).
2. When the swing function is not used, shift the left lever (1) to the neutral position (N). With the lever in this position, the swing lock is automatically engaged.

   (A): Swing to the left

   (b): Swing to the right





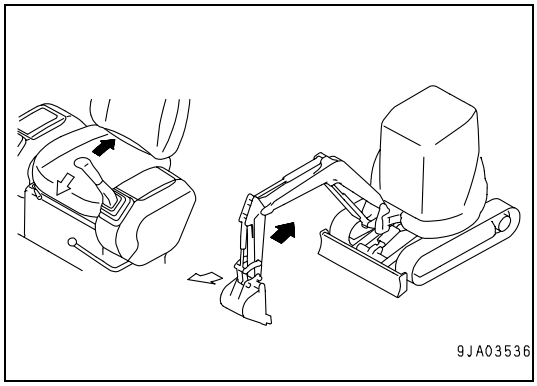
NOTE

- When the revolving frame swing function is used on a slope, let the engine idle and operate the swing control lever very slowly. Take care to avoid abrupt movements when the bucket is full.
- When the bucket is full and the left work equipment control lever is operated, the swing locking brake is released, so the revolving frame may swing momentarily, but this does not represent an anomaly.

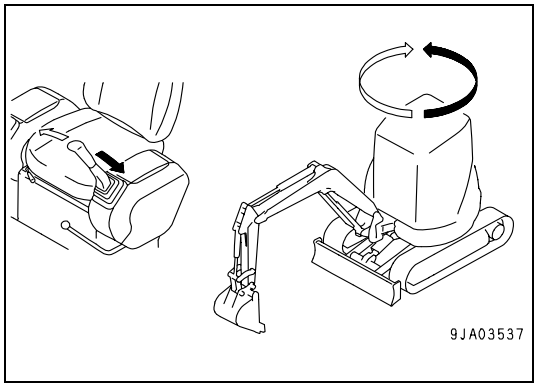
3.3.7 WORK EQUIPMENT CONTROLS AND FUNCTIONS

Working tools are controlled by the levers positioned to the Operator's right and left. The left lever controls the arm and the revolving frame swing, while the right lever controls the boom and the bucket. When the levers are released, they automatically return to the neutral position and the work equipment remain in the position where they stopped.
The movements of the levers and the corresponding movements of the equipment are shown in the diagrams below.

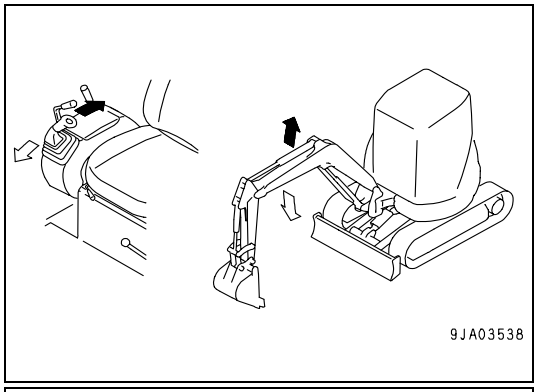
- **2nd boom control**
  To activate the 2nd boom, move the left lever forwards or backwards.



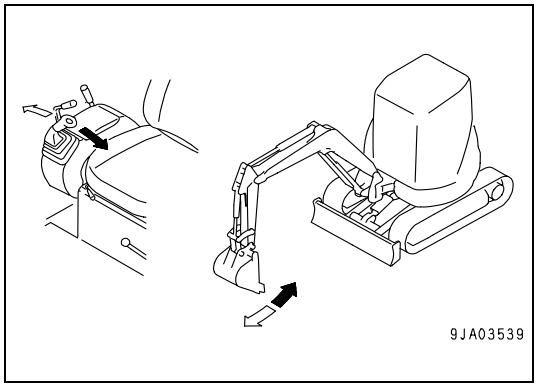
- **Swing control**
  To turn the revolving frame, move the left lever to the left or right.



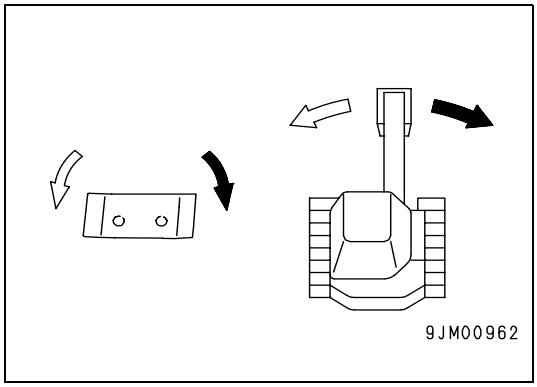
- **1st boom control**
  To activate the 1st boom, move the right lever forwards or backwards.



- **Bucket control**
  To activate the bucket, move the right lever to the left or right.



- **Boom swing control**
  To swing the boom, use the boom swing control pedal.

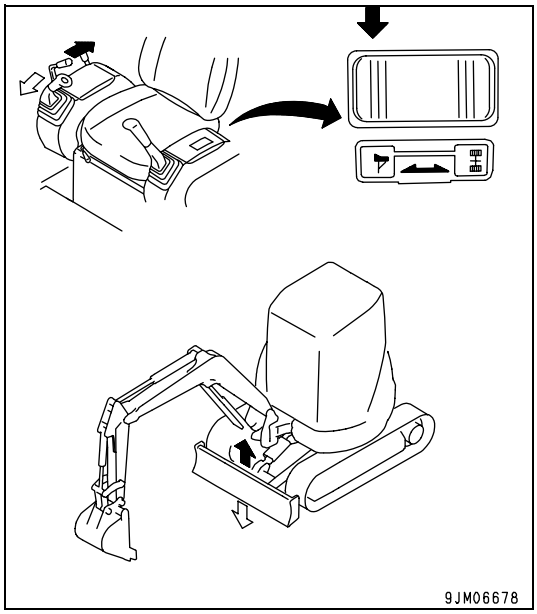


- **Blade control**

⚠ WARNING

- **The scraper control is not locked, even if the safety device lever is in locking position. Therefore, do not touch the control lever if no operations are being carried out with the scraper.**

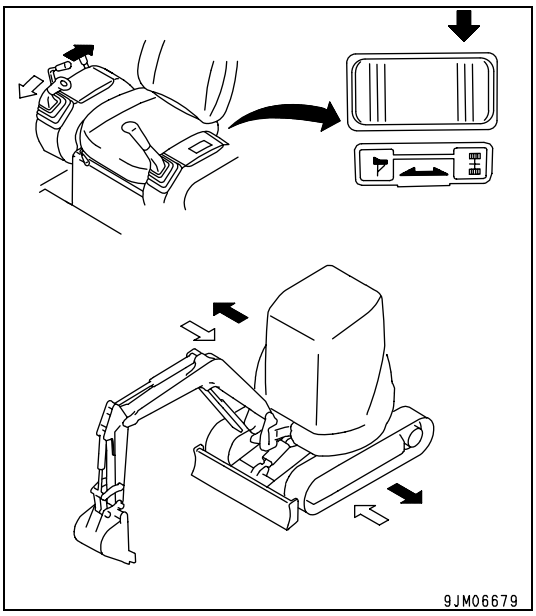
- Select the use of the blade with the blade/adjustable track gauge selection switch.
  To operate the blade, shift the lever positioned to the right of the operator seat forward or backward.



- **Track gauge adjustment control**

⚠ WARNING

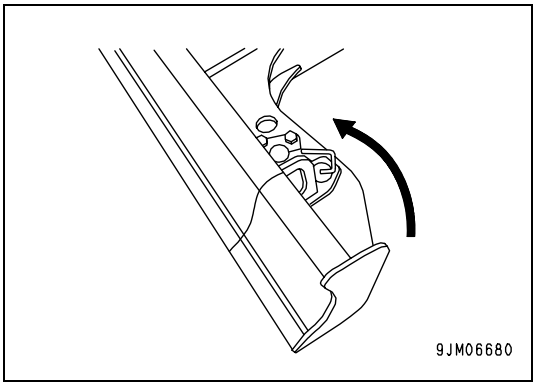
- **Select the narrow track gauge only when the machine must travel in small spaces. For normal applications and digging operations, always select the wide track gauge.**
- **Adjusting the track gauge on slopes is dangerous, since this may affect the lateral stability of the machine. Therefore, it is advisable to adjust the track gauge on level surfaces.**
- **When the track gauge is narrowed completely, also the lateral stability of the machine is reduced. In work sites where the machine runs the risk of overturning, widen the track gauge and pay the utmost attention during travel.**
- **The adjustable track control is not locked, even if the safety device lever is in locking position. Therefore, do not touch the control lever if no operations are being carried out with the adjustable track.**
- **Before using the blade/adjustable track gauge lever, check the position of the switch.**



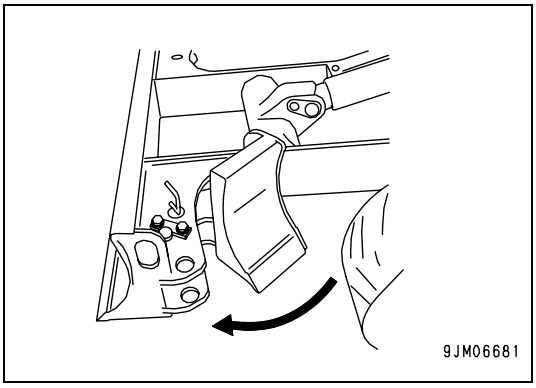
- Set the blade/adjustable track gauge switch to the track gauge adjustment position.
  To adjust the track gauge, shift the lever positioned to the right of the operator seat forward or backward.

IMPORTANT

- **If there are obstacles that prevent the adjustment of the track gauge, remove them or place the machine on a level surface, in order to be able to find the correct position for the adjustment.**
- **If the tracks are dirty with mud, clean them thoroughly before adjusting the track gauge.**
- **It is possible to vary the width of the blade to adapt it to the track gauge. To adjust the blade width from wide to narrow, remove the pin and rotate the extended portion of the blade in the direction indicated by the arrow, then align the two holes and insert the pin.**



- To adjust the blade width from narrow to wide, carry out the same operations in the reverse order.

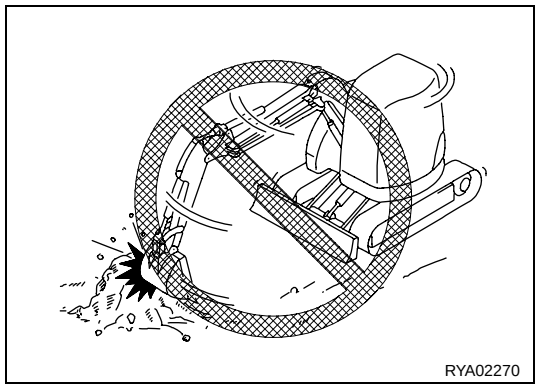


3.3.8 UNAUTHORIZED OPERATIONS

⚠ WARNING

- **Do not attempt to operate the work equipment control levers during travel.**
- **If it is necessary to operate the work equipment control levers while the machine is moving, carry out this operation with the maximum care.**

- **PERATIONS FOR WHICH IT IS NOT ALLOWED TO EXPLOIT THE REVOLVING FRAME SWING**
  Do not use the revolving frame swing force to compact soil or break earth mounds or walls.
  When swinging the revolving frame, do not dig the bucket teeth into the ground.
  These operations will damage the work equipment.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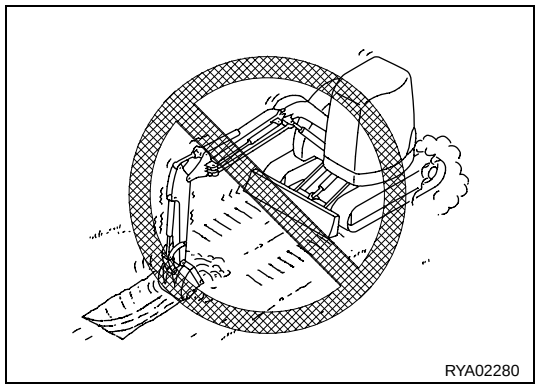
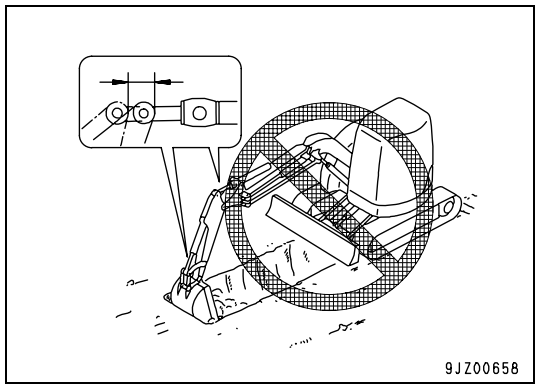
- **OPERATIONS FOR WHICH IT IS NOT ALLOWED TO EXPLOIT THE TRAVEL FORCE OF THE MACHINE**
  Do not dig the bucket into the ground and do not use the travel force to carry out digging operations. This may damage the machine or the work equipment.

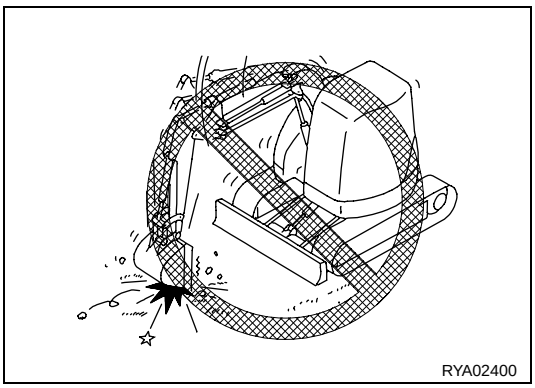

RYA02280

- **PRECAUTIONS WHEN USING HYDRAULIC CYLINDERS AT THE END OF STROKE**
  When the hydraulic cylinders are activated, be careful so as not to reach the end of stroke; always leave a small margin.
  If working tools are used with the cylinder rods at the end of stroke and are subject to shocks due to external forces, the hydraulic cylinders may get damaged, and injuries may be caused. Avoid performing operations in which the hydraulic cylinders are extended or retracted completely.

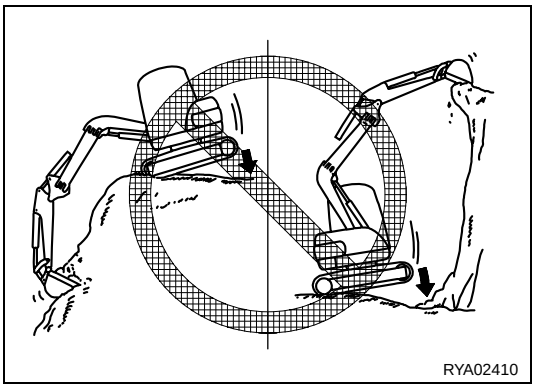

9JZ00658

- **EXCAVATION ON HARD ROCKY GROUND**
  It is advisable to carry out excavations on hard rocky ground after breaking it up with some other means, in order to avoid damaging the machine and to ensure a more economic use of the same.

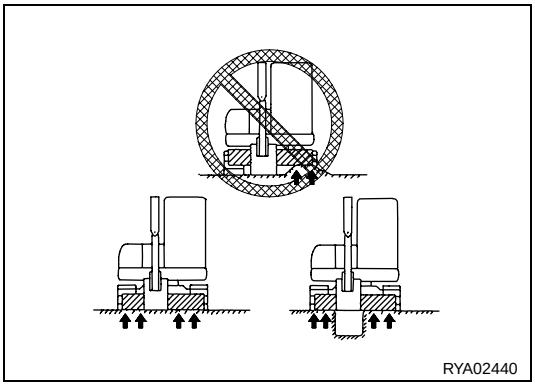
- **OPERATIONS FOR WHICH IT IS NOT ALLOWED TO EXPLOIT THE DROPPING FORCE OF THE BUCKET**
  Do not exploit the dropping force of the bucket to use it as a pickaxe, breaker, or pile driver. This may considerably reduce the life of the machine.


RYA02400

- **OPERATIONS FOR WHICH IT IS NOT ALLOWED TO EXPLOIT THE FORCE OF GRAVITY OF THE MACHINE**
  Do not use the force of gravity of the machine to carry out digging operations.
  When working on hard rocky surfaces, use some other method to break the rock into small pieces before excavating. This avoids any damage to the machine and is also more economical.

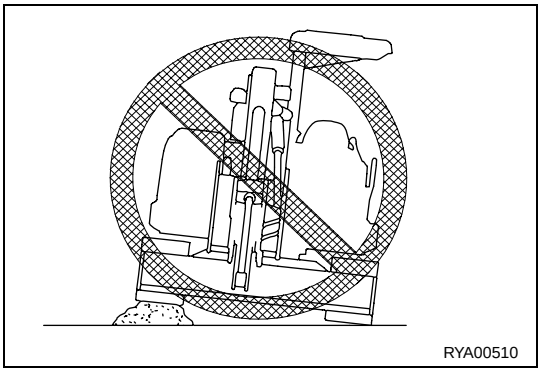

RYA02410

- **SUPPORT THE MACHINE WITH BOTH SIDES OF THE BLADE**
  When using the blade as a stabilizer, avoid loading all the weight of the machine on one side of the blade only.


RYA02440

3.3.9 PRECAUTIONS FOR USE

- **TRAVEL**
  Travelling over boulders, tree stumps, or other obstacles means submitting the frame (and in particular the tracks) to considerable stress, and this may damage the machine. For this reason, it is advisable to remove any obstacles or to avoid passing over them.
  If it is not possible to avoid an obstacle, reduce the speed, keep the work equipment near the ground and try to move the machine so that the obstacle is positioned in line with the mid point of the track gauge.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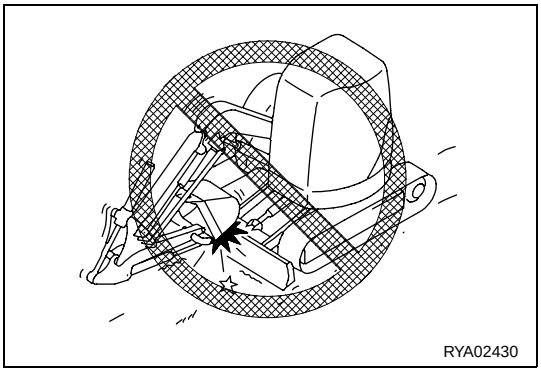
- **FOLDING THE WORK EQUIPMENT**
  When folding the work equipment to the travel or transport position, be careful to prevent the bucket from hitting the blade.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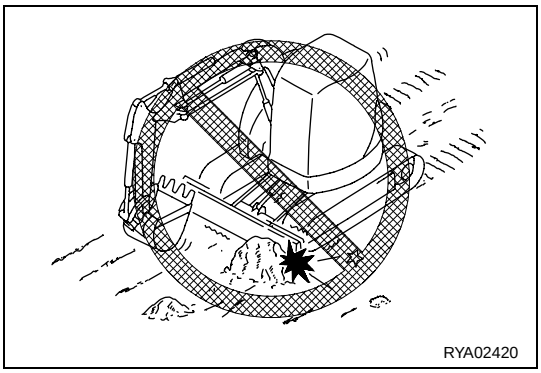
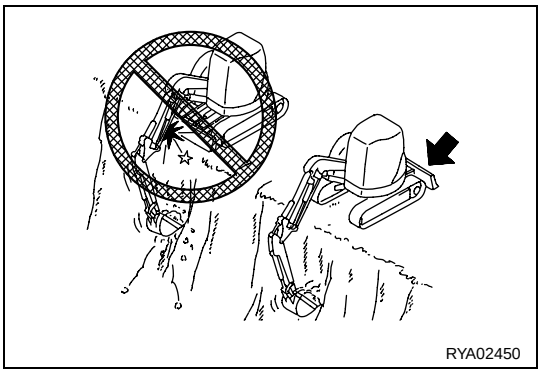
- **AVOID HITTING THE BLADE**
  Be careful not to hit the blade against rocks or boulders, since this may damage the blade or the cylinders.


RYA02420

- **POSITION OF THE BLADE DURING DIGGING OPERATIONS WITH THE EXCAVATOR**
  When carrying out deep digging operations with the blade at the front, be careful to prevent the boom cylinder from hitting the blade. If possible, always position the blade at the rear of the machine.

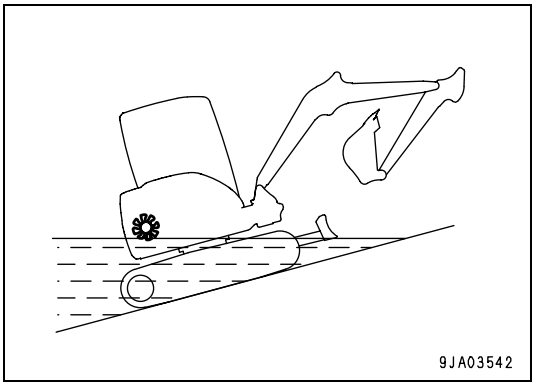

RYA02450

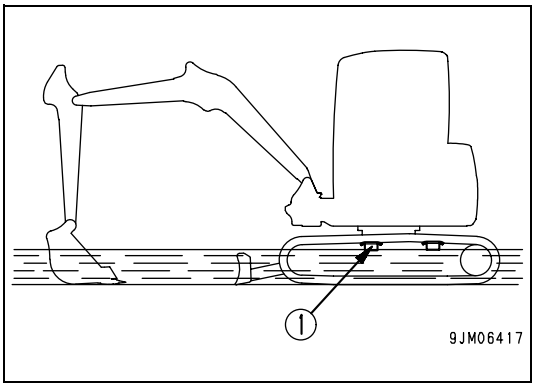
- **MAXIMUM WATER DEPTH**

⚠ CAUTION

- **When driving the machine out of water, if the inclination of the machine exceeds 15°, the rear of the revolving frame will be submerged, and this may cause the cooling fan to break.**
  Be extremely careful when driving the machine out of water.

Do not immerse the machine in water beyond the permissible depth (under the carrier roller (1)).
Furthermore, when a component has been immersed in water for a long time, pump in grease until the old grease comes out of the bearings (around the bucket pins).



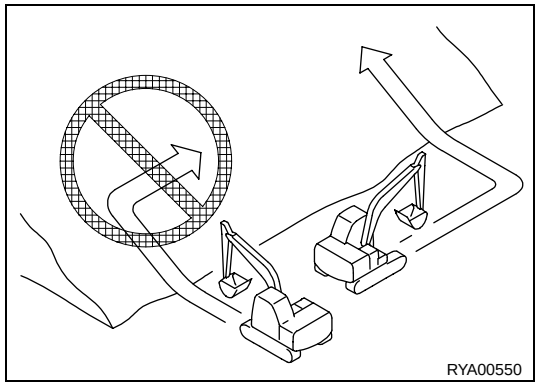


3.3.10 PRECAUTIONS TO BE TAKEN WHEN TRAVELLING ON SLOPES

⚠ WARNING

- **When travelling downhill on steep slopes, slow down using the travel levers and the hand accelerator.**
  Do not travel downhill on slopes whose inclination exceeds 15°.
- **Swinging or using the work equipment on slopes may cause the machine to lose stability and overturn, therefore it is advisable to avoid these operations. It is particularly dangerous to swing the revolving frame when the machine is travelling downhill with full bucket. If these operations cannot be avoided, create a sort of platform by heaping some ground, so that the machine can work in horizontal position.**
- **Do not travel up or down steep slopes, since the machine may overturn.**
- **During travel, lift the machine at about 20-30 cm from the ground. Do not travel downhill in reverse.**
- **Do not change direction on slopes; side movements must be carried out on level ground, or with inclination not exceeding 10° .**
- **Always operate the machine or travel in such a way as to be able to stop it safely at any time if it slips or becomes unstable.**
- **When lifting, if the tracks slip or if it is not possible to continue lifting using the track force only, do not use the tractive force of the 2nd° boom to facilitate machine movement. The machine runs the risk of overturning.**

1. When the machine travels downhill, the sprocket (1) must be facing downhill.
   If the machine travels downhill with the sprocket (1) positioned uphill, the tracks tend to slacken and this may cause the machine to slip.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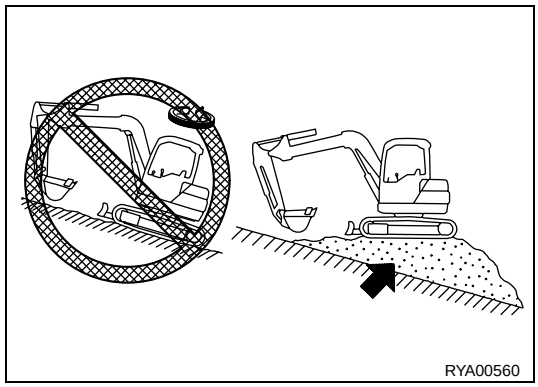
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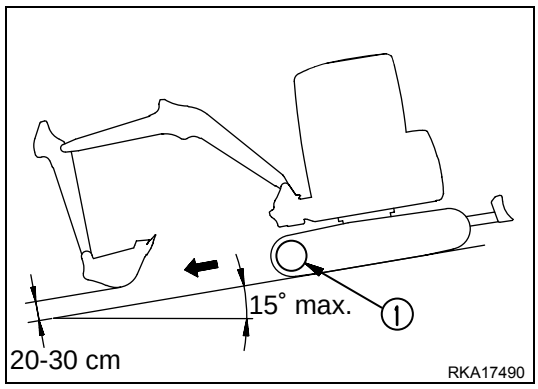

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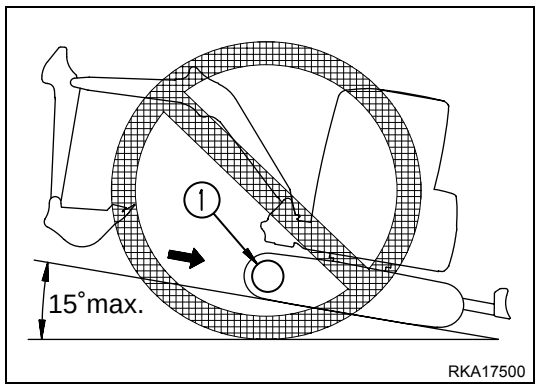

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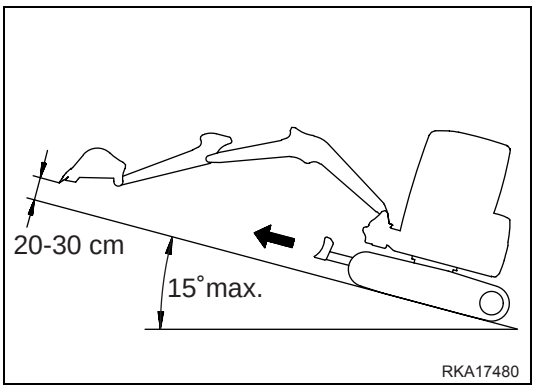
2. When travelling uphill on a slope, position the work equipment as shown in the diagram on the right.



BRAKING WHEN TRAVELLING DOWNHILL

To brake when travelling downhill, shift the travel levers to the neutral position. This will automatically engage the brakes.

WHEN THE ENGINE STOPS ON A SLOPE

If the engine stops when the machine is travelling uphill, shift the travel levers to the neutral position, lower the bucket to the ground, stop the machine, then start the engine again.

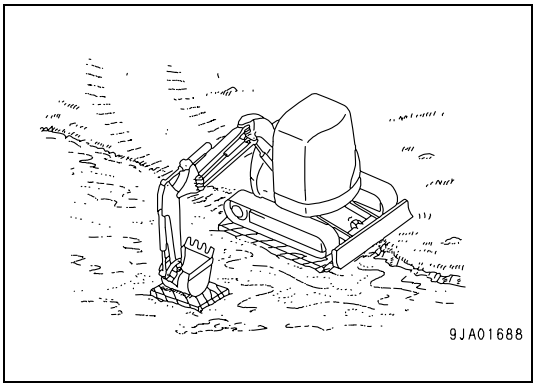
PRECAUTIONS TO BE TAKEN ON SLOPES

- If the engine stops when the machine is on a slope, do not use the left work equipment control lever to swing the revolving frame. The revolving frame will swing due to its own weight.
- Do not open or close the cab door during travel or when working on slopes.
- Always keep the cab door closed or locked in full open position.

3.3.11 GETTING THE MACHINE OUT OF MUD

Always proceed carefully to avoid getting stuck in mud. However, if the machine gets stuck in mud, proceed as indicated below.

WHEN ONE SIDE ONLY GETS STUCK

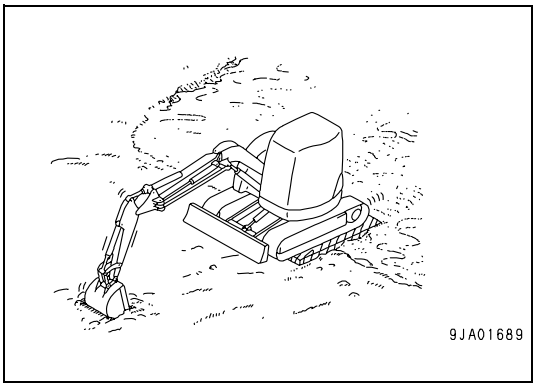


IMPORTANT

- **When using the boom or arm to raise the machine, always place the bottom of the bucket in contact with the ground. (Never push with the bucket teeth.) The angle between the boom and the arm should be included between 90° and 110°.**

When only one side gets stuck in mud, use the bucket to raise the track, then lay boards or logs under the track and drive the machine out.

BOTH TRACKS STUCK IN MUD



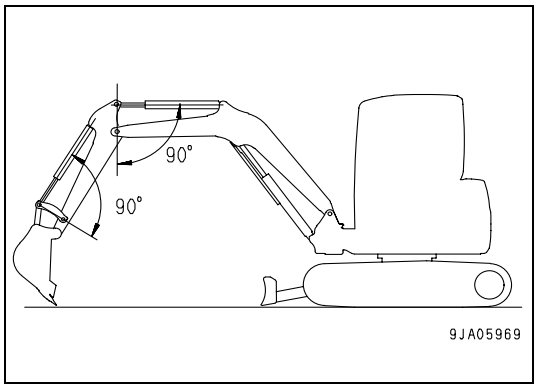
If both tracks are stuck in mud and the machine slips and cannot move, put logs or wooden blocks under the machine, proceeding as indicated above. Thrust the bucket into the ground in front of the machine, operate the arm in the same way as for digging work, and shift the travel levers forward to drive the machine out.

3.3.12 POSSIBLE APPLICATIONS OF THE HYDRAULIC EXCAVATOR

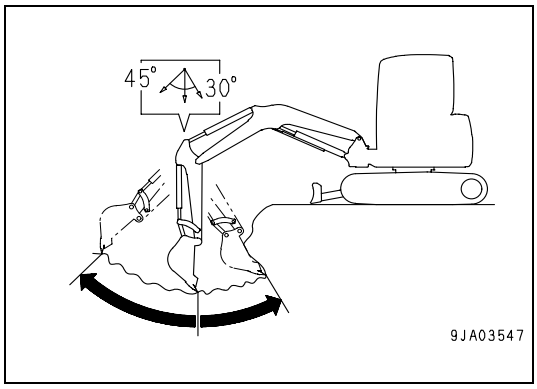
In addition to those indicated below, many other applications are possible, thanks to the use of various attachments.

DIGGING WITH REVERSED BUCKET

The excavator is suitable for carrying out digging operations in a lower position with respect to the machine.
When the machine is in the position shown in the diagram on the right, the maximum digging and thrusting force of each cylinder is achieved when the bucket cylinder and its articulated joint, the arm cylinder and the arm are at 90° with respect to each other.
During the digging operations, keep this angle amplitude to optimize the performance of the machine.

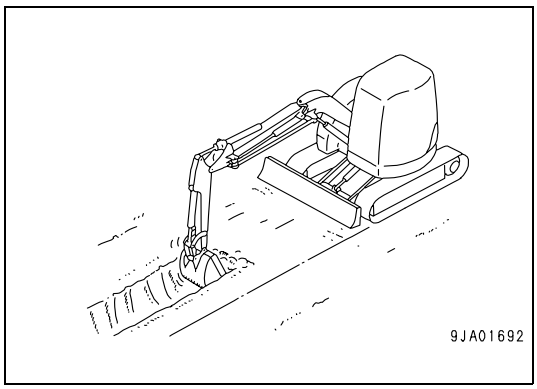


The positions available for digging with the arm range from a 45° angle away from the machine to a 30° angle towards the machine.
There may be some differences depending on the digging depth, but it is advisable to try to keep within the above range rather than operate with the cylinders reaching the end of stroke.



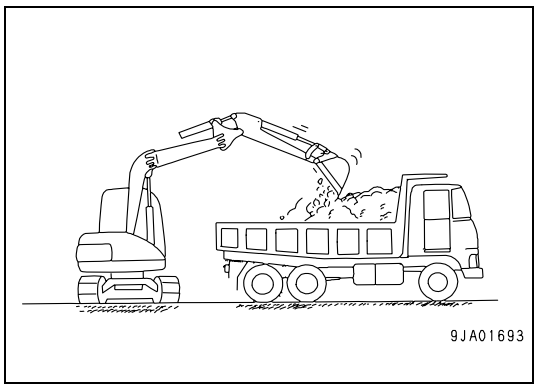
DITCH DIGGING

Ditch digging operations may be effectively carried out by installing a bucket suitable for this type of digging and positioning the tracks parallel to the ditch digging line.
To create wide ditches, first dig on both sides and then remove the earth at the centre.



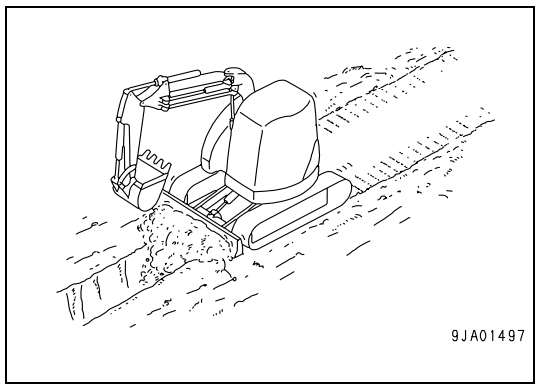
LOADING OPERATIONS

In the positions in which the rotation angle is reduced, the operating efficiency may be increased by positioning the dumper so that it is clearly visible for the operator.
The loading operation is easier and the loading capacity greater if the hydraulic excavator works from the back and not from the sides of the truck.



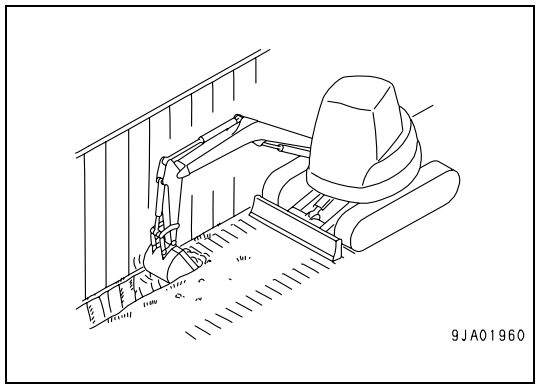
FILLING/LEVELLING OPERATIONS

Use the blade to refill after excavation or to level the ground surface.



SIDE DITCHING WORK

The machine can be used for side ditching in confined spaces by combining the revolving frame swing and boom swing functions.

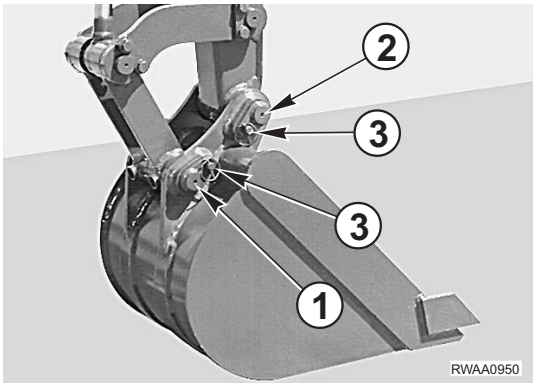


3.3.13 CHANGING THE BUCKET

⚠ WARNING

- **When the coupling pins are removed or installed, chips may come off; always use gloves, goggles and helmet.**
- **The change of the equipment must be carried out by two operators, who must decide together the words and signals to be used during work.**
- **When the bucket is removed, place it in stable position.**
- **If the pins are hit with force, they may get ejected and injure people standing in the surrounding area. Before starting operations, check that nobody is in the surrounding area.**
- **When the pins are removed, do not stand behind the bucket. Moreover, operate carefully so that you do not place your feet below the bucket while you stand next to the machine to carry out the job.**
- **Avoid using your fingers to align the holes, since they may be cut off in case of sudden or uncontrolled movements.**
- **The described procedures are valid also for the coupling of the mechanical connections of the optional equipment.**

1. Position the bucket on level ground, directing it so that the flat part of its back rests on the ground.
2. Remove first the tie-rod pin (1) and then the arm connection pin (2).
3. Change the bucket, taking care to clean the pins, the bushings and the seals perfectly and to grease the pins slightly before reinstalling them.



IMPORTANT

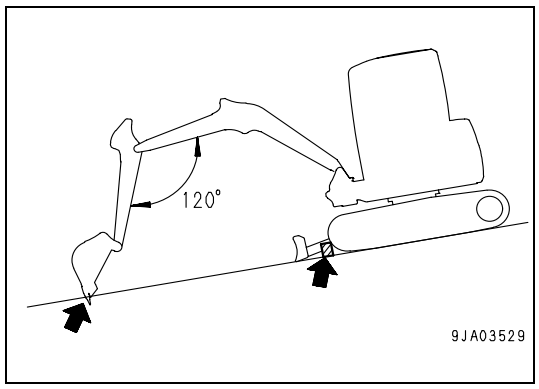
- **Install first the arm connection pin, making sure that the seals are in good conditions.**

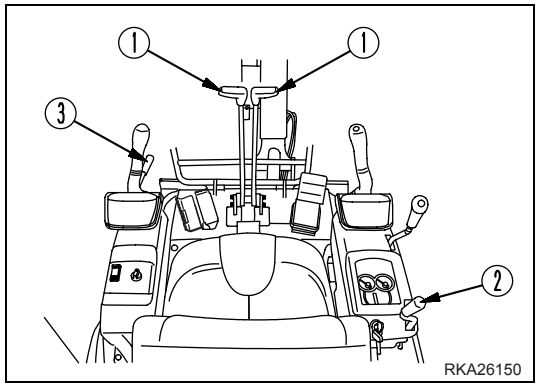
4. Put back all the safety pins (3) and lubricate by means of the appropriate grease nipple.

3.3.14 PARKING THE MACHINE

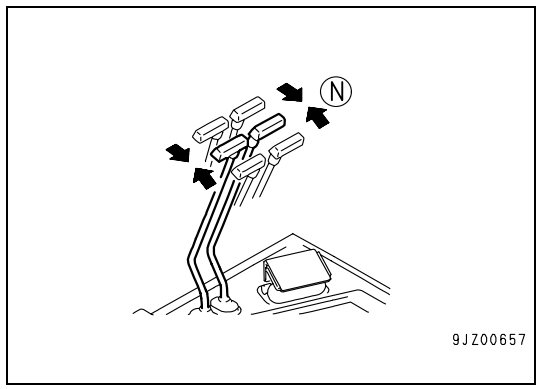
⚠ WARNING

- **Avoid stopping the machine abruptly. Always calculate a sufficient safety distance when stopping.**
- **Park the machine on firm and level ground. Avoid parking the machine on slopes. If it is absolutely necessary to park the machine on a slope, put blocks under the tracks and thrust the work equipment into the ground to prevent the machine from moving.**
- **If the control levers are inadvertently touched, the work equipment or the machine may move suddenly and cause serious accidents. Before leaving the operator seat, shift the safety lever to the "locked" position (L).**
- **Position the blade facing downhill and lower it to the ground.**

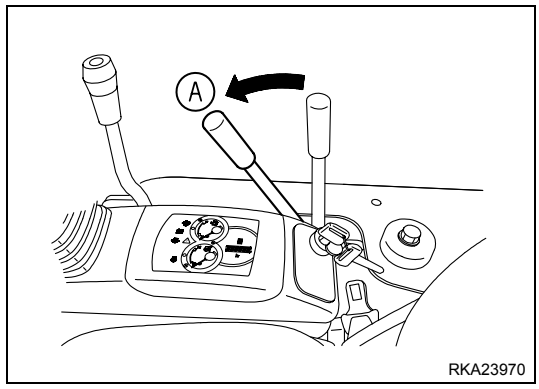




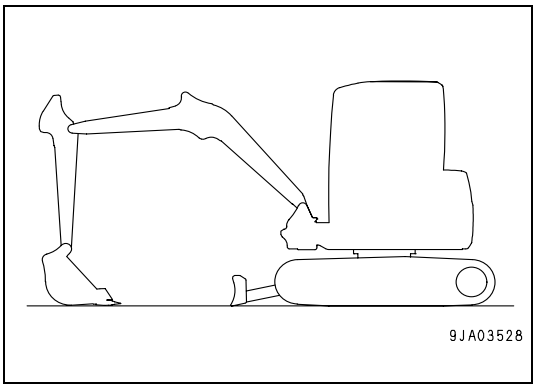
1. Shift the right and left travel levers (1) to neutral, then stop the machine.



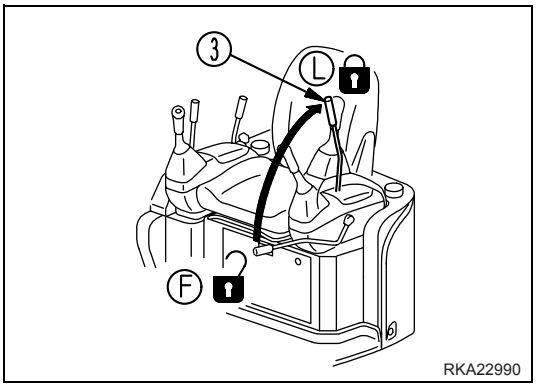
2. Shift the accelerator lever (2) to the low idling position (A) to reduce the engine speed.



3. Lower the bucket horizontally until its bottom touches the ground.
4. Lower the blade to the ground.

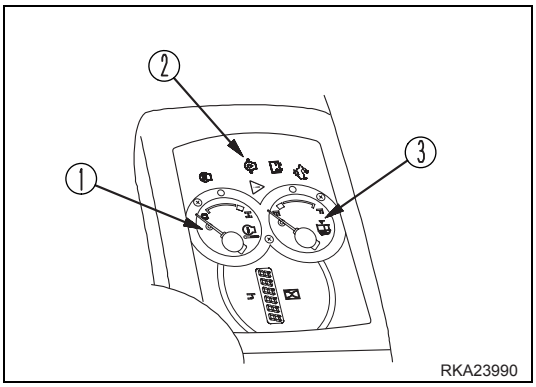


5. Shift the safety lever (3) to the “locked” position (L).



3.3.15 CHECKS TO BE CARRIED OUT BEFORE STOPPING THE ENGINE

At the end of the working day, before turning the engine off, check the engine water temperature in the indicator (1), the engine oil pressure warning light (2) and the fuel level in the indicator (3).



3.3.16 CHECKS TO BE CARRIED OUT AFTER WORK

1. Walk around the machine, check the work equipment, the outside of the machine and the undercarriage, and make sure that there are no oil or coolant leakages. If any anomaly is observed, provide for the necessary repairs.
2. Fill the fuel tank.
3. Check the engine compartment for paper and debris. Remove any paper and debris to avoid a fire hazard.
4. Remove any mud that may be attached to the undercarriage.

3.3.17 LOCKING THE MACHINE

Always lock the following parts:

(1) Engine hood

(2) Tank cover

(3) Battery cover

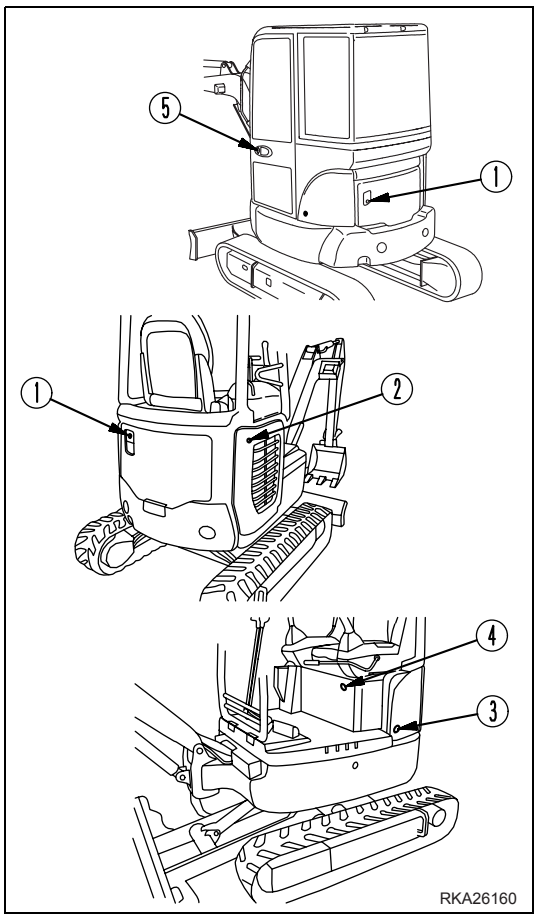
(4) Document and tool compartment cover.

(5) Cab door (machines with cab)
Always close the windows.

For further details, see paragraph "3.2.5 COVERS WITH LOCK".

NOTE

- Use the ignition key to open and lock the door, caps and covers.



3.3.18 RUBBER TRACKS (Machines equipped with rubber tracks only)

3.3.18.1 OPTIMAL USE OF THE RUBBER TRACKS

Rubber tracks have exceptional characteristics that cannot be found in steel tracks. However, if they are used as steel shoes, their advantages cannot be fully exploited.
Make sure not to put rubber shoes into excessive efforts by adapting them to the environmental working conditions and the nature of the operations to be performed.

COMPARISON BETWEEN RUBBER SHOES AND STEEL SHOES

	Rubber track	teel track
Reduction of vibrations	Excellent	Average
Smooth travel	Excellent	Good
Noiselessness	Excellent	Average
Reduction of damages to paved surfaces	Excellent	Average
Manoeuvrability	Excellent	Average
Resistance to damage	Average	Excellent
Traction force	Excellent	Excellent

Considering the properties of the material used, rubber tracks offer various advantages. However, their weak point is their poor resistance. For this reason, it is necessary to know the characteristics of rubber shoes and track pads well. Thus, the working life of rubber shoes will be extended and their characteristics will be fully exploited.
Before using rubber shoes always read section "3.3.18.3 USE OF THE RUBBER TRACKS".

3.3.18.2 WARRANTY ON RUBBER TRACKS

It is important to carry out checks and maintenance operations to guarantee a perfect track tension. Shoes must not be used in working places where they may get damaged; for example, steel plate corners or edges, U-shaped grooves, attachment fittings, pointed stones or crushed rocks, steel rods or iron scraps.
The warranty shall not be valid for damages deriving from an incorrect use of the machine.

3.3.18.3 USE OF THE RUBBER TRACKS

UNAUTHORIZED USES

Do not carry out the following operations.

- Rotation or other operations over heavy rocky surfaces, rock surfaces with protrusions, steel rods or steel swarf, or near steel plate edges damage rubber shoes.
- Rubber shoes may get damaged or detached if stones of different dimensions, which may be found on river banks or other working places with stones, get stuck. If the machine is used for levelling operations and the shoes slide on the ground, the working life of rubber shoes may get reduced.
- Do not stain the rubber shoes with oil, fuel or chemical solvents. If one of these substances gets on the tracks, clean them immediately. Do not use the machine on roads with oil traces.

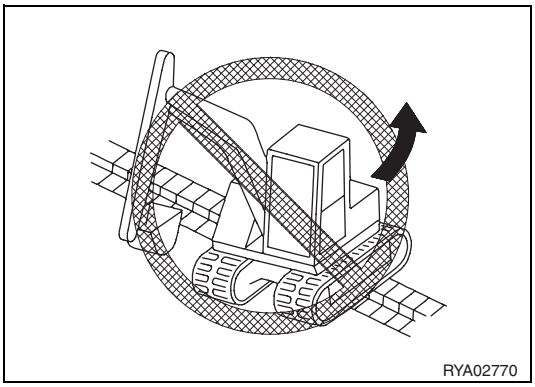
- When stored for long periods (3 months or more), keep the machine in a closed room protected from direct sunlight and rain.
- Do not use the machine in areas characterised by high temperatures, for example, in presence of burning woods, scorching steel plates or surfaces in asphalting process.
- Do not use the machine while lifting the track to one side with the working tools. Thus, shoe damage or removal is prevented.

PRECAUTIONS FOR USE

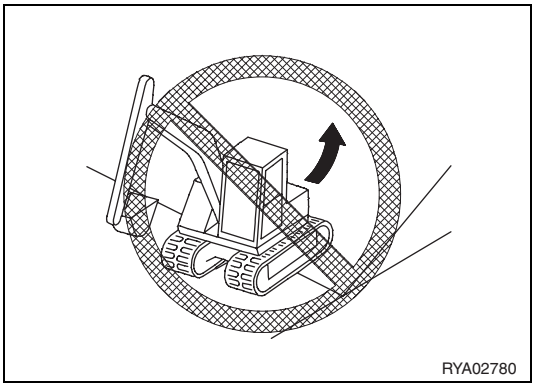
During operation, observe the following indications.

- Avoid carrying out counter-rotations on concrete surfaces. The cement surface may scrape away the rubber from the shoes.
- Avoid sudden changes of direction that may damage the rubber tracks and wear them out.
- Avoid movements and steering on surfaces with broad fall of ground. When passing through falls, get near the fall in right angle. This will help preventing the shoe from loosening.
- If the machine has been lifted from the ground with the bucket, lower it slowly.
- Avoid transporting materials or substances that produce oil when crushed (soya seeds, corn, remaining vegetables, etc.) If the machine is used for transporting such products, wash it after use.
- Do not transport materials that can corrode the steel core such as salt, ammonium sulphate, potassium chloride, potassium sulphate or calcium superphosphate. If necessary, wash the machine after use.
- The steel core adherence is corroded by salt in the air, so avoid using the machine near sea coasts.
- When transporting salt, sugar, flour or soy seeds, deep cuts in the shoes may cause seepage of these substances in ridges and cuts; therefore, repair the rubber before using.
- Do not use the machine if the rubber track creeps against concrete walls.
- Rubber slides easily on snow or frozen surfaces. Be careful with skids also when working on slopes.
- When working in very cold places, rubber shoes characteristics change and their life is reduced.
- Taking into account the characteristics of rubber, use rubber shoes at temperatures between -25°C and +55°C.
- When using the bucket, be careful so as not to damage rubber shoes with the bucket.
- To avoid rubber shoes removal, always keep the correct tension.
  If tension is inadequate, shoes may be removed in the conditions listed below.
  Even if tension is adequate, carry out operations with extreme caution.

1. Avoid steering when travelling over curbs, rocks, or places where there is a considerable difference in height (more than 20 cm). If this cannot be avoided, always proceed perpendicularly to the obstacles.


RYA02770

2. When travelling uphill in reverse, avoid steering at the beginning of the slope.
   If this is absolutely necessary, carry out the manoeuvre gradually.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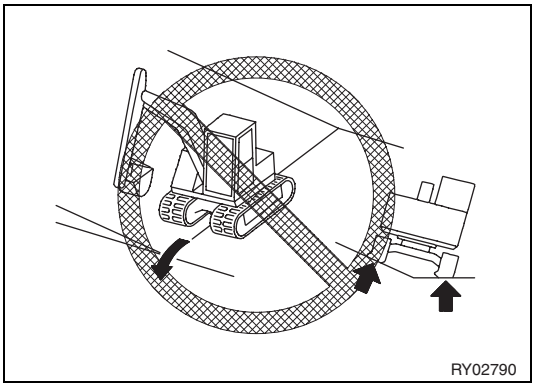
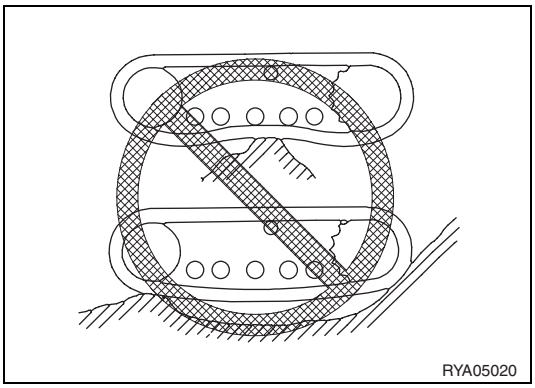
3. Avoid traveling along the edge of slopes or on rough ground with one track raised (machine inclination exceeding 10°) and with the other track on flat ground. To avoid damaging the rubber tracks, always proceed with both tracks resting on the same horizontal plane.


RY02790

4. If the machine is operated in the conditions described in points from 1 to 3 above, do not change direction if the tracks do not adhere perfectly to the ground, see figure.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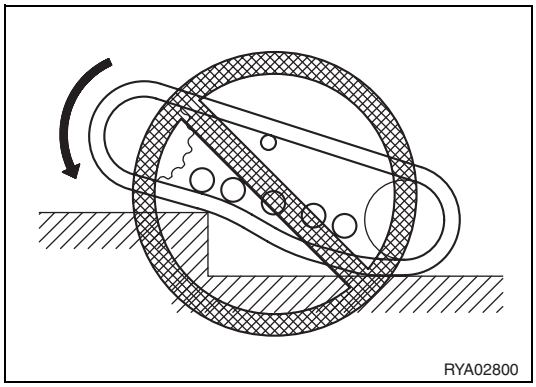
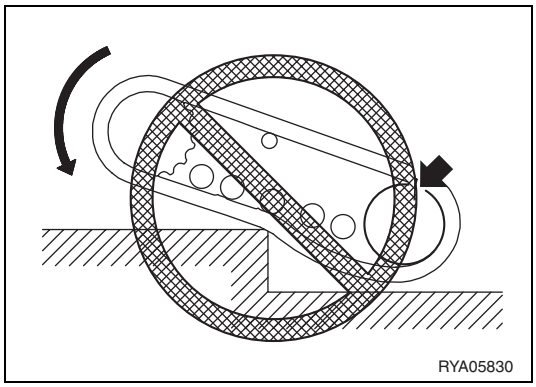
Removal mechanism of the rubber shoe from the track

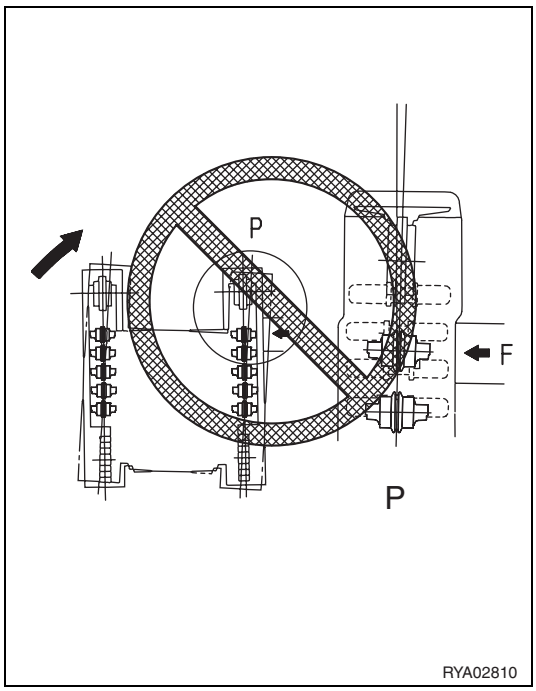
5. When the machine moves over an obstacle, a gap forms between the carrier roller and the rubber track. In these conditions, the track may come off.



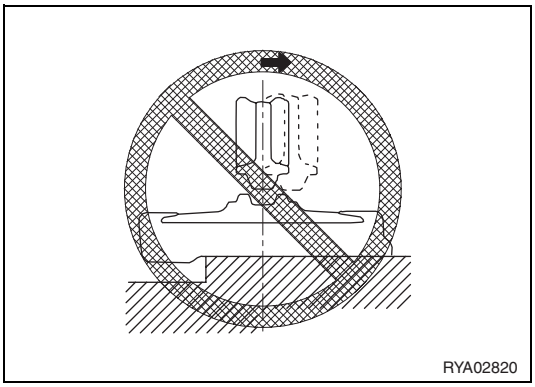
6. Furthermore, if the machine travels in reverse, a gap is formed between the carrier roller, the idler roller and the track.



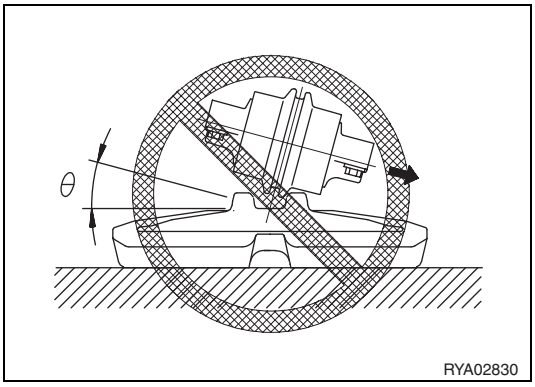
- When turning in a condition where the rubber track cannot move laterally due to the obstacle over which it is passing, or because of any other obstacle.
- When the rubber track is not aligned and the idler roller or the carrier roller are not aligned with the centre.



- If the machine travels in reverse in these conditions, the rubber track will come off.



- If the machine steers in these conditions, the rubber track will come off.



3.4 TRANSPORTING THE MACHINE

When transporting the machine, observe all the laws and regulations in force, paying special attention to safety.

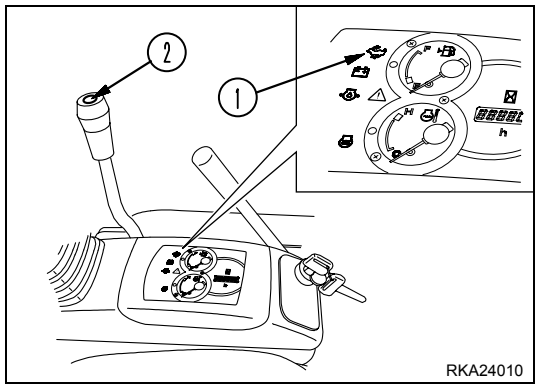
3.4.1 TRANSPORT PROCEDURE

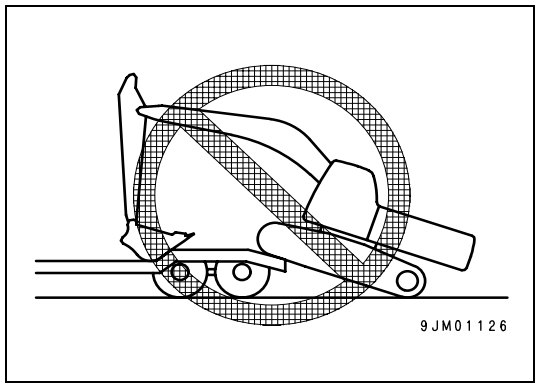
As a general rule, the machine must be transported on a trailer. Choose the trailer according to the weight and size of the machine, as indicated in paragraph "5.1 TECHNICAL SPECIFICATIONS".
It is important to remember that the weight and transport size indicated in the technical data may vary according to the type of track, to the type of boom or to the other attachments installed on the machine.

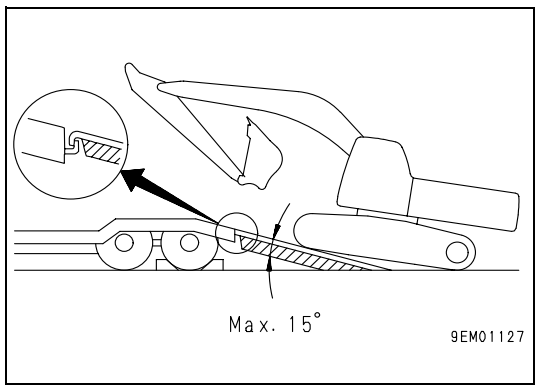
3.4.2 LOADING AND UNLOADING THE MACHINE

⚠ WARNING

- **During loading and unloading operations, make sure that the travel speed increase warning light (1) is off and always travel at low speed.**
- **During loading and unloading operations, let the engine idle, reduce speed and operate the machine slowly.**
- **The machine must be loaded and unloaded on/from the trailer on firm and level ground. Keep a safety distance from the edge of the road.**
- **Use sufficiently wide, long, thick and strong ramps, and position them with a maximum inclination of 15°. When using piled soil, compact it to prevent the inclined surface from collapsing.**
- **Before loading the machine, remove any trace of mud and dirt from the tracks, in such a way as to prevent the machine from slipping when it is on the ramps. Make sure that the surface of the ramps is clean and that there are no traces of water, snow, ice, grease or oil.**
- **Do not change direction when the machine is already on the ramps, since it may overturn. If necessary, move the machine down the ramps, find the correct direction and go up again.**
- **It is dangerous to use the work equipment for the loading and unloading operations.**
- **When the machine is on the ramps, do not operate any lever apart from the travel levers.**
- **The centre of gravity of the machine changes in the point where the ramps reach the vehicle and this may cause the machine to overturn. At this point proceed very slowly.**
- **If the revolving frame is swung when the machine is on the truck or trailer, the machine becomes unstable, therefore it is advisable to fold the work equipment and to swing the revolving frame slowly.**
- **In machines with cab, always check that the door is locked, whether it is open or closed. If the door is opened or closed on the ramps or on the flatbed, the operating effort may change suddenly. Do not open or close the door on the ramps or on the flatbed.**



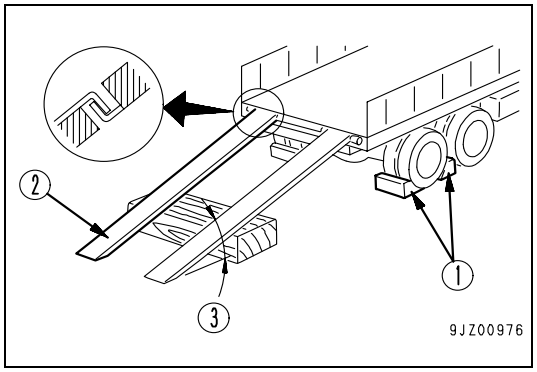




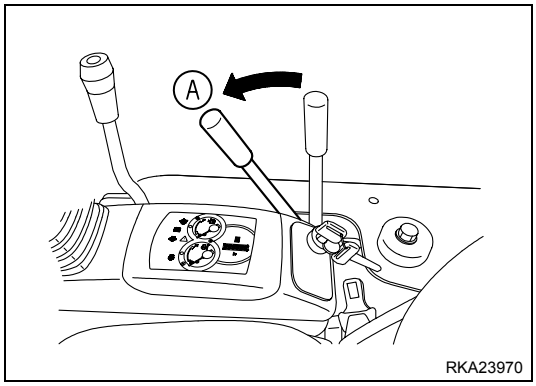
During the loading and unloading operations, always use ramps or a platform and proceed as indicated below.

LOADING THE MACHINE

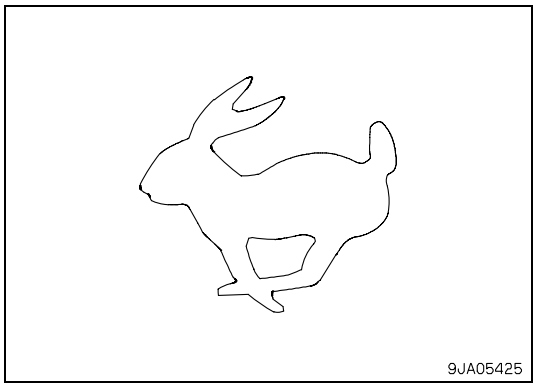
1. Load and unload the machine on/from the trailer on firm and level ground only, and widen the track gauge.
   Keep a safety distance from the edge of the road.
2. Operate the trailer brake and fit chocks (1) under the wheels to prevent the trailer from moving.
   Fit the ramps (2), with a maximum gradient of 15° (3) and spaced equally from both sides of the trailer.



3. Run the engine at low speed.
   (A): Idling

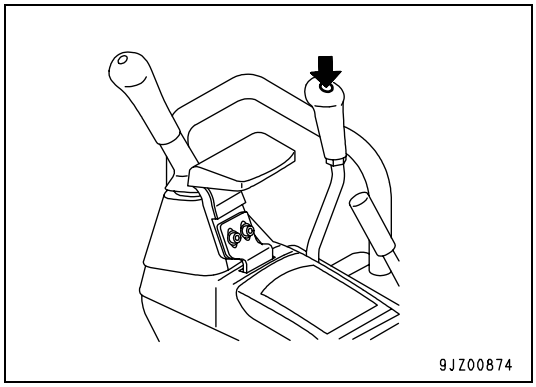


4. Make sure that the travel speed increase warning light is off.



NOTE

- If the warning light is on, press the translation speed selector switch located on the blade control lever grip. The warning light will go out and the low speed will be selected.

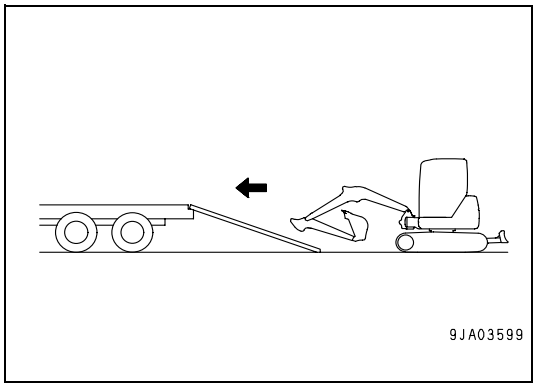


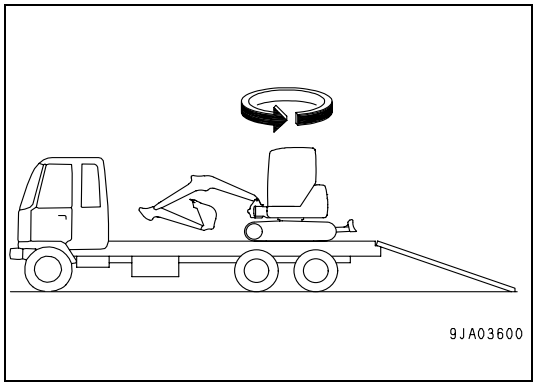
5. When loading, set the work equipment at the front and the blade at the back, with the undercarriage and the revolving frame parallel.
6. Before getting on the ramps, make sure that the machine is in line with the ramps and that the centerline of the machine corresponds to the centerline of the trailer.

   The machine must move slowly and its travelling direction must correspond to the direction of the ramps.

   Lower the work equipment as much as possible, without causing any interference.

   When the machine is on the ramps, operate only the travel levers. Do not operate any other lever.
7. Stop the machine where required, then swing the revolving frame slowly by 180°.





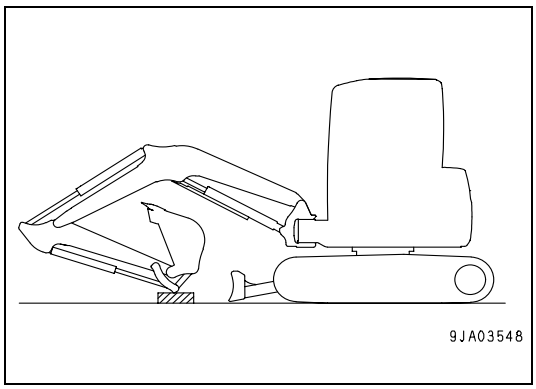
SECURING THE MACHINE ON THE MEANS OF TRANSPORT

After positioning the machine on the trailer, it is necessary to secure it by proceeding as indicated below.

IMPORTANT

- **To avoid damaging the bucket cylinder during transport, position a wooden block at one end of the cylinder to prevent it from touching the ground.**

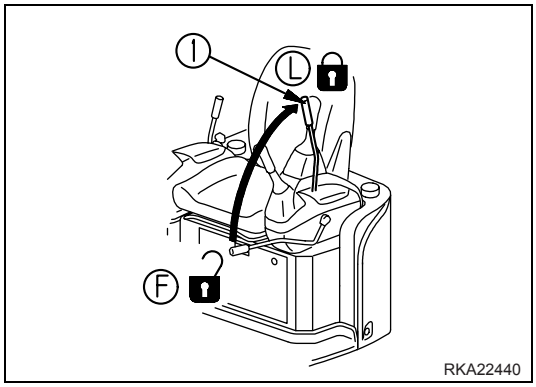
1. Lower the blade.
2. Fully extend the bucket cylinder of the 2nd boom and lower the 1st boom slowly.
3. Stop the engine and remove the ignition key.



4. Shift the safety lever (1) to the “locked” position (L).
5. Lock the cab door and cases with lock, see section "3.2.5 COVERS WITH LOCK".

IMPORTANT

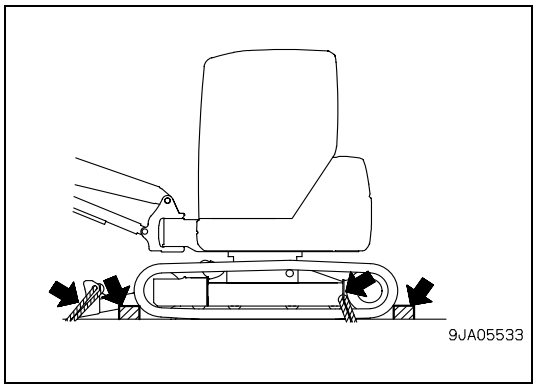
- **Do not use the hole in the back of the undercarriage to tow or lift the machine.**



6. Position safety blocks under both ends of the tracks to avoid machine movements during transport and fasten the machine with chains or metal ropes or chains of adequate resistance.
   Pay special attention when fastening the machine in order to avoid side sliding.

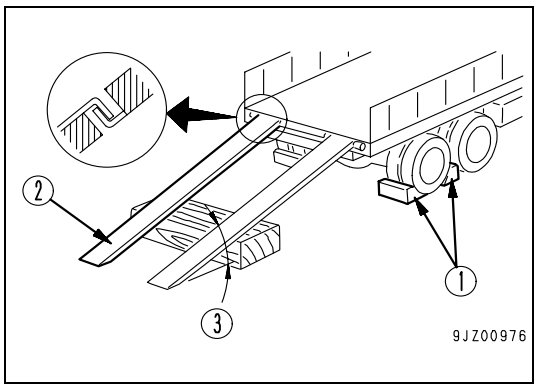
NOTE

- When the machine is fastened with a chain or a metal rope, use the bore in the lower car back and the bore in the blade side plate.

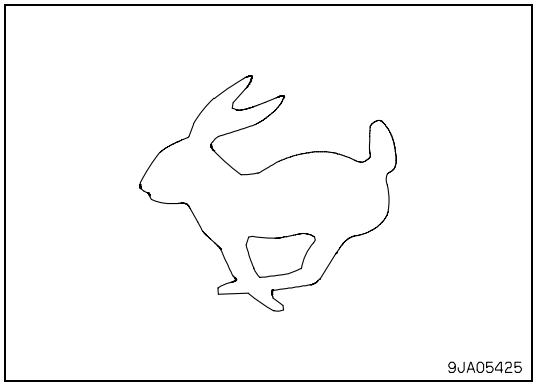


UNLOADING THE MACHINE

1. Load and unload the machine on/from the trailer on firm and level ground only, and widen the track gauge.
   Keep a safety distance from the edge of the road.
2. Operate the trailer brake and fit chocks (1) under the wheels to prevent the trailer from moving.
   Fit the ramps (2), with a maximum gradient of 15° (3) and spaced equally from both sides of the trailer.
3. Remove the chains and the metal cables with which the machine has been secured.
4. Start the engine and let it warm up completely.

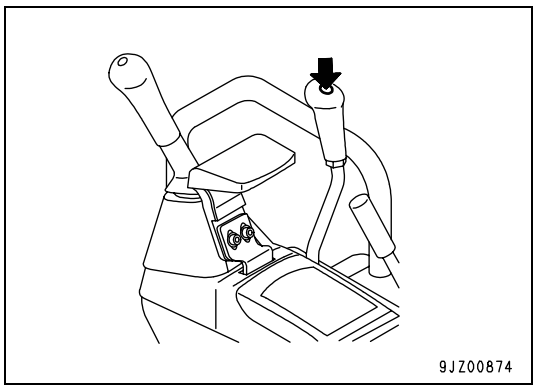


5. Make sure that the travel speed increase warning light is off.

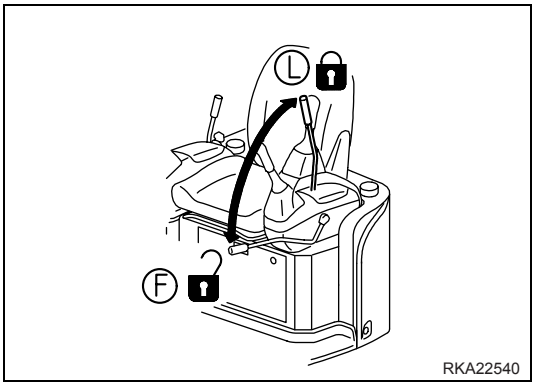


NOTE

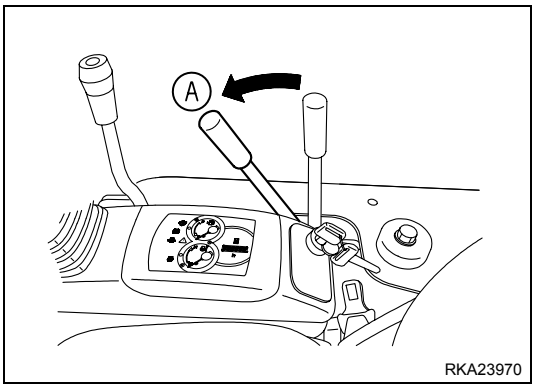
- If the warning light is on, press the translation speed selector switch located on the blade control lever grip. The warning light will go out and the low speed will be selected.



6. Set the safety device lever to working position (F).



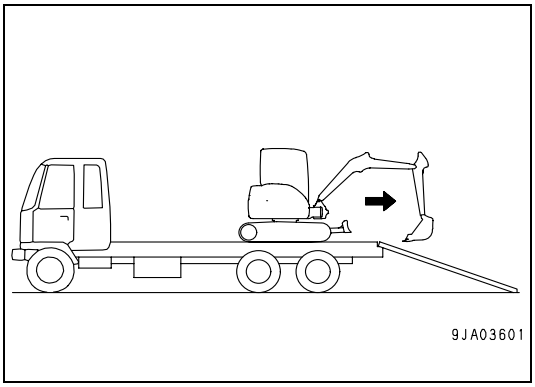
7. Run the engine at low speed.
   (A): Idling
8. Lift the blade.



9. Raise the work equipment, make sure that the travelling direction of the machine corresponds to the direction of the ramps, and proceed slowly.

   Lower the work equipment as much possible, without causing any interference.

   When the machine is on the ramps, operate only the travel levers. Do not operate any other lever or pedal.



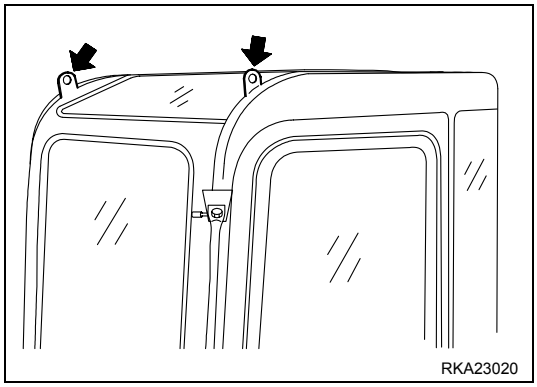
3.4.3 LIFTING THE MACHINE

⚠ WARNING

- **To lift the machine, the cables and the upper lifting bar used must be properly sized; do not use worn cables or cables with broken strands.**
- **Do not lift the machine before the operator has got off and make sure that there is no one around before lifting it.**
- **Do not lift the machine with the revolving frame swung laterally. Before lifting the machine, swing the work equipment to the sprocket side, then position the undercarriage and the revolving frame parallel to each other.**
- **Always keep the machine in horizontal position during the lifting operations.**
- **Do not stand under the machine when this is suspended.**
- **Do not attempt to lift the machine in any position different from that illustrated below, since it may lose stability.**

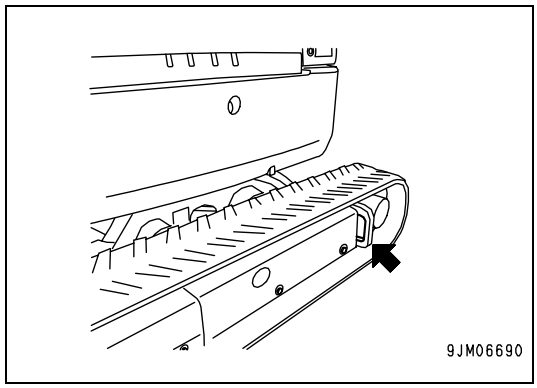
⚠ CAUTION

- **It is prohibited to use the 4 hooks on the top of the cab to lift the machine. This would damage the cab.**
- **It is prohibited to lift the machine using the holes provided in the undercarriage, since these must be used only for transporting the machine. This would damage the undercarriage.**


RKA23020

IMPORTANT

- **For details on the weight of the machine, see paragraph "5.1 TECHNICAL SPECIFICATIONS".**
- **The lifting procedure is valid for machines with standard specifications.**
  The lifting method varies depending on the accessories and tools that are actually installed. In case of machines with different specifications, contact your Komatsu Distributor for more detailed information.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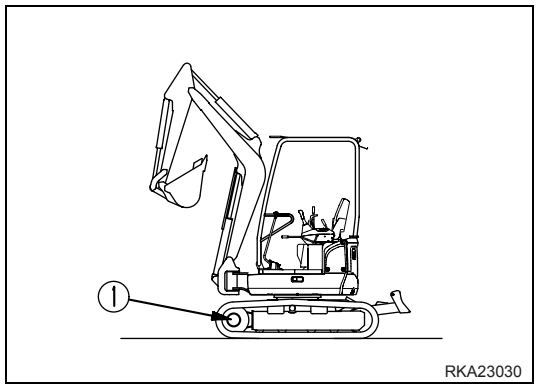
When lifting the machine, carry out the operation on a level surface, proceeding as indicated below.

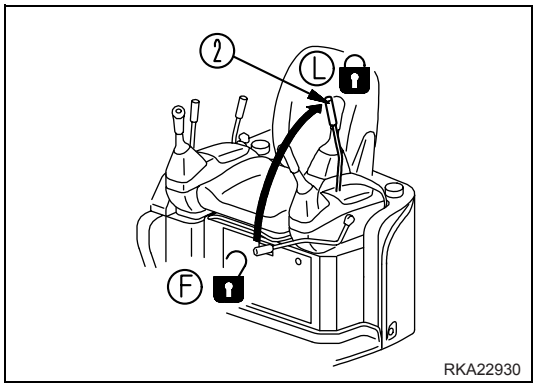
1. Start the engine, then swing the revolving frame so that the work equipment is above the sprockets (1) with the undercarriage and the revolving frame parallel to each other.
2. Lift the blade completely.
3. Extend the bucket cylinder, the arm cylinder and the boom cylinder completely.
4. If the boom is swung to the left or to the right, operate the boom swing pedal to position the boom parallel to the undercarriage, then lock the pedal safety device.



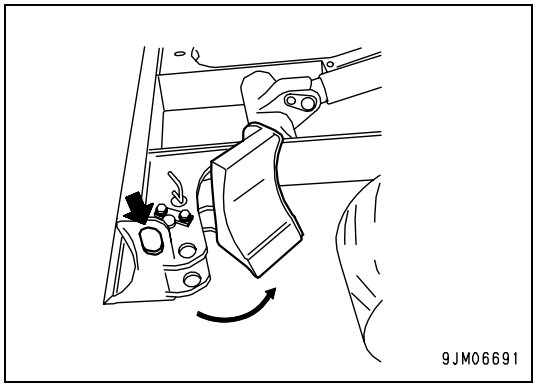
RKA23030

5. Shift the safety lever (2) to the “locked” position (L).

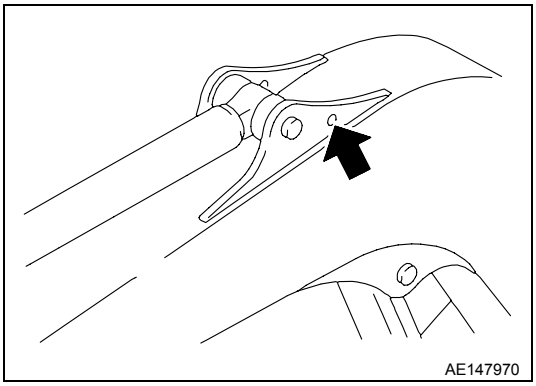
6. Stop the engine, make sure there is nothing inside the operator's cab, and then get off the machine.
   If the machine is fitted with cab, close the door and the front windscreen.



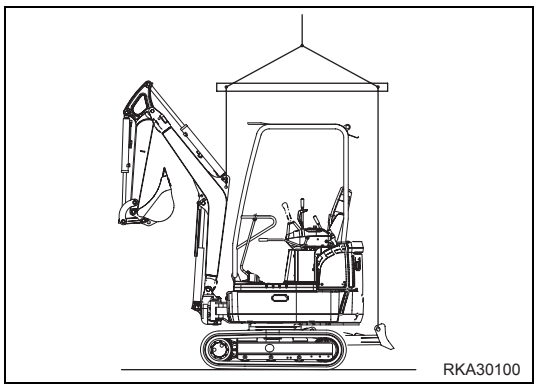
7. Shift the extended portion of the blade to the narrow position, install shackles in the lifting holes (2 points) on both ends of the blade, then pass the metal cables through them.



8. Install one shackle in the lifting hole provided in the boom, then pass the metal cable through it.



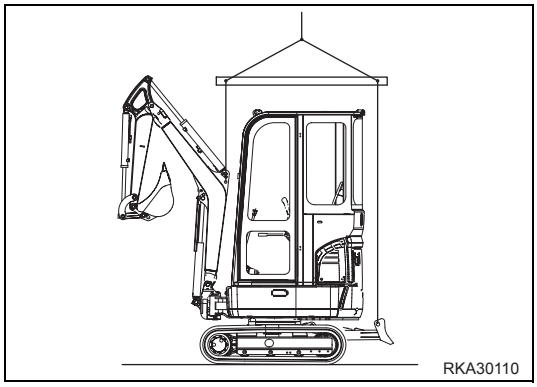
9. Connect the ropes to the upper lifting bar as indicated in the figure.



IMPORTANT

- **Always use the three coupling points provided for lifting the machine. Do not lift the machine with swing boom or revolving frame.**
- **Pay attention to the pipes and take care that they do not get caught.**

10. Lift the machine slowly until the ropes are stretched and make sure that the fastenings are correct before lifting the machine definitively.



⚠ CAUTION

- **When lifting the machine, make sure that it is correctly balanced and that it remains in horizontal position during the lifting operations.**
- **Do not lift the machine with swung boom or without using the lifting bar.**

3.5 USING THE MACHINE IN THE COLD SEASON

3.5.1 PRECAUTIONS TO BE TAKEN WHEN USING THE MACHINE IN THE COLD SEASON

During the cold season or in areas where temperatures are particularly low, especially during the night, it is necessary to take some countermeasures meant to limit any damage deriving from low temperatures.

3.5.1.1 FUEL AND LUBRICANTS

Change fuel and oil with low viscosity products for all components. For details on the required viscosity, see "4.2 MAINTENANCE NOTES".

3.5.1.2 COOLANT

⚠ WARNING

- **Antifreeze is toxic. Avoid any contact with the eyes or the skin. In case of contact with the eyes or the skin, wash with plenty of running water and consult a doctor without delay.**
- **To replace the coolant or carry out operations with coolant containing antifreeze fluid drained during radiator repair, please contact your Komatsu Distributor or a company specialised in this kind of operation.**
  Antifreeze fluid is toxic. Do not let it drain for the drainage channels or spray it on the ground.
- **The coolant containing antifreeze is flammable; do not smoke and do not use naked flames during the checks and when preparing the mixture.**

1 - Use only Komatsu original coolant antifreeze (AF-NAC) to dilute according to the minimum atmospheric temperature indicated in the table in section "4.4.1 COOLANT".

2 - Do not mix different brands of antifreeze.

3 - The use of permanent antifreeze coolant only requires the level check and scheduled replacement. It is not necessary to wash the cooling circuit.

4 - In case of doubt regarding the applicable standards for the use of permanent antifreeze, contact your Komatsu Distributor, who will supply you with exhaustive and precise information.

3.5.1.3 BATTERY

⚠ WARNING

- **The battery produces flammable gas, therefore keep flames and sparks away from it.**
- **The battery electrolyte is dangerous. In case of contact with the eyes or the skin, wash with plenty of running water and consult a doctor without delay.**
- **The battery electrolyte melts paint. In case of contact with the machine body, wash immediately with water.**
- **If the battery electrolyte freezes, do not charge the battery or start the engine with a different power source, since the battery may explode.**
- **The battery electrolyte is toxic, therefore it is important to avoid draining it in sewage systems or contaminating the ground.**

When the ambient temperature drops, the capacity of the battery decreases accordingly. If the battery charge is low, the electrolyte may freeze. Keep the battery charge level as high as possible and insulate the battery against excessively low temperatures, in such a way as to be able to start the machine easily when starting work in the morning.

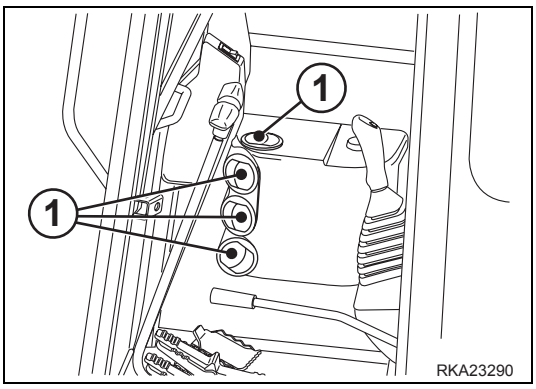
NOTE
- Measure the coolant weight density and check the battery charge percentage, using the following table:

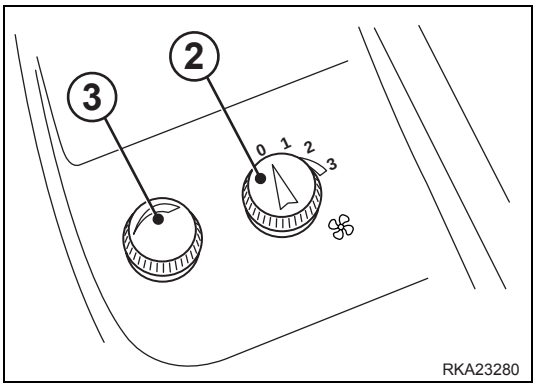
CHARGE PERCENTAGE	FLUID TEMPERATURE			
	20°C	0°C	-10°C	-20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

- Since the capacity of the battery decreases considerably at low temperatures, cover the battery or remove it from the machine, store it in a warm place and install it again the following morning.
- If the electrolyte level is low, add distilled water in the morning before starting work. Do not add electrolyte in the evening at the end of work, since it may freeze during the night.

3.5.2 VENTILATION AND HEATING

The ventilation and heating of the cab serve to reduce the operator's stress both in summer and in winter; these functions also serve to eliminate condensate from the front windshield, thus ensuring visibility during both work and travel. Ventilation and air exchange are obtained with a three-speed fan controlled by the switch (2).
The air intake is protected by a filter placed on the right side of the cab, and air is distributed by a series of swinging vents with adjustable output (1) whether for the internal air flow or for demisting and defogging the glasses.
Together with the fan, there is a radiator that transfers heat to the air sent into the cab; it is used during the cold season and receives the hot water necessary for exchange heat directly from the engine cooling system.
The water flow is limited or interrupted by a cock controlled by the knob (3). Turning the handwheel clockwise to increase the hot water flow intensity.



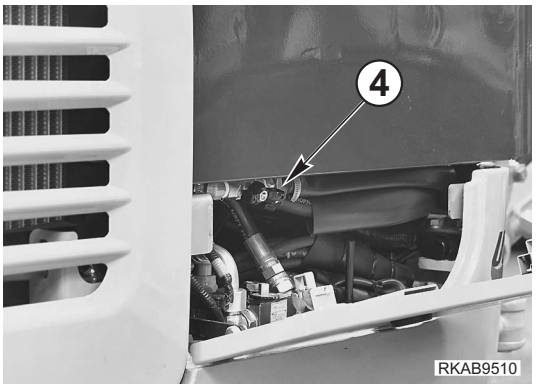


CAB VENTILATION

Ventilation is turned on by turning the switch (2) located on the right side instrument panel. Turn the switch clockwise to increase ventilation.

CAB HEATING

To use the heating system, open the valve (4) on the water manifold by turning anticlockwise.
Remove the right hand lateral cover to access the valve.



NOTE

- When the heating system is going to remain unused for a long period, close the valve (4) turning it clockwise.

3.5.3 PRECAUTIONS TO BE TAKEN EVERY DAY AT THE END OF WORK

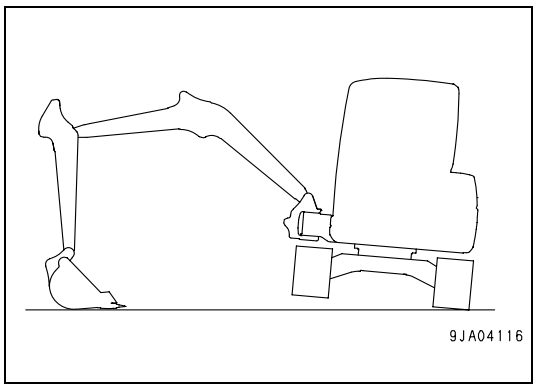
⚠ WARNING

- **Making the tracks turn idly is dangerous, therefore it is advisable to keep away from the tracks when carrying out this operation.**

To prevent the mud and water present on the undercarriage from freezing, thus making it impossible to move the machine the following morning, always take the following precautions.

- Remove any mud and water that may be present on the machine body. In particular, clean the hydraulic cylinder rod to avoid any damage to the gasket due to the penetration of the mud or dirt present on the rod surface together with water drops.
- Park the machine on firm and dry ground.
  If this is not possible, position it on wooden boards to prevent the tracks from freezing on the ground, which would make it extremely difficult to start the machine the following morning.
- Open the drain valve and drain the water accumulated in the fuel system to prevent it from freezing.
- After working in water or mud, remove the water from the undercarriage by proceeding as indicated below, in order to extend the life of the undercarriage.

1. Swing the revolving frame 90° with the engine at low idling and bring the work equipment to the track side.
2. Lift the machine using a jack until the track is slightly raised from the ground. Make the track rotate idly. Repeat this procedure on both the left and the right side of the machine.



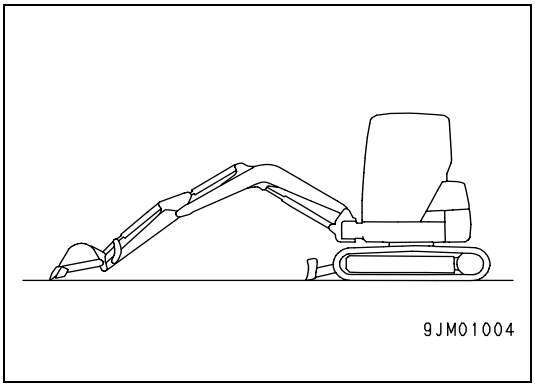
3.5.4 HOW TO PROCEED AT THE END OF THE COLD SEASON

At the end of the cold season, when the climate becomes warmer, proceed as follows.

- Change fuel and oil with products having suitable viscosity.
  For further details, see "4.2 MAINTENANCE NOTES".

3.6 LONG PERIODS OF INACTIVITY

3.6.1 BEFORE A PERIOD OF INACTIVITY



IMPORTANT

- **To protect the hydraulic cylinder rods while the machine is not used, position the work equipment as shown in the figure on the right.**
  (This prevents the cylinder rods from rusting).
- **Before removing the battery, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.**

If the machine is going to remain unused for a long period (more than one month), proceed as indicated below.

- Clean and wash all the machine components, then store the machine indoors. If the machine is going to be stored outdoors, choose a level surface and cover the machine with a cloth.
- Fill the fuel tank completely, to prevent the accumulation of condensate.
- Lubricate where necessary and change the oil.
- Coat the exposed portion of the hydraulic cylinder piston rod with grease.
- After shutting off the engine, wait over one minute, then turn the battery disconnect switch to the OFF position and take out the battery disconnect switch key. Put a cover on the battery during storage.
- Lock all the control levers and pedals with the safety lever and the pedal locking device.
- If the machine has accessories, set the selection valve to the 'Crusher or other accessories' position.

3.6.2 DURING A PERIOD OF INACTIVITY

⚠ WARNING

- **If it is necessary to carry out a rust-prevention treatment while the machine is kept indoors, open doors and windows to increase ventilation and avoid poisoning by gas.**

When the machine is not used, start the machine once a month following the steps below.

- Recharge the battery and install it on the machine.
- Insert the key into the battery main switch and turn it to ON.
- Start the engine and make some movements with the working tools so as to cover the moving parts and all the component surfaces with a new oil layer.
- When operating the work equipment, remove all the grease from the hydraulic cylinder rods.

3.6.3 AFTER A PERIOD OF INACTIVITY

IMPORTANT

- **If the machine has been stored without carrying out the monthly rust-prevention treatment, have maintenance performed by your Komatsu Distributor.**

Before using the machine after a long period of inactivity, carry out the operations listed below.

- Recharge the battery and install it on the machine.
- Insert the key into the battery main switch and turn it to ON.
- Remove the grease from the hydraulic cylinder rods.
- Add oil and lubricate all the lubrication points.
- When the machine is not used for a long period, the humidity of the air may contaminate the oil over time. Before and after starting the engine, check if there is water in the oil. If necessary, change the oil.
- The fuel tank is made of plastic, therefore do not clean it using trichloroethylene-based solvents. The use of trichloroethylene may damage the tank.

3.6.4 RECOMMENDATIONS FOR MACHINES EQUIPPED WITH KOMTRAX SYSTEM DURING LONG PERIODS OF INACTIVITY

Even if the starter key is turned to OFF, the KOMTRAX system can absorb a minimum quantity of energy.
In case the machine is not used for a long time (more than 1 month), strictly follow the instructions indicated below.

- Stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key. Remove the battery and place it in a room at mild temperature.
- Measure the coolant weight density and check the battery charge percentage, using the following table:

CHARGE PERCENTAGE	FLUID TEMPERATURE			
	20°C	0°C	-10°C	-20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

3.6.5 AMBIENT TEMPERATURE RANGE FOR OPERATION AND LONG TERM STORAGE

The recommended ambient temperature range for operation and long term storage is -20°C to +45°C.
When operating in ambients below 0°C, refer to "3.5 USING THE MACHINE IN THE COLD SEASON" for detail of precautions.

3.7 TROUBLESHOOTING

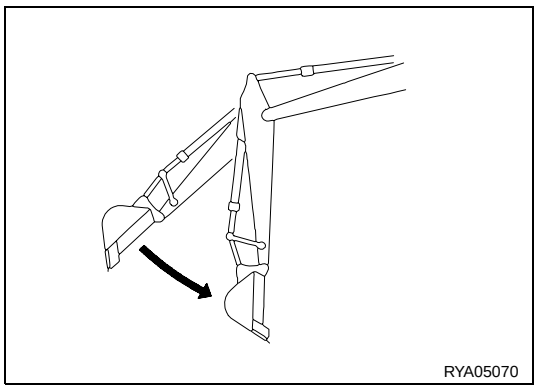
3.7.1 IF FUEL RUNS OUT COMPLETELY

Before starting the engine after running out of fuel, refuel and bleed the fuel system.
For details on the bleeding procedure, see "4.9.6.b CHANGING THE FUEL FILTER CARTRIDGE" - " BLEEDING THE FUEL CIRCUIT".

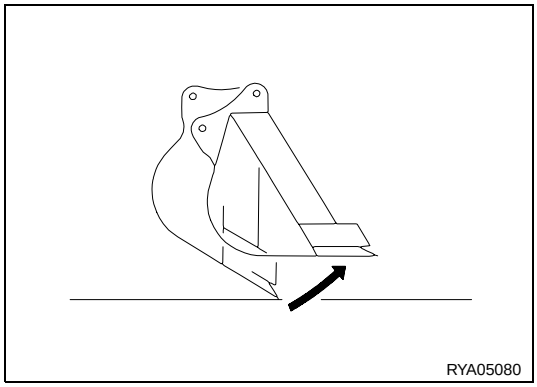
3.7.2 OCCURRENCES THAT ARE NOT FAILURES

Pay attention to the following occurrences, that are not considered failures:

- When the arm is retracted and the work equipment is lowered with no load, the arm speed drops momentarily according to the more or less vertical position of the arm itself.


RYA05070

- When the bucket is folded and the work equipment is lowered with no load, the bucket speed drops momentarily according to the more or less horizontal position of the bucket teeth.
- When the swing is operated or locked, the brake valve emits a noise.
- When the machine travels down a steep slope at low speed, the travel motor brake valve emits a noise.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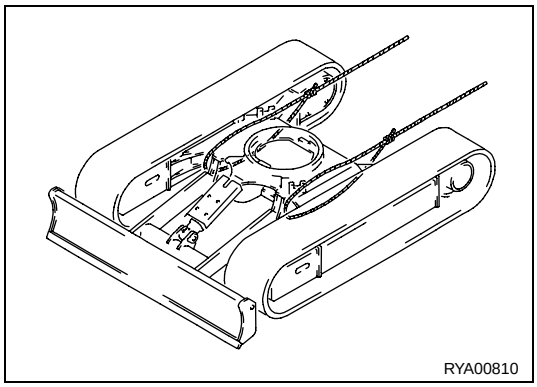
3.7.3 REMOVING THE MACHINE

⚠ WARNING

- **When removing the machine, use a metal cable suitable for the weight of the machine to be removed.**
- **Do not apply sudden loads to the cable.**

When the machine is stuck in mud and cannot get out with its own power, or in case of failure, before removing it pass wire cables around the central part of the undercarriage, as shown in the diagram on the right.
Position wooden blocks between the wire cables and the machine body, in order to prevent the cables from damaging the body itself.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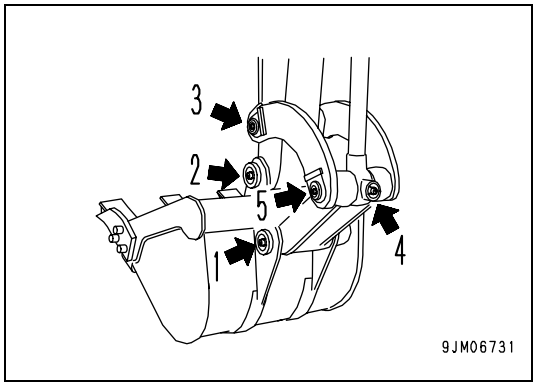
3.7.4 PRECAUTIONS TO BE TAKEN WHEN WORKING IN PARTICULAR CONDITIONS

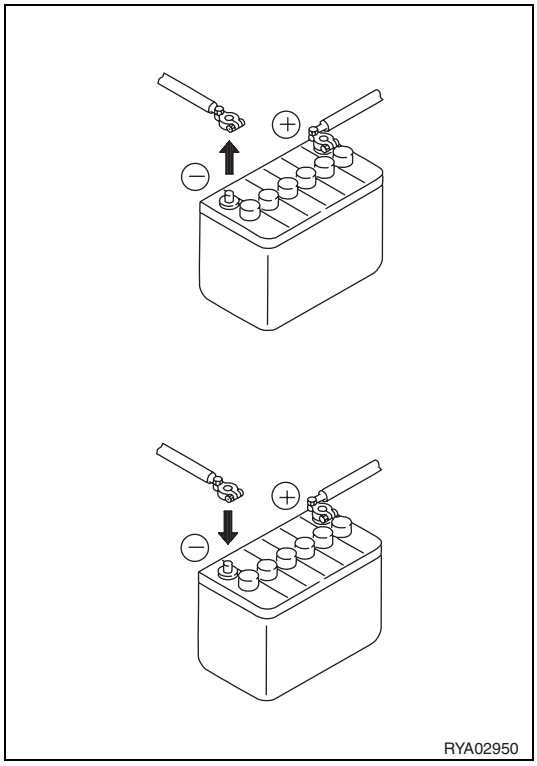


- When carrying out digging operations in water, if water gets on the pins of the work equipment, always add grease to the bucket articulations (1), (2), (3), (4) and (5) before work.
- When carrying out heavy duty digging and deep digging operations, always add grease to the bucket articulations (1), (2), (3), (4) and (5) (total: 5 points) before work.
  After greasing, operate the bucket more than once, then add grease again.

3.7.5 IF THE BATTERY IS DOWN

⚠ WARNING

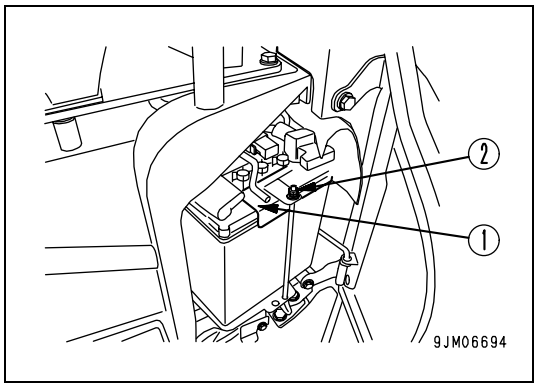
- **It is dangerous to charge the battery when it is installed in the machine. Always remove it before recharge.**
- **Before any operation related to the battery, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.**
- **The battery produces hydrogen, which may explode. Do not smoke and avoid producing sparks near the battery.**
- **The battery electrolyte is made of diluted sulphuric acid that may corrode clothes and even the skin; in case of contact with this fluid, immediately rinse the involved part with plenty of water. If the acid gets into the eyes, immediately rinse with plenty of water and consult a doctor without delay.**
- **When working on the battery, always wear goggles and rubber gloves.**
- **When removing the battery, disconnect the earth cable (-) first. When installing the battery, connect the positive terminal (+) first.**
  If a tool touches the positive terminal and the frame of the machine at the same time, sparks may be generated, thus causing an explosion hazard.
- **Carefully tighten the connection terminals, since false contacts may generate sparks with consequent risk of explosion.**
- **The accumulation of oxide around the terminals causes the battery to discharge. Clean the terminals carefully and cover them with a thin film of grease before installation.**



3.7.5.1 REMOVING AND INSTALLING THE BATTERY

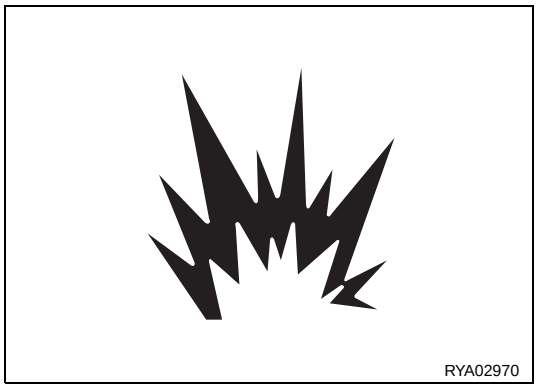
IMPORTANT

- **After securing the battery, make sure that it does not move. If it does move, tighten it adequately again.**
- Before removing the battery, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.
  If a tool is touching the positive terminal and the machine frame at the same time, there is risk of sparking.
- Upon fitting the battery, make sure that the battery main switch is set to OFF and finally connect the (-) ground cable.
- Install the battery correctly. During this operation, take care to prevent the clamps from touching the terminals.
- When changing the battery, secure it with the clamp (1) and tighten the fastening screw (2) with the required torque.
  Tightening torque: from 4.9 to 5.9 Nm (from 0.5 to 0.6 kgfm).
- Make sure that the cover is correctly positioned. If the cover is damaged, change it immediately.
- If the battery terminals are oxidized, clean them carefully using a metal brush.



3.7.5.2 CHARGING THE BATTERY

When charging the battery, always follow the instructions given in paragraph "3.7.5 IF THE BATTERY IS DOWN" and in the user's manual of the battery charger, and proceed as indicated below.

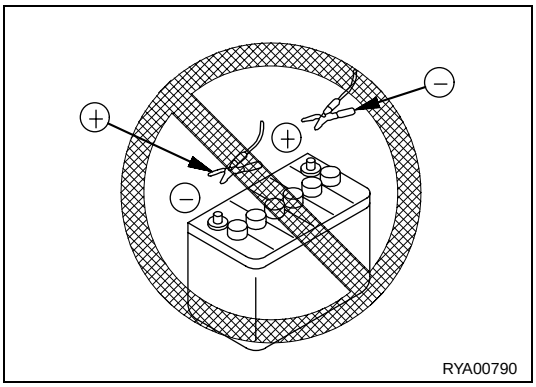


- During recharge the battery produces hydrogen, which is flammable and may explode, therefore for this operation it is necessary to remove the battery from the machine, position it in a well ventilated place and remove the caps before proceeding.
- Immediately change any damaged caps.
- Set the voltage of the battery charger so that it corresponds to the voltage of the battery to be charged. If the voltage is not set correctly, the battery charger may overheat and cause an explosion.
- Connect the positive clamp (+) of the battery charger to the positive terminal (+) of the battery, then connect the negative clamp (-) of the battery charger to the negative terminal (-) of the battery.
- Set the recharge current to 1/10 of the rated capacity of the battery; when carrying out a quick recharge, set it to a lower value than the rated capacity of the battery.
  If the recharge current is too high, there may be an electrolyte leakage or the electrolyte may dry up and the battery may consequently catch fire and explode.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with a different power source. The battery may catch fire and explode.
- Do not use or charge the battery if the electrolyte level is below the MIN. reference mark, since this may cause an explosion. Check the electrolyte level periodically and top up with distilled water until reaching the MAX. reference mark.

3.7.5.3 STARTING WITH BOOSTER CABLES

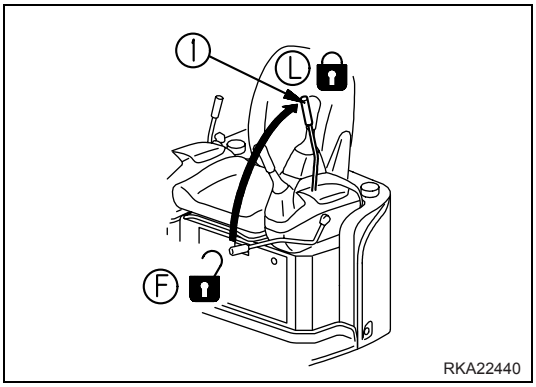
When starting the engine with booster cables, proceed as indicated below.

CONNECTING AND DISCONNECTING THE BOOSTER CABLES



WARNING

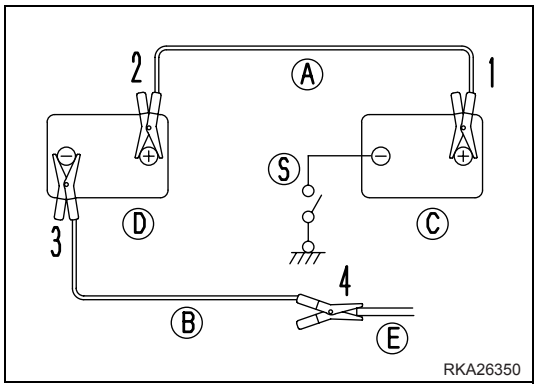
- **When connecting the cables, avoid any contact between the positive cable (+) and the negative cable (–).**
- **When starting the engine with booster cables, always wear safety goggles.**
- **Take care to avoid any contact between the machine to be started and the machine used as starting aid, in order to avoid sparks and therefore the explosion of the hydrogen produced by the batteries. The explosion of hydrogen causes serious damage and injury.**
- **Take care not to make any mistake when connecting the booster cables. In the last connection (to the revolving frame) a spark is generated, therefore it is advisable to connect the cable as far from the battery as possible. (In any case, avoid the attachments, since they are poor conductors).**
- **When removing the booster cables, take care to avoid any contact of the clamps with each other or with the machine frame.**



IMPORTANT

- **The booster cables and the clamps must be sized according to the dimensions of the battery.**
- **The battery to be used to start the engine must have greater capacity or at least the same capacity as the battery of the machine to be started.**
- **Make sure that cables and clamps are neither corroded, nor damaged.**
- **Make sure that cables and clamps are secured firmly.**
- **Make sure that the safety levers (1) of both machines are in the “locked” position (L).**
- **Make sure that all the levers are in neutral.**
- **Before connecting two machines with booster cables, turn the troubled machine's battery disconnect switch to OFF and take out the battery disconnect switch key in order to prevent damage to the electrical systems of the machine.**

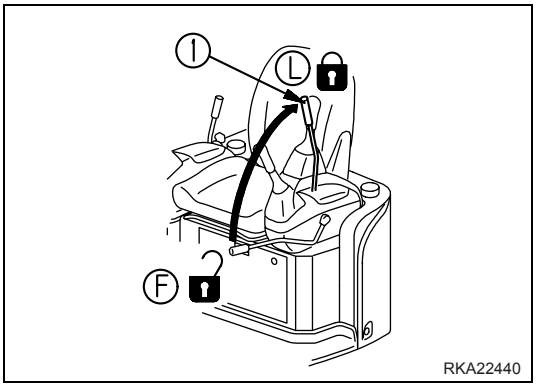
CONNECTING THE BOOSTER CABLES



Before connecting the batteries via additional cables, make sure that the starter key of both the machines and the battery main switch of the machine to be started are turned to OFF.
Connect the additional cables as instructed below and observing the number order in the diagram.

1. Connect on clamp of the additional cable (A) to the positive (+) lead of battery (C) of the machine to be started.
2. Connect the other clamp of the additional cable (A) to the positive (+) lead of battery (D) of the machine that supplies the current.
3. Connect one clamp of the additional cable (B) to the negative (-) lead of battery (D) of the machine that supplies the current.
4. Turn to ON the battery main switch (S) of the machine to be started and connect the other clamp of additional cable (B) to revolving frame (E) of the machine to be started.

STARTING THE ENGINE

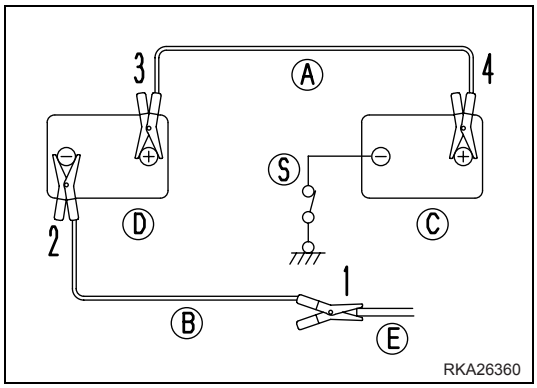


⚠ CAUTION

- **Make sure that the safety levers (1) of both machines are in the "locked" position (L). Also make sure that all the control levers are in NEUTRAL.**

1. Make sure that the clamps hold the battery terminals firmly.
2. Start the engine of the machine used as starting aid and run it at high rpm.
3. Start the engine of the machine to be started (see "3.3.1.5 STARTING THE ENGINE").

REMOVING THE BOOSTER CABLES



After starting the engine, disconnect the booster cables proceeding in the reverse order.

1. Disconnect one clamp of the additional cable (B) from revolving framerevolving frame (E) of the machine started.
2. Disconnect the other clamp of the additional cable (B) from the negative (-) lead of battery (D) of the machine that has supplied the current.
3. Disconnect one clamp of the additional cable (A) from the positive (+) lead of battery (D) of the machine that has supplied the current.
4. Disconnect the other clamp of the additional cable (A) from the positive (+) lead of battery (C) of the started machine.

3.7.6 OTHER TROUBLES

(•) Always contact your Komatsu Distributor when you have to carry out this operation.

- In case of anomalies or problems that are not listed here below, contact your Komatsu Distributor, who will provide for the necessary repairs.

3.7.6.1 ELECTRICAL SYSTEM

TROUBLE	CAUSE	SOLUTION
Lights do not work satisfactorily even with engine running at high speed.	(•) Faulty cables	(•) Check and repair any loose terminals and connections.
Lights come on intermittently with engine running.	(•) Faulty fan belt tension. (•) Blown fuse	• Adjust fan belt tension. For details, see “EVERY 500 HOURS OF OPERATION” • Change.
Battery charge warning light does not go out even with engine running.	• Faulty alternator. • Faulty cables.	(•) Change. (•) Check and repair.
Alternator emits abnormal noise.	• Faulty alternator.	(•) Change.
Starter does not turn with ignition switch in position ON.	• Faulty cables. • Battery charge insufficient. • Faulty fuse. • Battery main switch turned to OFF.	(•) Check and repair. • Charge battery. • Change. • Turn the switch to ON.
Starter pinion engages and disengages repeatedly.	• Battery charge insufficient.	• Charge battery.
Starter makes engine run slowly.	• Battery charge insufficient. • Faulty starter.	• Charge battery. (•) Change.
Starter disengages before engine start.	• Faulty cables. • Battery charge insufficient.	(•) Check and repair. • Charge battery.
Preheating warning light does not come on.	• Faulty cables. • Faulty bulb.	(•) Check and repair. (•) Change.
Engine oil pressure warning light does not come on when engine stops (ignition key in position ON).	• Faulty bulb. • Faulty oil pressure switch.	(•) Change. (•) Change.

3.7.6.2 FRAME

TROUBLE	CAUSE	SOLUTION
Travel speed, swing, boom, arm, bucket slow.	• No hydraulic oil.	• Restore level. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
Pump does not work correctly.	• Foreign body in the hydraulic tank filter.	• Clean. See "Every 2000 hours OF OPERATION".
Hydraulic oil temperature increases excessively.	• No hydraulic oil. • Fan belt slack. • Radiator or exchanger fins clogged.	• Restore level. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE". • Adjust fan belt tension. See "Every 500 hours OF OPERATION". • Clean or repair. For details, see “EVERY 500 HOURS OF OPERATION”
Tracks come off.	• Slack tracks.	• Adjust the track tension, see “WHEN REQUIRED”.
Sprocket excessively worn.		

3.7.6.3 ENGINE

TROUBLE	CAUSE	SOLUTION
The engine oil pressure warning light blinks (and the acoustic alarm sounds at the same time).	• Oil level in oil pan too low (air sucked in). • Oil filter clogged. • Oil leakage due to damage or incorrect tightening of oil pipes or joints. • Engine oil pressure sensor faulty.	• Restore level. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE". • Replace cartridge. See "Every 500 hours OF OPERATION". (•) Check and repair. (•) Change.
Steam comes out of radiator top (pressure valve).	• Fluid level low, fluid leakages.	• Add fluid, repair. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
The engine water temperature indicator has reached the red overheating area (warning light blinks and acoustic alarm sounds at the same time)	• Fan belt slack. • Mud or limestone accumulated in cooling system. • Radiator fins damaged or closed. • Faulty thermostat. • Radiator cap loose (work at considerable heights). • Fluid level sensor faulty.	• Adjust fan belt tension. See "Every 500 hours OF OPERATION". • Change the fluid and clean the cooling system, see “WHEN REQUIRED”. • Clean or repair, see “EVERY 500 HOURS OF OPERATION”. (•) Change. • Tighten cap or change unit. (•) Change.
Even if the engine runs for a long time, the engine water temperature indicator does not reach the correct range.	• Faulty thermostat. • Faulty display.	(•) Change. (•) Change display.
The warning light blinks even when the engine water temperature indicator is in the correct range.	• Faulty thermostat.	(•) Change.

TROUBLE	CAUSE	SOLUTION
Engine does not start with starter running.	• No fuel.	• Restore level. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
	• Air in fuel system.	• Repair the point where air is sucked in, see "EVERY 500 HOURS OF OPERATION".
	• Water in fuel system.	• Drain the water from the system, see "WHEN REQUIRED" and "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
	• Pump or fuel injection nozzle faulty.	(•) Change pump or nozzle.
	• Starter makes engine run slowly.	• See "ELECTRICAL SYSTEM".
	• Preheating warning light does not come on.	• See "ELECTRICAL SYSTEM".
	• Faulty compression.	
	• Excessive valve clearance.	(•) Adjust valve clearance.
Exhaust gases white or light blue.	• Too much oil in oil pan.	• Restore level. See "CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".
	• Unsuitable fuel.	• Change with fuel in compliance with standards.
Exhaust gases occasionally tend to be black.	• Air filter clogged.	• Clean or repair. See "WHEN REQUIRED"
	• Faulty nozzle.	(•) Change.
	• Faulty compression.	(•) See above: faulty compression.
Combustion noise occasionally resembles a blow.	• Faulty nozzle.	(•) Change.
Abnormal noises (during combustion or in mechanical parts).	• Fuel with low cetane rating.	• Change with fuel in compliance with standards.
	• Overheating.	• See above: Engine coolant temperature indicator reaches red overheating range.
	• Inside of exhaust silencer damaged.	• Change.
	• Excessive valve clearance.	(•) Adjust valve clearance.

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MAINTENANCE

4.1 GUIDE TO MAINTENANCE

⚠ WARNING

- **Oils, filters, coolant, gaskets, electric cables, and batteries are considered special waste and must be collected and disposed of according to the anti-pollution regulations in force.**
- **The combustible material of some components may become extremely dangerous if it burns. For this reason, avoid any contact of burnt material with your skin or eyes and do not inhale its fumes.**

- Do not carry out any inspection or maintenance operation not prescribed in this manual.
- During maintenance ensure that the machine and its attachments are stable enough to avoid overturning, falling or uncontrolled movements.
- When dismantling or assembling the machine for the purpose of maintenance or repair, always ensure that at each stage of the process, care is taken to ensure that the machine remains stable. Failure to do this could result in serious injury or death.
- Guards are installed in the area of the engine to protect personnel from moving parts. These guards should only be removed by a Komatsu service engineer unless specific instructions are given in this manual.
- If any doubt exists, contact your Komatsu Distributor.
- Check the hour meter every day to verify if it is necessary to carry out any maintenance operation.
- Before opening the engine hood, engage all the safety locks and stop the engine.
- If it is necessary to check the hydraulic oil level, retract the bucket and arm cylinders completely and lower the bucket teeth to the ground.
- Carry out these operations on firm and level ground.
- Use Komatsu genuine oils and greases; choose oils suitable for the ambient temperature.
- Use clean oils and greases. Keep the oil and grease containers clean and prevent any foreign matter from getting into them.
- Keep the machine thoroughly clean; this facilitates troubleshooting. In particular, grease nozzles, breather holes, and the areas where fluid levels are checked should be kept clean to prevent the infiltration of impurities.
- Draining water or oil, and changing filters soon after work is dangerous; wait for the engine to cool down to a safe temperature of 40÷45°C.
  If it is necessary to drain the oil when it is cold, warm it up to a suitable temperature (approximately 20÷40°C) before draining it.
- When changing oils or filters, check if metal particles are present. If there are large quantities of metal particles, contact your Komatsu Distributor.
- If the machine is provided with a fuel filter in the filler neck, do not remove it while refuelling.
- Check and change the oil in a clean place and prevent any impurity from getting into the tank.
- Before carrying out any maintenance operation, hang a warning plate to the ignition switch and the control levers to prevent anyone from starting the engine.
- When performing maintenance operations, always take the precautions indicated in the safety plates applied to the machine.
- Instructions for arc welding:
  1 - Before any welding operation on the machine, stop the engine, wait at least one minute, and afterwards turn the battery main switch to OFF and extract the specific key.
  2 - Disconnect the alternator and the KOMTRAX system control unit.
  3 - Do not apply more than 200V continuously.
  4 - Connect the earth cable within 1 m from the point where the welding operation must be carried out.
  5 - Avoid placing gaskets and bearings between the welding area and the earth cable. If the earth cable is connected near instruments, connectors, etc., these may not function correctly.
  6 - Do not use the area around the work equipment pins or the hydraulic cylinders as earth.

- Do not use flammable fluids to clean any parts of the machine. Keep naked flames away from these fluids and avoid smoking.
- When O rings and gaskets are removed, clean the sealing surfaces thoroughly and replace the O rings and gaskets with new ones. Fit the O rings and gaskets correctly when reassembling.
- Avoid keeping loose objects or tools in your pockets: they may fall out and drop into the machine, especially when you open covers and work on the machine while bending over it.
- When working on rocky areas, make sure that the undercarriage is not damaged and that there are no breakages, damages, worn parts, or loose or damaged nuts or bolts.
- When washing the machine, do not direct the high-pressure water jet onto the radiator.
- When washing the machine, protect the electric system connectors and avoid wetting the ignition switch.
- The fuel tank is made of plastic, therefore avoid using trichloroethylene to clean it. Trichloroethylene reduces the resistance and duration of the tank.
- Before starting work on muddy ground, under rain or snow, on seashores or river banks,, check the tightening of valves and caps. Wash the machine immediately after work, in order to prevent its components from rusting Make sure that there are no damages, missing or loose nuts or pins.
  Lubricate the components more frequently than usual. Lubricate the pins of the work equipment carefully every day, if during work they are immersed in water.
- When the work site is particularly dusty, proceed as follows:
  1 - Check the air filter for clogging and clean it more frequently than usual.
  2 - Clean the radiator frequently in order to prevent the fins from clogging.
  3 - Change the diesel oil filter more frequently than usual.
  4 - Clean the electrical components, especially the starter and the alternator, to avoid any accumulation of dust.
- Do not mix oils of different brands.
  Do not top up with oils different from those being used. If you cannot use the same oil, drain the tank and change the oil completely.

4.2 MAINTENANCE NOTES

- Use only Komatsu genuine spare parts.
- Do not mix different types of oil.
- Unless specified otherwise, the oils and the coolant used by Komatsu to fill the tanks before the delivery of the machine are the following:

ITEM / TANK / SYSTEM	SPECIFICATIONS
• Engine oil	Komatsu EO10W30DH SAE 10W-30 Specifications: API CF4
• Hydraulic system oil	Komatsu TO10 SAE 10W Specifications: API CD
• Biodegradable hydraulic system oil (Only for machines in which synthetic biodegradable oil type HEES not of plant origin is used)	PANOLIN HLP SYNTH 46
• Travel reduction gears oil	Komatsu TO30 SAE 30 Specifications: API CD
• Fuel	With ambient temperature over -10° C, use: Diesel oil ASTM D975 N°2
	With ambient temperature below -10°C, use: Diesel oil ASTM D975 N°1 / EN 590 class 2
• Radiator	Special biodegradable permanent long-life antifreeze coolant, an ethylene glycol-based solution with corrosion inhibitor, free of silicates, borates, nitrates, phosphates and amines. Product compatible with aluminium radiators, diluted in 50% water to ensure protection up to -30°C.

4.2.1 OIL, FUEL AND COOLANT

4.2.1.1 OIL

- The oil used for the engine and the work equipment is subjected to demanding conditions (high temperature, high pressure) and deteriorates with use. Always use oil suitable for the characteristics and temperatures indicated in the use and maintenance manual. Change the oil after the prescribed interval, even if it is not dirty.
- The engine oil must be selected very carefully, since it lubricates the engine, which is the machine's heart; the main maintenance operations required for the engine oil are the following:
  1. daily check of the oil level;
  2. check of the degree of pollution of the oil;
  3. periodical change.
- When changing the oil, change also the filters.
- It is advisable to have the oil periodically analysed in order to check the conditions of the machine. The analysis must be carried out by specialized personnel at Komatsu Distributors.

4.2.1.2 FUEL

- Always use fuel suitable for the engine. Other fuels with different specifications may damage the engine or reduce its power.
- Always refuel at the end of the workday.
- When refuelling, make sure that there is no water on the fuel drum cover and take care not to draw condensate from the drum bottom.
- If fuel runs out, or if the fuel filter has been replaced, it is necessary to bleed the circuit.
- If there are foreign bodies in the fuel tank, wash the tank and the fuel circuit.
- Use only low- or ultra low-sulphur content fuel.

IMPORTANT

- **Always use diesel oil as fuel.**
  To ensure good characteristics of fuel consumption and exhaust gases, the engine fitted to this machine uses an injection device at high pressure.
  This device needs that components and lubrication have high precision characteristics, therefore, its working life may be considerably reduced if you use low viscosity fuel with poor lubricating capacity.

4.2.1.3 COOLANT

- The coolant is used to keep the engine at the right temperature and in ideal working conditions; check the level in the expansion tank daily and, if required, refill with coolant to the correct concentration according to the minimum atmospheric temperature. For concentration, see "4.4.1 COOLANT".
- The coolant containing antifreeze is flammable; do not use naked flames near the coolant and do not smoke while topping up.
- Use only Komatsu original permanent antifreeze coolant (AF-NAC), an ethylene glycol-based solution with anticorrosive and antifoam products compatible with aluminium radiators.
- The use of permanent antifreeze requires only the check of the level and the periodical change of the fluid. It is not necessary to wash the cooling circuit.
- Use drinkable water and in any case soft water.
- Do not use corrosion inhibitors containing soluble oil, since they damage the rubber couplings.
- In case of doubt regarding the applicable standards for the use of coolant, contact your Komatsu Distributor, who will supply you with exhaustive and precise information.

4.2.1.4 GREASE

- Use grease to prevent seizing and noise related to the joints.
- These construction equipment are used in heavy working conditions. Always use recommended grease and respect replacement intervals as well as room temperatures recommended in this user and maintenance manual.
- The greased parts not included in the maintenance section relate to overhaul, therefore, they do not require grease application.
  If any component turns rigid after it has been used for a long time, add grease.
- When cleaning the involved area, always wipe out any old grease that flows out when applying grease.
  Pay particular attention to eliminate the old grease in the areas where deposited sand or retained impurities may cause wear and tear of rotary components.

4.2.1.5 KOWA (KOMATSU OIL WEAR ANALYSIS)

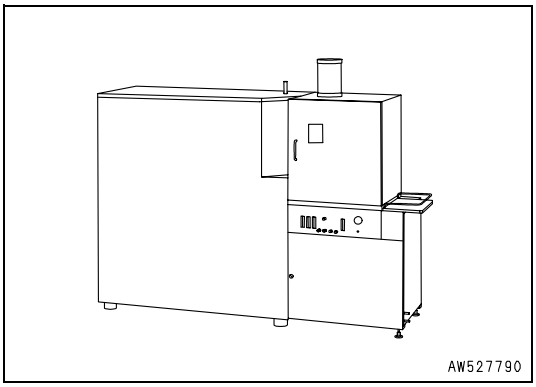
This system requires that oil samples be periodically collected and analysed. This is a preventive maintenance service, which makes it possible to identify faulty parts or worn machine components timely. Thus, failures are avoided and dead time is reduced.

Many years of experience and the availability of countless data and information allow Komatsu to accurately determine the conditions of the machine. This also allows us to locate troubles and suggest the most suitable and fast repair solutions.

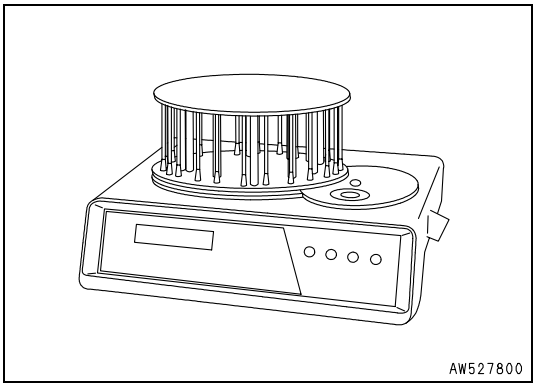
Only actual costs are charged to the customer, who receives a report with the analysis results and indications about the interventions to be carried out. This low-cost service is very useful and allows customers to save money and avoid many problems.

KOWA ANALYSIS STAGES

- Analysis of metal particles
  In this stage a ICP (Inductively Coupled Plasma) analyser is used to measure the density of the metal particles present in the oil.



- Measurement of particle quantity
  In this stage a PQI (Particle Quantifier Index) machine is used to measure the quantity of large iron particles present in the oil.



- Other analyses and measurements
  In this stage other aspects, such as the percentage of water or fuel in the oil and the dynamic viscosity, are analysed.

OIL SAMPLING

- Collection intervention
  Every 500 hours: engine and other components
- Precautions to be taken when sampling the oil
  - Make sure that the oil is well mixed before sampling.
  - Carry out sampling regularly, at fixed intervals.
  - Do not carry out sampling on rainy or windy days, when water or dust can get into the oil.

For further details on KOWA, please contact your Komatsu Distributor.

4.2.1.6 STORING OIL AND FUEL

- Keep oil and fuel indoors to prevent any water, dirt, or other impurities from getting into them.
- When storing drums for a long period, position them on one side, so that the opening is lateral. This prevents moisture from being sucked in through the drum filling opening.
  If drums have to be stored outside, cover them with a waterproof sheet or take other measures to protect them.
- To prevent any change in quality during long-term storage, be sure to use the fluids following the first in - first out (use the oldest oil or fuel first) method.

4.2.1.7 FILTERS

- Filters are very important components for safety. They prevent any impurities from getting into the oil, fuel, or in the air circuits, thus avoiding problems to important components of the machine.
  Periodically change all the filters. For further information, see the relevant Use and Maintenance manual.
  However, when working in extreme conditions, it is necessary to change the filters more frequently, depending on the type of oil and fuel used (sulphur content).
- Do not attempt to clean the filters (type with cartridge) and reuse them. Always change them with new filters.
- When changing the oil filters, check if metal particles are present. If you find large quantities of metal particles, contact your Komatsu Distributor.
- Do not open the spare filter packages before using them.
- Always use Komatsu original spare parts.

4.2.2 NOTES ON THE MAINTENANCE OF THE ELECTRICAL SYSTEM

- If the cables are wet or their insulating material is damaged, the electrical system leaks and this may result in malfunctions of the machine.
- The maintenance operations required for the electrical system are the following:
  1 - Check of the alternator belt tension.
  2 - Check of the alternator belt for damage or breakages.
  3 - Battery electrolyte level check.
- Do not remove or eliminate any electric component installed on the machine and do not install any electric component with characteristics different from those specified and approved by Komatsu.
- Keep the electric system dry.
- When working on the seashore or on river or lake banks, protect the jack plugs from corrosion.
- External electromagnetic interference may cause a malfunction of the controller of the control system; before installing a radio receiver or any other wireless tools, contact your Komatsu Distributor.
- Do not connect any optional device to the fuses, ignition switch, battery, relays, etc.; for the installation of any optional equipment, contact your Komatsu Distributor.
- If electric welds are necessary, turn the battery main switch to OFF and disconnect the alternator and the KOMTRAX system control unit.

4.2.3 NOTES ON THE MAINTENANCE OF THE HYDRAULIC SYSTEM

- Be extremely careful when performing maintenance operations on the hydraulic system, since soon after work the oil is very hot. The circuit is pressurized not only during work, but also at the end of work.
- The maintenance operations required for the hydraulic system are the following:
  1 - Daily check of the oil level in the tank.
  2 - Periodical change of the oil filter.
  3 - Periodical change of the oil and cleaning of the intake filter.
- Always bleed the circuit after changing the oil filter or the oil.
- When a component is removed from the circuit, check the gaskets and O rings and change them if they are damaged.
- When a cylinder or a component of the hydraulic circuit is removed, after reassembly bleed the circuit by proceeding as follows:
  1 - Start the engine and let it idle.
  2 - Extend all the cylinders 4-5 times, stopping them at approx. 100 mm from the end of stroke.
  3 - Slowly make all the cylinders reach the end of stroke for 3-4 times.

4.2.4 MAINTENANCE NOTES REGARDING LUBRICATION

- Lubrication makes the operations carried out with the machine and work equipment smoother, while preventing wear and the noise that may be produced if the joints are dry.
  Lubricate with grease or oil.
- The maintenance operations required for the components that need lubricating are the following:
  1 - Check of the levels.
  2 - Oil change.
  3 - Injection of grease through the grease nipples.
- Use only the specified lubricants, according to the ambient temperature.
- Always clean the grease nipples before injecting grease and remove any excess grease after lubrication; this cleaning operation must be performed with extreme care on the revolving parts.
- Maintain correct lubricant levels, avoiding excessive or insufficient quantities.

4.3 PARTS SUBJECT TO WEAR

The parts subject to wear like filters, bucket teeth, etc. must be changed when periodical maintenance is carried out or when they reach the wear limits.
The timely change of these parts ensures an economic use of the machine.
Use only Komatsu genuine parts, which alone can guarantee excellent quality and interchangeability.

Due to our constant efforts aimed at improving product quality, the spare parts codes may be changed, therefore when ordering spare parts it is advisable to indicate also the machine serial number to the Komatsu Distributor, in order to receive the most updated version of the component required.

4.3.1 LIST OF THE PARTS SUBJECT TO WEAR

The parts between parenthesis must be replaced at the same time.

Part	Parts book - Fig. No.	Description	Qty	Change interval
Engine oil filter	Fig. V0100-001001	Cartridge	1	EVERY 500 HOURS OF OPERATION
Fuel filter	Fig. V0100-001001	Filtering element (O ring)	1 (1)	EVERY 500 HOURS OF OPERATION
Hydraulic filter	Fig. H0110-001001	Filtering element	1	EVERY 1000 HOURS OF OPERATION
Water separator	Fig. A0100-001024	Filtering element (O ring)	1 (1)	-
Air filter	Fig. A0100-001037	Filtering element (O ring)	1 (1)	-
Bucket	Fig. T1510-001001	Tooth (Screw) (Nut)	AR (AR) (AR)	- - -

4.4 FUEL, COOLANT AND LUBRICANTS

- Original Komatsu oils have been designed to ensure reliability and long life of the Komatsu construction equipment and their components.
  To keep machinery in the best conditions for a long time, it is essential to observe the instructions indicated in this user and maintenance manual.
- Failure to observe these instructions may entail a shorter useful life and excess wear of engine, transmissions, cooling circuit and/or other components.
- Lubricant additives available in the market may work, but they may also damage the machine. Komatsu recommends any additive for lubricants normally available in the market.
- Use oil recommended in the table below according to the room temperature.
- The specified capacity indicates total amount of oil including oil contained in both the tank and pipes. Topping up capacity indicates the amount of oil required to top up the system during checks and maintenance.
- When the engine is started at temperature below 0°C, make sure to use multigrade oil, even if the room temperature increases during the day.

CORRECT SELECTION ACCORDING TO ROOM TEMPERATURE

Topping up	Fluid type	Room Temperature -30 -20 -10 0 10 20 30 40 50°C -22 -4 14 32 50 68 86 104 122°F	Fluid recommended by Komatsu
Engine oil pan	Engine oil	SAE 10W30DH	Komatsu EO10W30DH
		SAE 15W40DH	Komatsu EO15W40DH
		SAE 30DH	Komatsu EO30DH
Final reduction gears	Transmission oil (Note .1)	TO30	TO30
Hydraulic system	Transmission oil	TO10	TO10
	Hydraulic oil	HO46-HM	HO46-HM
Hydraulic system with biodegradable oil	●See par. “4.4.2”		PANOLIN HLP SYNTH 46
Articulation greasing	Grease super white (Note .2)	G2-T, G2-TE	G2-T, G2-TE
	Grease EP lithium based	G2-LI	G2-LI
Engine cooling system	Supercoolant AF-NAC (Note .3)	AF-NAC (Note.3)	AF-NAC
Fuel tank	Fuel oil (Note .4)	No.2-D	ASTM No.2-D S15 ASTM No.2-D S500
		No.1-D	ASTM No.1-D S15 ASTM No.1-D S500
Window washer fluid	Ethyl alcohol based detergent		

• ASTM: American Society of Testing and Materials

		Engine oil pan	Final reduction units (each)	Hydraulic system	Fuel tank	Cooling system	Window washer fluid
First filling quantity:	litres	3.6	0.3	23.8	19	3.1	1
Oil change quantity:	litres	3.3	0.3	15.2	-	-	-

IMPORTANT

- **Always use diesel oil as fuel.**
  To ensure good characteristics of fuel consumption and exhaust gases, the engine fitted to this machine uses an injection device at high pressure.
  This device needs that components and lubrication have high precision characteristics, therefore, its working life may be considerably reduced if you use low viscosity fuel with poor lubricating capacity.

Note 1:
transmission oil has properties different from those of engine oil. Make sure to use the recommended oil.

Note 2:
The super white grease (G2-T, G2-TE) has high performance.
If it is necessary to increase the grease lubricating capacity to prevent pins or bushes squeaking, use recommended G2-T or G2-TE.

Note 3:
Supercoolant (AF-NAC)

1) The coolant carries out the important function to prevent corrosion as well as freezing.
   In the areas where freezing is not a problem, it is essential to use of an antifreeze coolant.
   All Komatsu equipment are supplied with Komatsu Supercoolant coolant (AF-NAC). Komatsu Supercoolant coolant (AF-NAC) has excellent anticorrosive, anti-freezing and cooling properties and may be used constantly for 2 years or 2000 hours.
   It is advisable to use Komatsu Supercoolant coolant (AF-NAC) at all times.
2) For information on dilution ratio of the super coolant in water, see "4.4.1 COOLANT".
3) To keep the anticorrosive properties of the Supercoolant (AF-NAC), always keep its density between 30% and 68%.

Note 4:
Use only low- or ultra low-sulphur content fuel.

4.4.1 COOLANT

Use only original Komatsu coolant (AF-NAC), which should be diluted according to the minimum atmospheric temperature following the table below:

Minimum atmospheric temperature	°C	above -10	-15	-20	-25	-30	-35	-40
Coolant quantity	litres	0.93	1.12	1.27	1.43	1.55	1.68	1.80
Water quantity	litres	2.17	1.98	1.83	1.67	1.55	1.42	1.30
Volume percentage	%	30	36	41	46	50	54	58

NOTE

- The percentage of original Komatsu coolant (AF-NAC) should never be below 30% in order to avoid corrosion.

4.4.2 APPROVED SYNTHETIC BIODEGRADABLE LUBRICANTS TYPE HEES

Our machines can be filled with synthetic biodegradable hydraulic oil type HEES not of plant origin and therefore the use of the oils indicated in the following table is authorized and recommended:

SUPPLIER	SYNTHETIC BIODEGRADABLE OIL TYPE “HEES”
KOMATSU	BO 46 G4 (KES 07.872)
AGIP	—
ARAL	—
AVIA	—
BP	—
CONDAT	CONDAT D 46 K
ELF	—
ESSO	—
FINA	BIOHYDRAN SE 46
FUCHS	—
KENDALL	—
KUWAIT PETROLEUM K8	—
MOBIL	EAL SYNDRAULIC
MOBIL (USA)	—
PAKELO	—
PANOLIN	HLP SYNTH 46
SHELL	—
TAMOIL	—
TEXACO	—
TOTAL	HYDROBIO 46
VALVOLINE	—

⚠ CAUTION

- **It is not possible to mix synthetic biodegradable oil type HEES with ordinary hydraulic oils, since when the temperature increases insoluble compounds are generated, which are deposited on the filters and clog them (the maximum concentration of ordinary oil cannot exceed 1% of the total quantity of oil).**
- **Biodegradable oil can be used only in the hydraulic system; it cannot be used in the engine, the transmissions, the braking system, etc.**
- **Before introducing the biodegradable oil in the hydraulic system, empty the system completely, disconnecting the cylinders and all the parts that may contain ordinary oil, and replace the drain filter with a new one.**
  Start the engine and let it idle without using the work equipment, wait until the oil reaches a temperature of at least 40°C, then start moving the equipment, so that all the parts of the system are filled with oil. Stop the engine and check the oil level (see "3.3.1.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE" - " CHECKING THE OIL LEVEL IN THE HYDRAULIC TANK AND TOPPING UP").

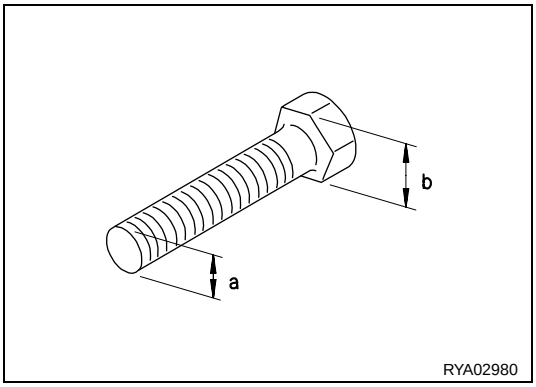
4.5 TIGHTENING TORQUES

4.5.1 STANDARD TIGHTENING TORQUES FOR SCREWS AND NUTS

⚠ CAUTION

- **If screws, nuts or other parts are not tightened with the required torque, they may become loose or damage the components with which they cooperate, and this may cause machine failures or operation problems. Always pay the utmost attention when carrying out tightening operations.**

If not specified otherwise, tighten the screws and nuts applying the torques specified in the table.
If it is necessary to replace a screw or a nut, always use Komatsu original spare parts having the same size of the part to be replaced.



★ Nm (Newton metre): 1 Nm = 0.102 kgm

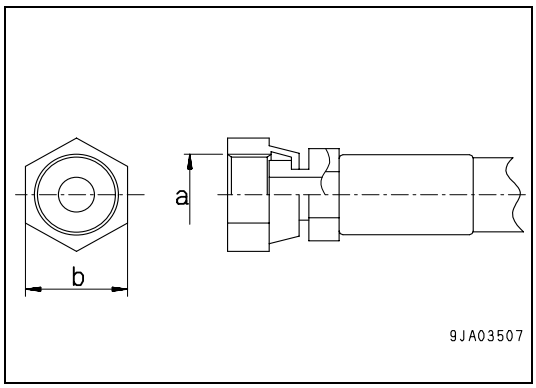
Thread diameter (a) (mm)	Pitch (mm)	Wrench size (b) (mm)	Driving torque:			
			Standard value		Use limit	
			Nm	kgm	Nm	kgm
6	1	10	13,2	1,35	11,8-14,7	1,2-1,5
8	1,25	13	31	3,2	27-34	2,8-3,5
10	1,5	17	66	6,7	59-74	6,0-7,5
12	1,75	19	113	11,5	98-123	10,0-12,5
14	2	22	172	17,5	153-190	15,5-19,5
16	2	24	260	26,5	235-285	23,5-29,5
18	2,5	27	360	37	320-400	33,0-41,0
20	2,5	30	510	52,3	455-565	46,5-58,0
22	2,5	32	688	70,3	610-765	62,5-78,0
24	3	36	883	90	785-980	80,0-100,0
27	3	41	1295	132,5	1150-1440	118,0-147,0
30	3,5	46	1720	175,0	1520-1910	155,0-195,0
33	3,5	50	2210	225,0	1960-2450	200,0-250,0
36	4	55	2750	280,0	2450-3040	250,0-310,0
39	4	60	3280	335,0	2890-3630	295,0-370,0

IMPORTANT

- **This tightening torque table is not valid for screws or nuts that must fasten parts made of nylon or similar materials onto washers or components made of nylon or nonferrous metals or requiring specific tightening torques.**

4.5.2 STANDARD TIGHTENING TORQUES FOR FLEXIBLE HOSES

If not specified otherwise, tighten the nuts of the hoses applying the torque specified in the table.
If it is necessary to replace a hose, always use Komatsu original spare parts having the same size of the part to be replaced.



★ **Nm (Newton metre): 1 Nm = 0.102 kgm**

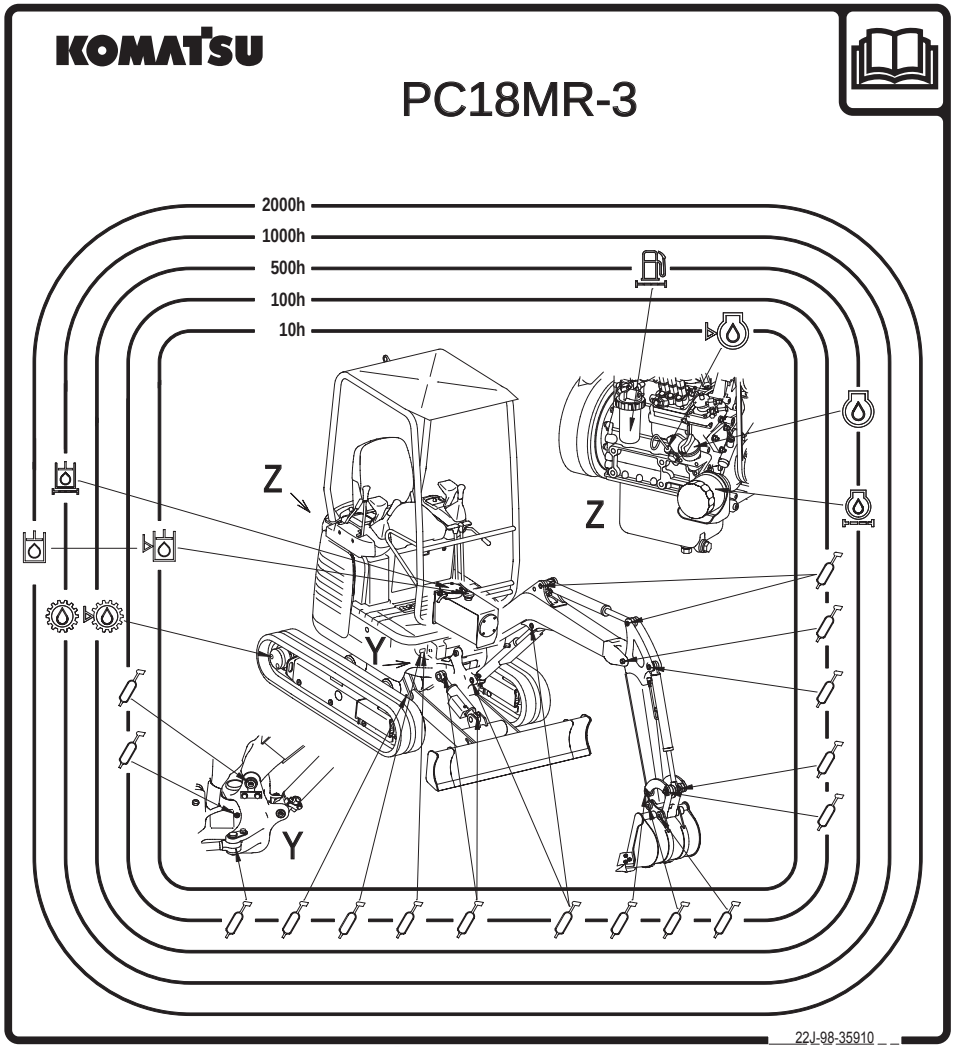
Thread diameter (a)	Wrench size (b) (mm)	TIGHTENING TORQUE	
		Nm	kgm
9/16” - 18UNF	19	34 - 54	3,5 - 5,5
11/16” - 16UN	22	54 - 93	5,5 - 9,5
13/16” - 16UN	27	84 - 132	8,5 - 13,5
1” - 14UNS	32	128 - 186	13,0 - 19,0
1.3/16” - 12UN	36	177 - 245	18,0 - 25,0

4.6 LUBRICATION

4.6.1 LUBRICATION DIAGRAM

IMPORTANT

- **For details on how to lubricate specific parts, see "4.9.4.a LUBRICATION".**
- **The type of lubricant to be used is indicated in the lubricant table (see "4.4 FUEL, COOLANT AND LUBRICANTS").**



RKA30750

- **Grease**
- **Fuel filter**
- **Engine oil**
- **Engine oil filter**
- **Engine oil level**
- **Hydraulic oil**
- **Hydraulic oil filter**
- **Hydraulic oil level**
- **Final reduction gear oil**
- **Final reduction gear oil level**

4.7 PERIODICAL CHANGE OF SAFETY-RELATED COMPONENTS

To ensure safety at any moment while driving and using the machine, the operator must carry out all the routine maintenance operations prescribed. Furthermore, the operator must periodically change the components indicated in the table in the following page, which are especially related to safety and fire-prevention rules. These components are subject to wear and since it is particularly difficult to evaluate their conditions through simple routine maintenance, after a certain time interval it is advisable to change them independently of their state, in order to keep them efficient over time. Repair or replace these components immediately in case of failures or anomalies, even if the time interval prescribed for their change has not elapsed yet.

If the pipe clamps show signs of deterioration, like deformations or cracks, provide for changing them together with the pipes.

In addition to the periodical change of the components listed in the following page, the inspections described below are to be carried out on the hydraulic pipes. Whenever anomalies are detected, carry out the necessary adjustment operations and replacements, or take any other measure required.

For the quantities and codes of the safety-related components to be changed, see the spare parts catalogue. When changing pipes, always change O rings, gaskets and analogous components.

Type of check	**Items to be checked**
Before starting the engine	Leakages from joints, hydraulic pipes or fuel pipes.
Periodically (monthly)	Leakages from joints, hydraulic pipes or fuel pipes. Damaged hydraulic or fuel pipes (cracks, wear and tear).
Periodically (yearly)	Leakages from joints, hydraulic pipes or fuel pipes. Deteriorated, twisted, damaged hydraulic or fuel pipes (cracks, wear and tear) or pipes in contact with other parts of the machine.

4.7.1 SAFETY-RELATED PARTS

No.	Safety-related components that periodically need changing	Q.ty	Change interval
1	Fuel pipe (fuel tank - water separator)	1	Every 2 years or 4000 hours, whichever occurs first.
2	Fuel pipe (water separator – fuel pump)	1	
3	Fuel pipe (fuel pump - fuel filter)	1	
4	Fuel pipe (fuel filter - injection pump)	1	
5	Fuel pipe (fuel filter – fuel tank)	1	
6	Fuel return pipe (fuel filter - injection pump)	1	
7	Fuel return pipe (between the nozzles)	2	
8	Fuel return pipe (nozzles – injection pump)	1	
9	Fuel return cap	1	
10	Hydraulic pipe (main pump suction)	2	
11	Hydraulic pipe (main pump delivery)	4	
12	Hydraulic pipe (boom cylinder)	4	
13	Hydraulic pipe (boom cylinder)	4	
14	Hydraulic pipe (bucket cylinder)	4	
15	Hydraulic pipe (swing cylinder)	2	
16	Accumulator (for control circuit)	1	
17	Seat belts	1	After 5 years from the production date indicated on the belt back or every 3 years from first use, whichever is the shortest period.

4.8 MAINTENANCE PLAN

If the machine is equipped with hydraulic breaker, the maintenance schedule for some components will be different. For further details, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER", in order to be able to provide for correct maintenance.

4.8.1 MAINTENANCE PLAN

WHEN REQUIRED

CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

MAINTENANCE EVERY 100 HOURS OF OPERATION

MAINTENANCE AFTER THE FIRST 500 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used) (Operations to be carried out together with those prescribed in paragraph "4.9.6 MAINTENANCE EVERY 500 HOURS OF OPERATION")

MAINTENANCE EVERY 500 HOURS OF OPERATION

MAINTENANCE EVERY 1000 HOURS OF OPERATION

MAINTENANCE EVERY 1500 HOURS OF OPERATION

MAINTENANCE EVERY 2000 HOURS OF OPERATION

4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER

The hydraulic oil used in the machines provided with demolition hammer deteriorates more quickly than the oil used in normal digging machines, therefore it is advisable to respect the following maintenance plan.

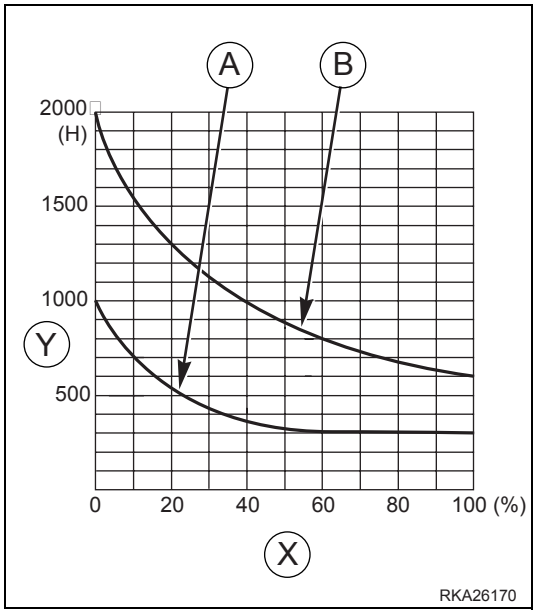
4.8.2.a CHANGING THE HYDRAULIC OIL FILTER

In new machines, change the filter after the first 100÷150 hours of operation and for the successive changes keep to the indications given in the table on the right.
If the machine contains synthetic biodegradable oil type HEES, the filter must be changed after the first 50 hours of operation.

(A): Hydraulic fluid filter - replacement interval.

(X): Demolition hammer - use percentage (%).

(Y): Change interval (H)



4.8.2.b CHANGING THE HYDRAULIC OIL

Change the hydraulic oil in the tank according to the intervals indicated in the table on the right.
On machines containing synthetic biodegradable oil type HEES, change the oil after the first 500 hours of operation and for the successive changes keep to the indications given in the table on the right.

(B): Hydraulic oil replacement interval

(X): Demolition hammer - use percentage (%).

(Y): Change interval (H)

4.9 MAINTENANCE PROCEDURES

4.9.1 WHEN REQUIRED

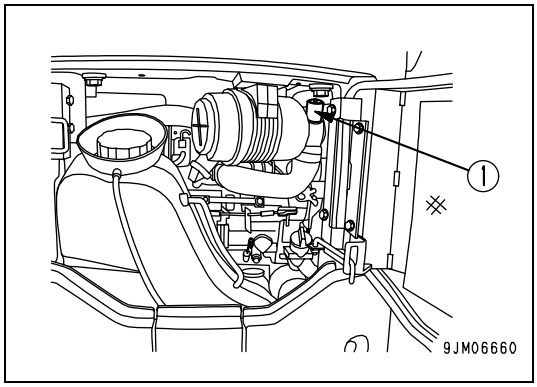
4.9.1.a CHECKING, CLEANING OR CHANGING THE AIR FILTER CARTRIDGE

⚠ WARNING

- **Remove the air filter only after stopping the engine and do not start the engine if the air filter is open.**
- **When compressed air is used to clean the filter, dust may get into the eyes. Wear safety goggles and a dust mask during the cleaning operations.**

Checking the cartridge

1. Open the engine hood. For further details, see paragraph"3.2.6 ENGINE HOOD".
2. If the red piston of the filter clogging indicator (1) is visible, clean the air filter cartridge.

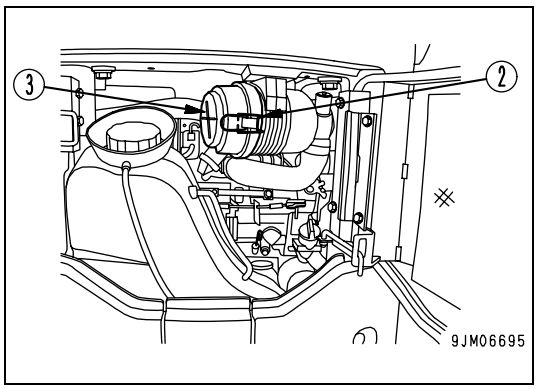


IMPORTANT

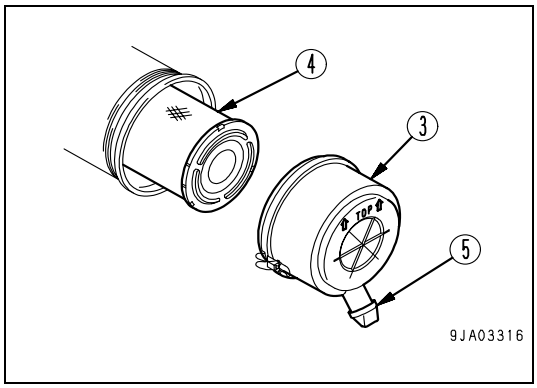
- **Do not clean the cartridge if the red piston of the filter clogging indicator (1) is not visible.**
- **In any case, check the cartridge for clogging every 50 hours of operation.**

Cleaning or changing the cartridge

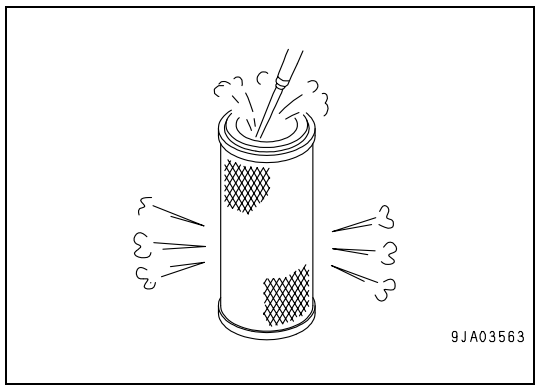
1. Open the engine hood. For further details, see paragraph"3.2.6 ENGINE HOOD".
2. Release the couplings (2) and remove the cap (3).



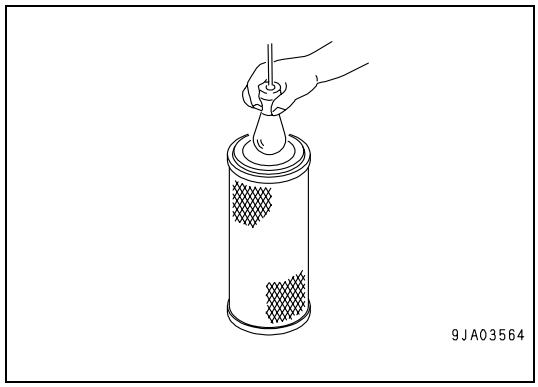
3. Remove the cartridge (4) and cover the air connector at the end of the air filter body with a clean cloth or adhesive tape.
4. Clean the inside of the filter body, the cap (3) and the drain valve (5).



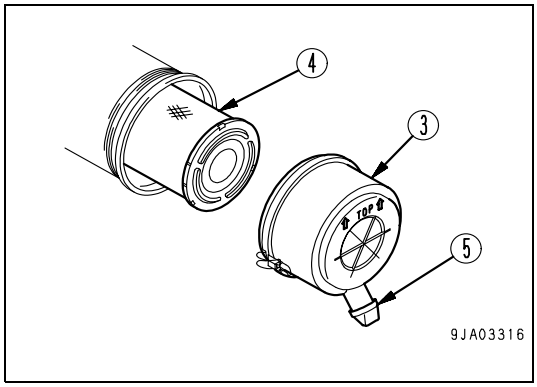
5. Slightly strike the filtering element (4) on the palm of your hand, in such a way as to remove the dust, and blow compressed air on the inner surface, keeping the air jet at a distance of approximately 15 cm and the pressure below 4-5 bars.



6. After the cleaning operations, inspect the filtering surface for damage by introducing a lamp into it and carefully check the front gaskets. If the cartridge is damaged, change it.



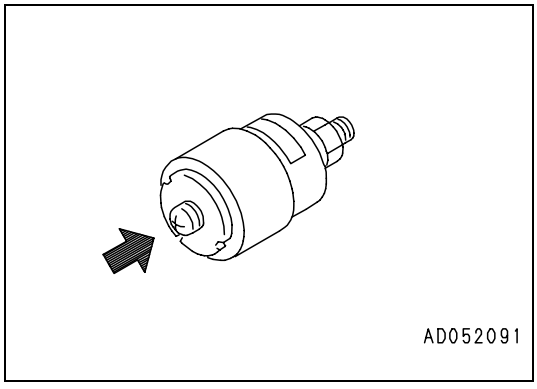
7. Remove the cloth or adhesive tape used to cover the air connector inside the filter body.
8. Install the cleaned cartridge (4) or a new cartridge.
9. Position the cap (3) with the drain valve (5) facing downwards and secure it with the couplings (2).



10. Press the button on the filter clogging indicator (1) so that the red piston returns to its original position.

IMPORTANT

- **If shortly after installing the cleaned cartridge the red piston of the clogging indicator is visible again, it is necessary to change the cartridge.**
- **Change the filtering element if it has been cleaned for 5 times or used for one year.**



4.9.1.b BATTERY ELECTROLYTE LEVEL CHECK

⚠ WARNING

- **Carry out this check with the machine parked on level ground.**
- **Check the level only when the engine is stopped and, if necessary, add distilled water only before starting the operations.**
- **Always wear protective goggles and waterproof gloves.**
- **To prevent gas explosions, do not use naked flames, do not smoke and avoid producing sparks due to short circuits.**
- **The battery electrolyte is dangerous; in case of contact with the eyes or skin, rinse with plenty of water and consult a doctor without delay.**

IMPORTANT

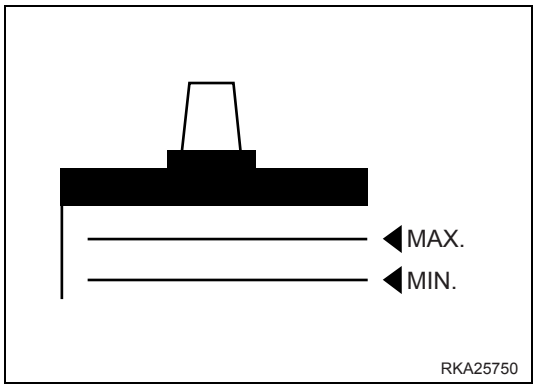
- **It is advisable to add distilled water just before starting work, in order to prevent if from freezing.**
- **Before putting back the cell caps, make sure that the breather holes are not clogged.**
- **Restore the level adding only distilled water. If the level is low because the liquid has spilled, add sulphuric acid diluted until the concentration suitable for the room temperature is obtained, see "3.5.1.3 BATTERY".**
- **Check that the terminals and connection cables are not rusted; if necessary, clean and protect them with antioxidant grease.**

Check battery electrolyte level at least once a month and strictly observe the safety procedures according to the following indications.

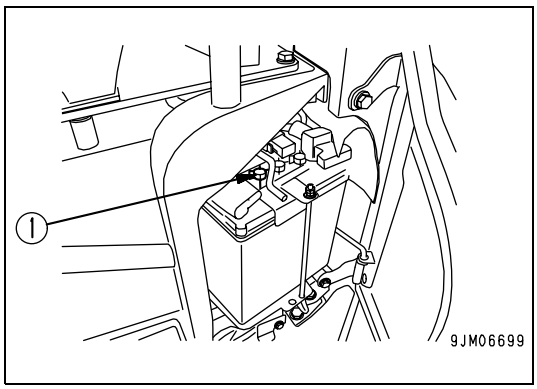
CHECKING ELECTROLYTE LEVEL ON THE BATTERY SIDE

Whenever possible, check electrolyte level on the battery side. Proceed as indicated below.

1. Open the battery cover, see "3.2.8 BATTERY COVER".
2. Use a wet cloth to clean the area around the level references and make sure that the electrolyte level is between the MAXIMUM and MINIMUM reference marks.
   Do not dry the battery with a dry cloth, because static electricity may cause fire or explosion.



3. If the electrolyte level is below the intermediate point between the MAXIMUM and MINIMUM reference marks, remove the plug (1) and add distilled water up to the MAXIMUM level.
4. After topping up, screw in the plug (1).

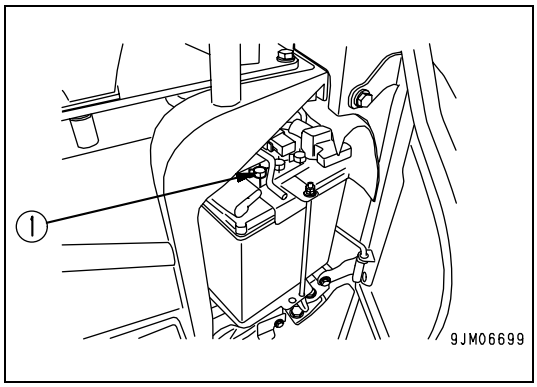


NOTE
- Do not add distilled water or electrolyte beyond the level indicated, as this would reduce the battery service life and electrolyte leakage could result.
- If the distilled water added goes over the MAXIMUM reference mark, take out excess electrolyte with a small pump and neutralise it with sodium bicarbonate, then rinse out with abundant running water or consult the Komatsu Distributor or the battery manufacturer.

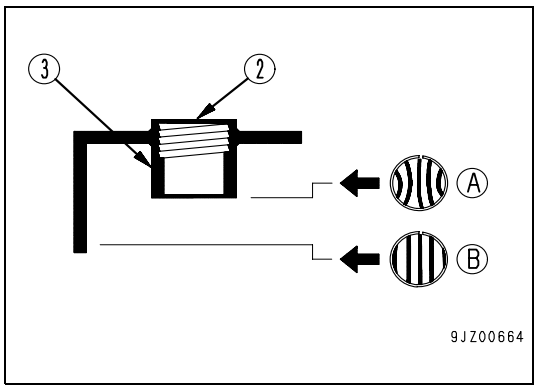
WHENEVER ELECTROLYTE LEVEL CANNOT BE CHECKED ON THE BATTERY SIDE

If electrolyte level cannot be checked on the battery side, or if the MAXIMUM level is not indicated, check following the steps below.

1. Open the battery cover, see "3.2.8 BATTERY COVER".
2. Remove the plug (1) of the battery, look through the filler opening (2) and check the electrolyte surface. If the electrolyte does not reach the sleeve (3), add distilled water until the level is at the sleeve bottom (MAXIMUM reference mark).



(A) Correct level: The electrolyte level reaches the sleeve bottom, so the tension lifts the surface and the plate seems to be deformed.
(B) Level too low: The electrolyte level does not reach the sleeve bottom, so the plate seems normal.
3. After topping up, screw in the plug (1).



NOTE
- Do not add distilled water or electrolyte beyond the level indicated, as this would reduce the battery service life and electrolyte leakage could result.
- If the distilled water added goes over the MAXIMUM reference mark, take out excess electrolyte with a small pump and neutralise it with sodium bicarbonate, then rinse out with abundant running water or consult the Komatsu Distributor or the battery manufacturer.

WHENEVER POSSIBLE, USE AN INDICATOR TO CHECK ELECTROLYTE LEVEL

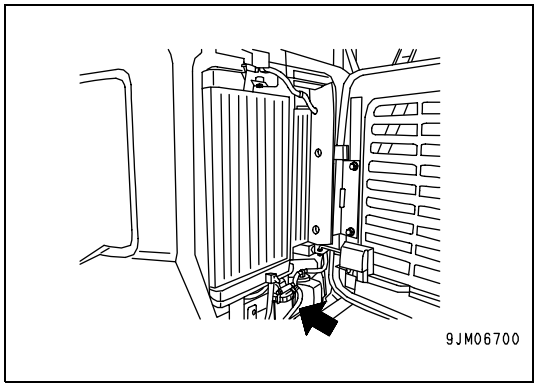
If an indicator can be used to check electrolyte level, proceed as indicated below.

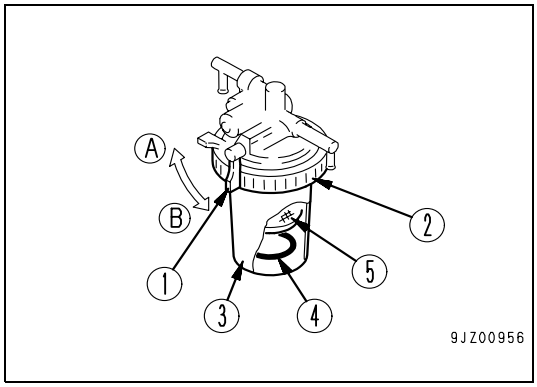
4.9.1.c CLEANING THE WATER SEPARATOR FILTER

⚠ WARNING

- **Change the filter after work, when the engine has cooled down to 40÷45°C.**
- **During these operations some fuel may be spilled; clean the dirty areas immediately, in order to prevent any risk of slipping or fire.**

1. Open the radiator cover. (For details, see "3.2.7 RADIATOR COVER").
2. Turn the valve (1) of the water separator to the closed position (A).
3. Loosen the metal ring (2) with a filter wrench and remove the casing (3) and the filtering element (5).
   Take care not to lose the red ring (4) that is positioned inside the casing.
4. Wash the inside of the casing (3) and the filtering element (5) with diesel or flushing oil.
5. After washing, install the filtering element (5).
6. Place the red ring (4) in the casing (3) and fill it with fuel, then put back the casing and tighten the metal ring (2).
   Driving torque: from 14.7 to 19.6 Nm (from 1.5 to 2.0 kgfm).
7. Turn the decanting device valve (1) to the opening position (B) and purge the air as indicated in section "4.9.6.b CHANGING THE FUEL FILTER CARTRIDGE".





IMPORTANT

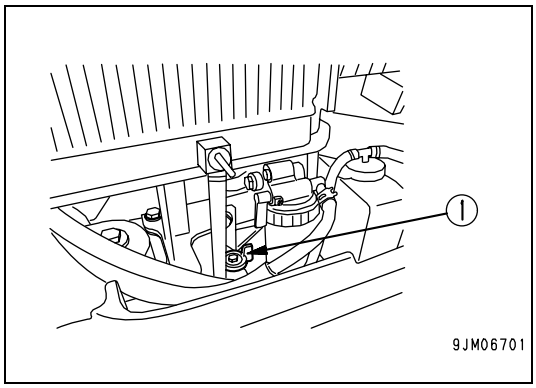
- **When removing the filter, be careful so as not to lose the sump red ring.**
- **If the filtering element is excessively clogged or damaged, change it.**

4.9.1.d DRAINING THE FUEL TANK

⚠ WARNING

- **When draining the fuel tank, avoid spilling fuel, since this may cause fires.**
- **If some fuel is accidentally spilled, clean the dirty area immediately, in order to prevent it from getting slippery and to avoid fires.**

1. Swing the revolving frame so that the drain valve (1) is positioned between the tracks.
2. Open the radiator cover. For details, see paragraph "3.2.7 RADIATOR COVER".
3. Open the drain valve (1) and drain the sediments and water collected at the bottom together with the fuel.
   Collect fuel and sediments into a container with suitable capacity.
4. When clean fuel flows out, close the drain valve (1).



IMPORTANT

- **The tank must be drained before starting the engine, with temperatures exceeding 0°C; when the temperature is below 0°C, the tank must be drained at the end of work or in any case with the machine at operating temperature, in order to prevent the condensate from freezing.**
- **The condensate and the impurities that may have accumulated inside the tank must be drained before refuelling.**
- **Never use trichloroethylene to wash the inside of the tank. Use exclusively diesel oil.**

4.9.1.e CHECKING AND ADJUSTING THE STEEL TRACK TENSION

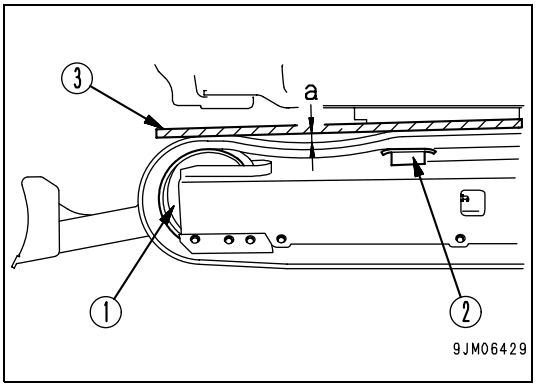
The pins and bushings of the undercarriage wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine works. Therefore it is necessary to check the track tension frequently and to adjust it when necessary.

IMPORTANT

- **To carry out the check and the corresponding maintenance operation, stop the machine on firm and level ground. Check both tracks.**

CHECK

1. With the engine idling, move the machine forward of a distance corresponding to the length of the track on the ground, then lower the equipment to the ground and stop the engine.
2. Choose a perfectly flat rod (3) long enough to cover the distance between the idler roller (1) and the track sliding plate (2), then position it on the track.
3. Measure the maximum deflection between the upper surface of the track and the lower surface of the rod.
   - Standard deflection
     The deflection value "**a**" should be included between 5 and 15 mm.



If the track tension does not correspond to the standard value, adjust it by proceeding as indicated below.

ADJUSTMENT

DANGER

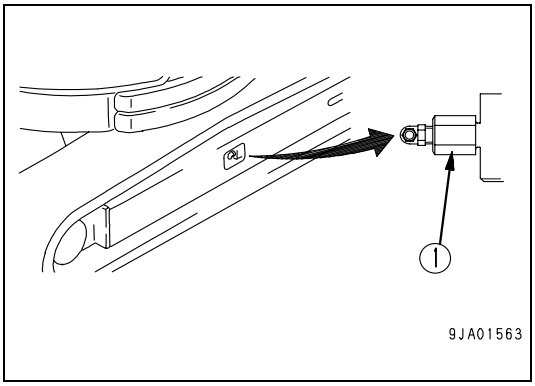
- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (1) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (1). If the track tension does not decrease after this operation, contact your Komatsu Distributor.

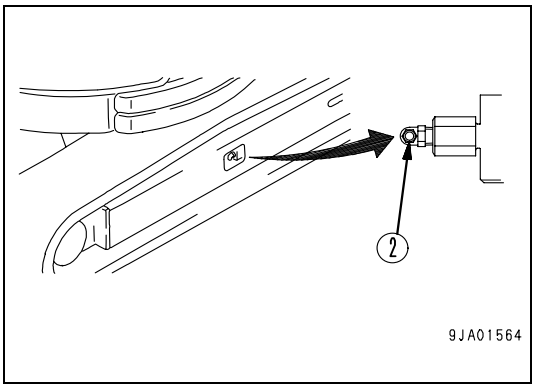
WARNING

- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

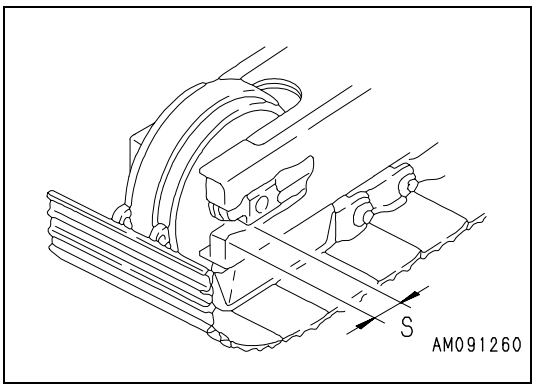
INCREASING THE TRACK TENSION

1. Carefully clean the grease valve (1) and inject grease through the grease nipple (2) until reaching the desired tension.





2. When after the injection of grease the idler roller sliding plate reaches the measure «S» of 0 mm and the track is not sufficiently stretched, this means that the pins and bushings are excessively worn. Therefore, it is necessary to exchange or replace the pins and bushings.
   For any replacement or repair, contact your Komatsu Distributor.

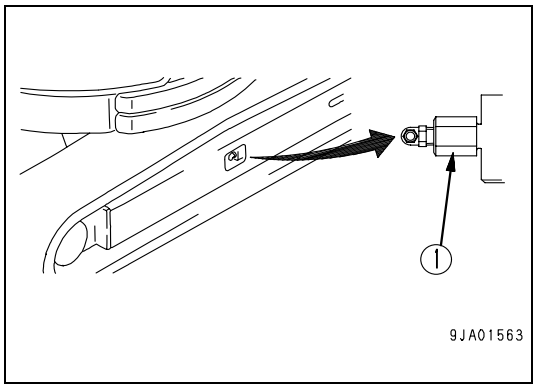


REDUCING THE TRACK TENSION

⚠ DANGER

- **It is extremely dangerous to let the grease out following any procedure different from those illustrated below.**
- **If the track tension cannot be reduced with this operation, contact your Komatsu Distributor, who will provide for the necessary repairs.**

1. Gradually loosen the grease valve (1) to let the grease out; do not give the valve more than one turn.
2. If the grease does not come out smoothly, move the machine slowly forward and backward covering a short distance.
3. Tighten the valve and remove any trace of grease.
4. Move the machine forward and backward, then stop it and make sure that the track tension is correct.



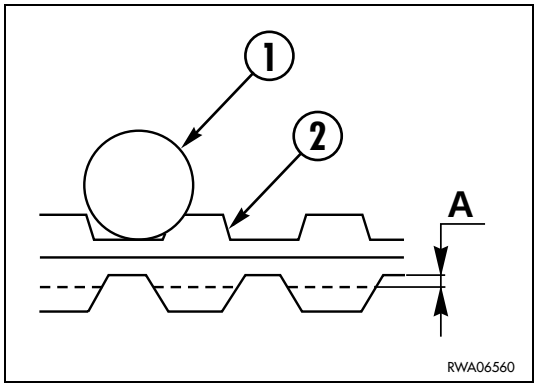
IMPORTANT

- **The degree of wear of pins and bushings varies depending on the work conditions and on the characteristics of the ground.**
  It is therefore necessary to check the track tension frequently, in order to ensure that it is always correct.
- **When working on rocky or very irregular surfaces, increase the track tension in order to prevent stones or debris to get stuck between the tracks and the sprocket; on the other hand, reduce the track tension when working on soft or muddy ground, since the soil penetrates between rollers and tracks and tends to increase the tension.**

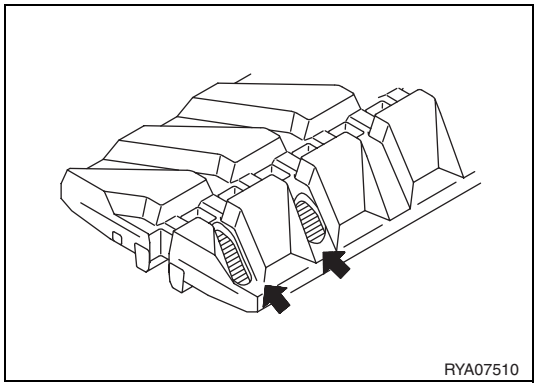
4.9.1.f CHECKING THE RUBBER TRACKS

Change the rubber tracks when they reach the indicated wear limits.

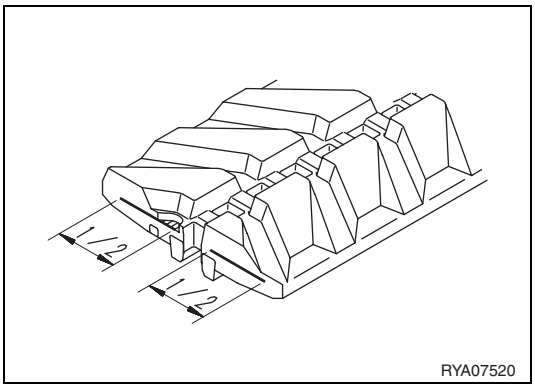
1. When the height “A” of the rubber claw is less than 5 mm: in this case, in fact, the track may slip and its traction force be reduced..
   1- Roller
   2- Rubber track



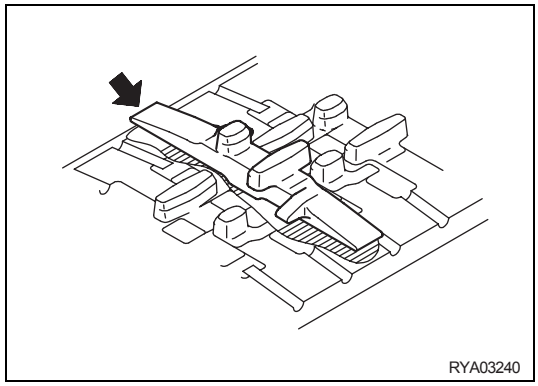
2. When the steel core is visible in two or more points of the track.



3. When more than half of the steel core cords at the centre of the track are cut.



4. When one or more steel cores have come off the track or are pushed out due to excessive tension.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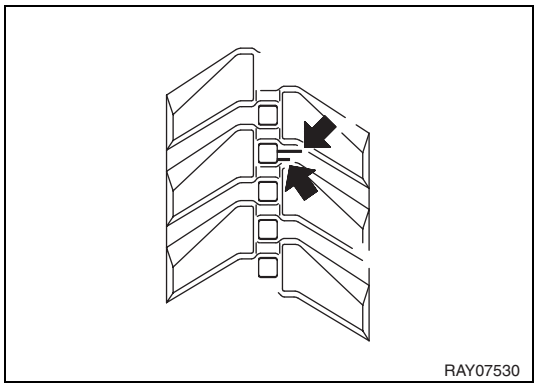
5. If the rubber track cannot be tensioned correctly through the injection of grease, check the track tensioner gaskets and if necessary change them or even the track.
(See "4.9.1.g CHECKING AND ADJUSTING THE RUBBER TRACK TENSION").

IMPORTANT
- **If the track tension is such that the track may come off its seat, the track may be lengthened and the track tensioner cylinder damaged.**

6. If the broken area between the rubber track claws reaches a length of approximately 60 mm, the track must be repaired.
It must be immediately repaired also when the steel cores are visible, even if the broken area is very small.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IMPORTANT
- **If the length of the broken area is less then 30 mm or its depth is less than 10 mm, it is not necessary to repair the track.**
- **For any repair or replacement, contact your Komatsu Distributor.**

4.9.1.g CHECKING AND ADJUSTING THE RUBBER TRACK TENSION

The rubber tracks wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine is working. Therefore, it is necessary to check the track wear and tension frequently, in order to keep the tracks correctly tensioned.

IMPORTANT

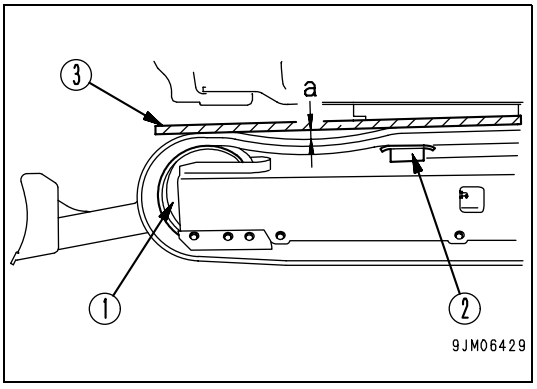
- **To carry out the check and the corresponding maintenance operation, stop the machine on firm and level ground. Check both tracks.**
- **In particular, on new machines or after the installation of new tracks, it is advisable to carry out a first check after 10 hours of operation.**
- **Adjusting the track tension frequently until the initial slackening does not occur any longer will prevent the tracks from coming off due to insufficient tension.**
- **If the machine works with loose rubber tracks, they may come off and cause the steel cores to wear out too early.**

CHECK

1. With the engine idling, move the machine forward of a distance corresponding to the length of the track on the ground, then lower the equipment to the ground and stop the engine.
2. Choose a perfectly flat rod (3) long enough to cover the distance between the idler roller (1) and the track sliding plate (2), then position it on the track.
3. Measure the maximum deflection between the upper surface of the track and the lower surface of the rod.

Standard deflection

The deflection “a“ should be included between 1 and 3 mm.

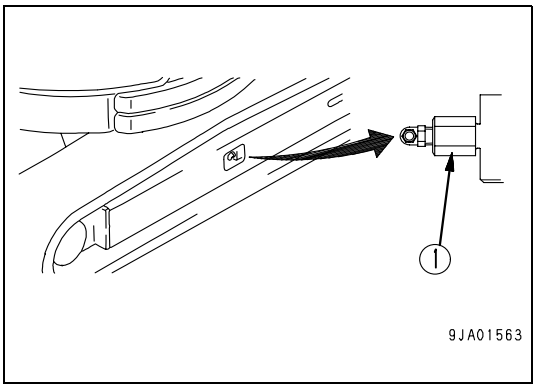


If the track tension does not correspond to the standard value, adjust it by proceeding as indicated below.

ADJUSTMENT

⚠ DANGER

- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (1) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (1). If the track tension does not decrease after this operation, contact your Komatsu Distributor.



⚠ WARNING

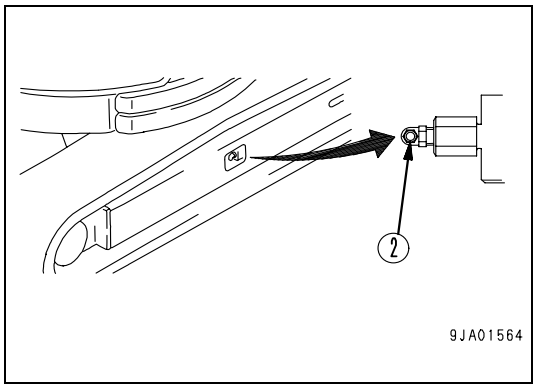
- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

INCREASING THE TRACK TENSION

IMPORTANT

- **The standard adjustment value is low, therefore take care to avoid increasing the rubber track tension excessively.**

1. Carefully clean the grease valve (1) and inject grease through the grease nipple (2) until reaching the desired tension.
2. If the rubber track cannot be tensioned enough by injecting grease, it is necessary to change the track or the track tensioner gaskets. For any repair or replacement, contact your Komatsu Distributor.

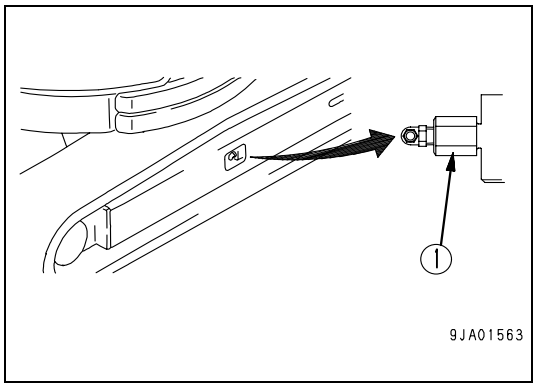


REDUCING THE TRACK TENSION

⚠ DANGER

- **It is extremely dangerous to let the grease out following any procedure different from those illustrated below.**
- **If the track tension cannot be reduced with this operation, contact your Komatsu Distributor, who will provide for the necessary repairs.**

1. Gradually loosen the grease valve (1) to let the grease out; do not give the valve more than one turn.
2. If the grease does not come out smoothly, move the machine slowly forward and backward covering a short distance.
3. Tighten the valve and remove any trace of grease.
4. Move the machine forward and backward, then stop it and make sure that the track tension is correct.



IMPORTANT

- **The rubber tracks wear out to different degrees, depending on the work conditions and on the characteristics of the surface on which the machine is working. It is therefore necessary to check the track tension frequently, in order to ensure that it is always correct.**
- **When working on soft or muddy ground, reduce the track tension to extend the service life of the components.**
- **After the installation of new tracks, it is advisable to carry out a first check after 10 hours of operation.**

4.9.1.h CHANGING THE RUBBER TRACKS

⚠ WARNING

- **This operation must be carried out by two persons. One operator must be seated in the cab and manoeuvre the machine following the signals of the other operator who carries out the change and the adjustment.**
- **The track must be changed with the frame raised from the ground; be careful not to shift any control lever while the operator is working.**
- **During the change do not remove any component apart from the track.**
- **If the track tension cannot be reduced by means of the procedure described above, contact your Komatsu Distributor for the necessary repairs.**

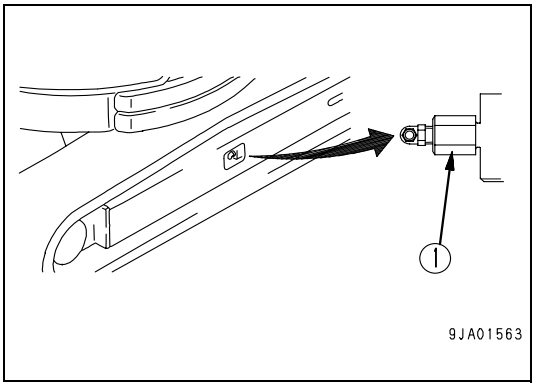
IMPORTANT

- **It is possible to switch over from rubber to steel tracks. However, the idler protection must be removed and the shock absorber, adjusted. This operation can be performed only by specialized personnel at any Komatsu Distributor.**

REMOVING THE RUBBER TRACK

⚠ DANGER

- **The grease contained in the hydraulic cylinder is pressurized. For this reason, do not give the grease valve (1) more than one turn when loosening it; in fact, if the valve is loosened excessively it may be pushed out due to the grease pressure and this is very dangerous for the operator..**
  Do not loose any component apart from the valve (1). If the track tension does not decrease after this operation, contact your Komatsu Distributor.
- **It is extremely dangerous to let the grease out following any procedure different from the one indicated below.**
- **When installing or removing the tracks, before turning the sprocket make sure that the grease contained in the cylinder has been removed.**

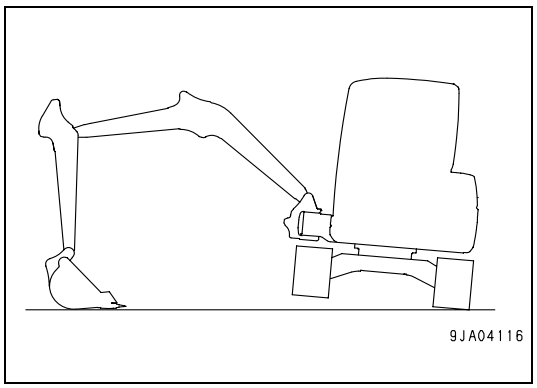


⚠ WARNING

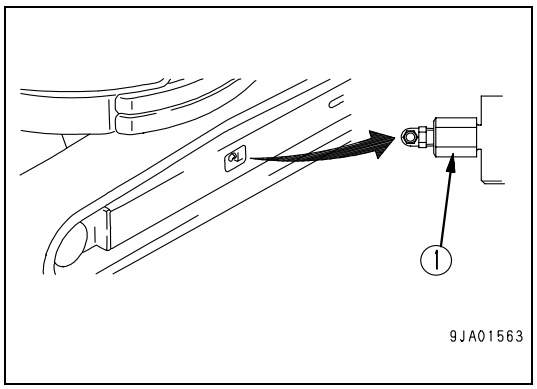
- **If the resistance met when injecting the grease is excessive, move the machine forward and backward covering a short distance.**

Stop the machine on a firm and level surface and lower the equipment to the ground.

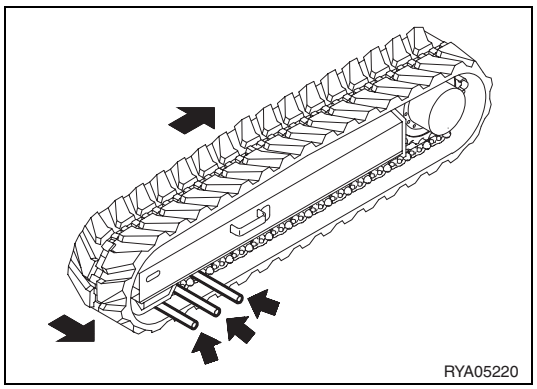
1. Raise the undercarriage using boom and arm.
   Carry out this operation shifting the control levers very slowly.



2. Gradually loosen the grease valve (1) to let the grease out; do not give the valve more than one turn.
3. If the grease does not come out smoothly, move the machine slowly forward and backward covering a short distance.

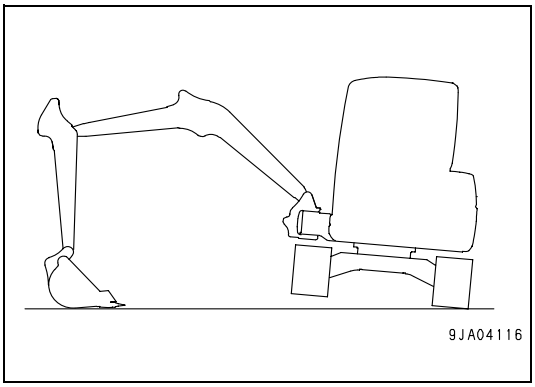


4. Introduce the steel tubes in the track, turn the sprocket as if in reverse, so that the steel tubes move with the track and get engaged with the idler roller; make the track slide sidewards and remove it.

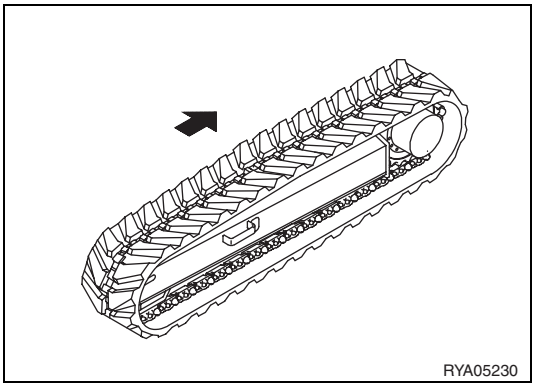


INSTALLING THE RUBBER TRACKS

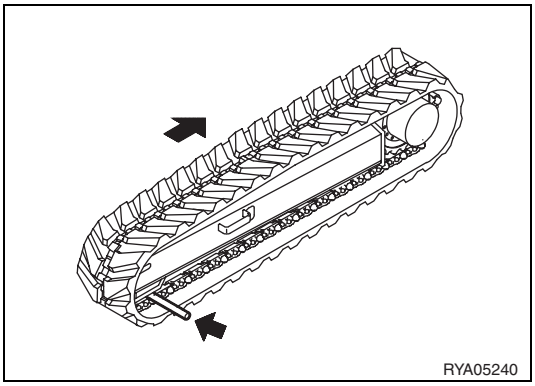
1. Raise the undercarriage using boom and arm and make sure that the grease contained in the cylinder has been eliminated.
   Carry out this operation shifting the control levers very slowly.



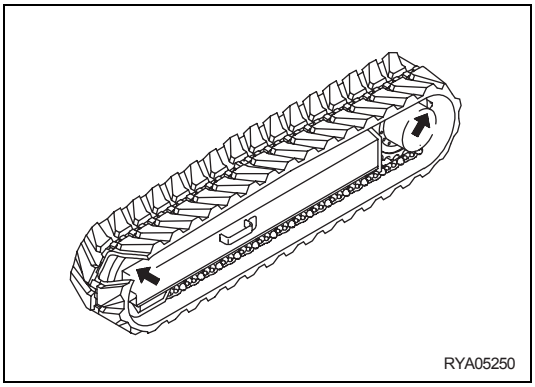
2. Install the rubber tracks on the sprocket by fitting the driving blocks.
3. Turn the sprocket as if in reverse, then push the track towards the revolving frame.



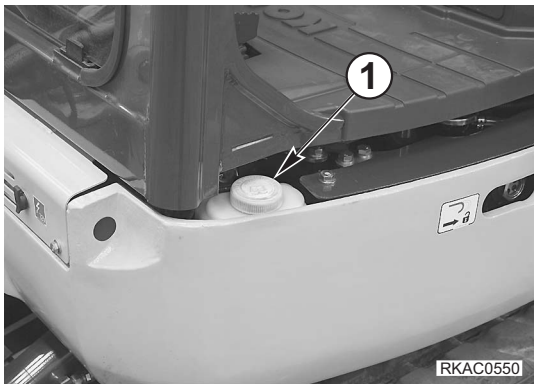
4. Using a steel tube, position the track and turn the sprocket again.
5. Make sure that the track is correctly installed on the sprocket and the idler roller.
6. Adjust the track tension. For details, see "4.9.1.g CHECKING AND ADJUSTING THE RUBBER TRACK TENSION").



7. Make sure that the track tension is correct, that the track is correctly fitted in the sprocket and the idler roller, then rest the machine on the ground.



4.9.1.i CHECKING THE DETERGENT LEVEL IN THE WINDSIELD WASHER RESERVOIR (machine with cab)



The tank (1) is located under the driving cab and can be accessed after opening the sliding door. The tank holds liquid detergent used for cleaning the front windscreen; make sure that the reservoir is always full. If necessary, add non-flammable detergent of the type used for cars.
While topping up, be careful to prevent dust from getting into the reservoir.

IMPORTANT

- **To fill the reservoir, use only non-flammable detergent an ethyl alcohol based of the type used for cars.**
- **Do not use methyl alcohol based detergents may irritate the eyes.**
- **Do not use the antifreezes used in engine cooling systems.**

Quantity of detergent to be mixed with water

Proportions vary according to the ambient temperature. Before topping up, it is advisable to dilute the detergent with water according to the quantities indicated in the following table.

Area, season	Proportions	Freezing temperature
Normal	Detergent 1/3 Water 2/3	-10 °C
Cold area - winter	Detergent 1/2 Water 1/2	-20 °C
Very cold area - winter	Undiluted detergent	-30 °C

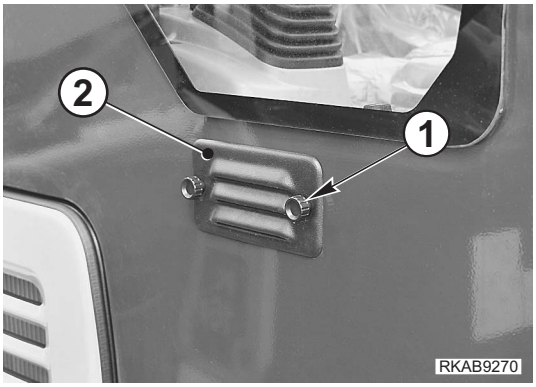
4.9.1.j LUBRICATION OF CAB DOOR HINGES (machines with cab)

Lubricate when the cab door squeaks when it is opened or closed, or when there are oxidation traces around the shoulder washers or their pivots.
Lubrication consists in filling the grease nipples placed on the hinge axis with grease.
For specifications on the grease type to be used, see "4.4 FUEL, COOLANT AND LUBRICANTS".

⚠ CAUTION

- **Inject grease until no more degraded grease is present.**
- **Once lubrication is finished, remove the spilt grease and thoroughly degrease the area.**

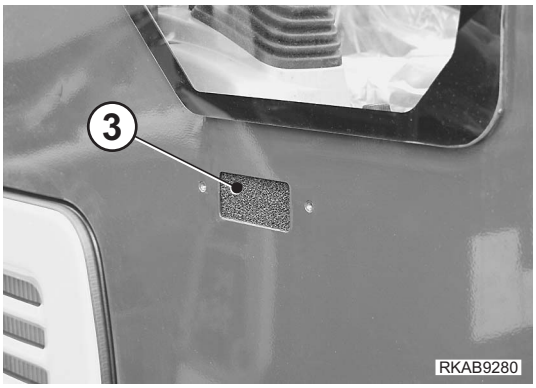
4.9.1.k CAB AIR FILTER CHECK AND CLEANING (machines with cab)



⚠ WARNING

- **When compressed air is used to clean the filter, dust may get into the eyes. Wear safety goggles and a dust mask during the cleaning operations.**

The air suction for the ventilation of the cab is protected by a filter positioned on the right side of the cab.
This filter blocks all the impurities contained in the air and must be cleaned whenever a decrease in air circulation is observed.
The filter can be reached from the outside of the cab. To clean the filtering element, proceed as follows:



1. Loosen the knobs (1), remove the external cover (2) and take out the filtering element (3).
2. Hit the element slightly on the palm of your hand to eliminate the dust and blow compressed air on its surfaces, keeping the jet at a distance of about 15 cm and making sure that the pressure does not exceed 4÷5 bars.
3. Carefully clean the filter casing, taking care to prevent any foreign body from entering the suction duct, and reassemble the unit.

IMPORTANT

- **If the filtering element is excessively clogged or damaged, change it with a new one.**

4.9.1.l CHECKING WINDSCREEN WIPER BLADE (machines with cab)

Check only after the windscreen wiper mechanism has been activated. Checking consists in detecting the faulty cleaning of the wiper carried out with the washer in function. If after cleaning, there are scratches, it means that the scrapping blade is deteriorated and it is necessary to replace the wiper.

IMPORTANT

- **For best functioning of the windscreen wiper mechanism, it is advisable to replace the wiper at least once a year. Replace it more often if you work in fairly critical environmental conditions. It is also advisable to clean the windscreen regularly to remove any dirt, grease or residue of any kind since they can hamper the wiper regular working.**

4.9.1.m BLEEDING THE HYDRAULIC SYSTEM

Start the engine (for details, see paragraph "3.3.1.5 STARTING THE ENGINE") and run it at idle for 10 minutes, then proceed as indicated below.

Purge the air from the cylinders.

IMPORTANT

- **If the engine runs at maximum rpm or if the cylinders are brought to the end of stroke soon after starting, the air sucked in by the cylinders may damage the piston gaskets.**

1. Run the engine at idle, extend and retract each cylinder 4 or 5 times, paying attention so as not to take it to the end of stroke (stop the cylinders about 100 mm away from the end of stroke).
2. Then, activate each cylinder 3 or 4 times up to the end of stroke.
3. Finally, activate each cylinder 4 or 5 times up to the end of stroke to fully remove the air.
4. Purge the air from the accessories (if fitted).

IMPORTANT

- **If the method to purge the air from the accessory is specified by the manufacturer, follow such instructions.**
- **After the bleeding operation, stop the engine and wait at least 5 minutes before starting work. This will eliminate the air bubbles from the oil present inside the hydraulic cylinders.**
- **Make sure that there are no oil leakages and remove any oil that may have been spilled.**

If a demolition hammer or another accessory is installed on the machine, run the engine at idle and press the control several times (around 10 times), until there is no more air coming from the accessory circuit.

4.9.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE

⚠ WARNING

- **Dirt, oil and fuel in the engine compartment near hot parts may damage the machine and even cause fires.**
  Check frequently and repair any leakage immediately; if they occur repeatedly, contact your Komatsu Distributor.

For details on the following items, see "3.3.1.2 CHECKS TO BE CARRIED OUT BEFORE STARTING THE ENGINE".

- Check the coolant level and top up
- Check the oil level in the oil pan and top up
- Check the fuel level and top up
- Check the oil level in the hydraulic tank and top up
- Check the air filter clogging indicator
- Decanting device check and cleaning
- Check the wiring systems
- Check the functionality of the horn

4.9.3 MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

The following maintenance operation should be carried out after the first 50 hours of use.

a - CHANGE THE HYDRAULIC OIL DRAIN FILTER

For further details, see paragraph “EVERY 1000 HOURS”.

4.9.4 MAINTENANCE EVERY 100 HOURS OF OPERATION

4.9.4.a LUBRICATION

⚠ WARNING

- **Do not turn the revolving frame during fifth wheel and swing pinion lubrication.**

IMPORTANT

- **Clean the grease nipples before using the grease gun and clean dirty grease leakage after lubrication.**
- **If the machine is used in difficult conditions, carry out this operation more frequently than usual.**
- **As a general rule, it is important to consider that each cylinder is provided with two grease nipples positioned on the couplings and that each pin serving as fulcrum point for a movement is provided with at least one grease nipple.**
- **When running in a new machine, lubricate every 10 hours for the first 100 hours of operation.**

LUBRICATING THE COMPONENTS OF THE SWING SYSTEM

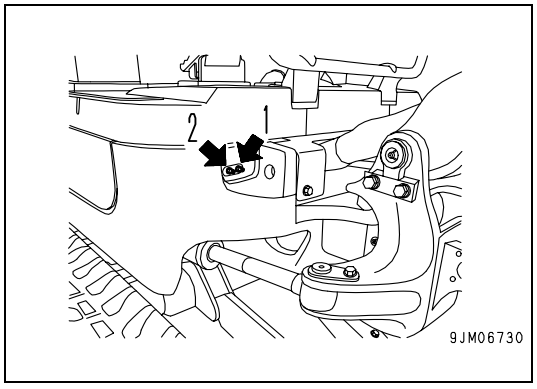
NOTE

- When grease is injected to lubricate the swing pinion and fifth wheel, turn the revolving frame slowly to change the position for greasing.

1. Carefully clean the grease nipples (1) and (2), and inject the grease indicated in the lubricant chart using a grease pump (see "4.4 FUEL, COOLANT AND LUBRICANTS").
2. After greasing, remove any trace of grease.

(1) Swing pinion (1 point)

(2) Fifth wheel (1 point)

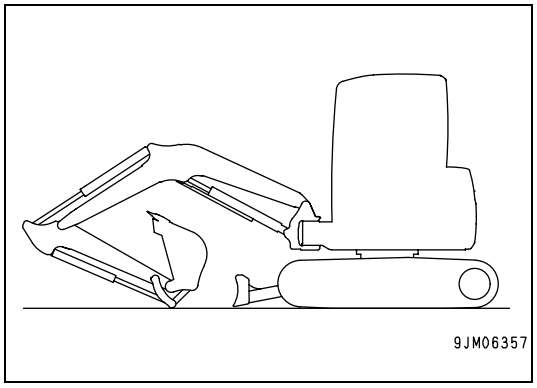


LUBRICATING THE WORK EQUIPMENT

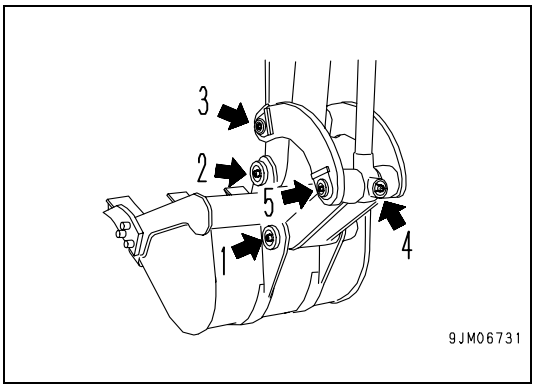
IMPORTANT

- **After carrying out digging operations with the equipment immersed in water, always lubricate the pins that have been in contact with water..**

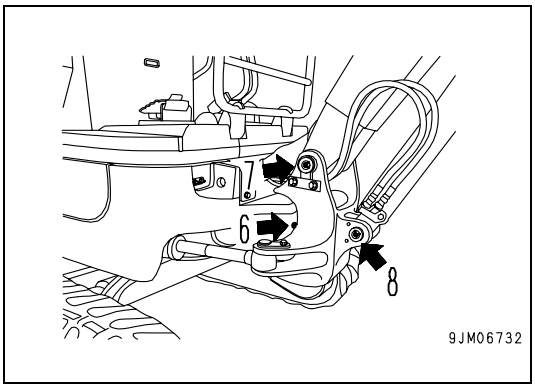
1. Position the machine as shown in the figure, lower the work equipment to the ground and stop the engine.
2. Carefully clean the grease nipples listed below, and inject the grease indicated in the lubricant chart using a grease pump (see"4.4 FUEL, COOLANT AND LUBRICANTS").
3. After greasing, remove any trace of grease.



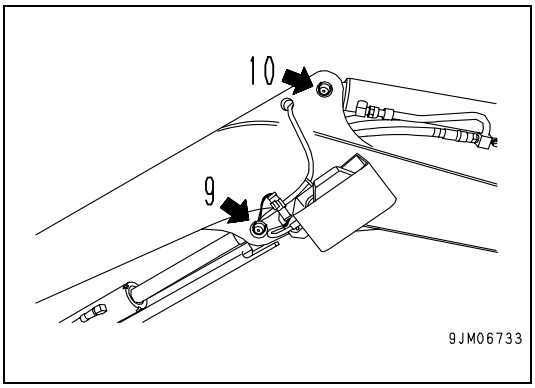
(1) Bucket-link connection pins (1 point)
(2) Arm–bucket connection pin (1 point)
(3) Arm–link connection pin (1 point)
(4) Bucket cylinder rod end (1 point)
(5) Link connection pin (1 point)



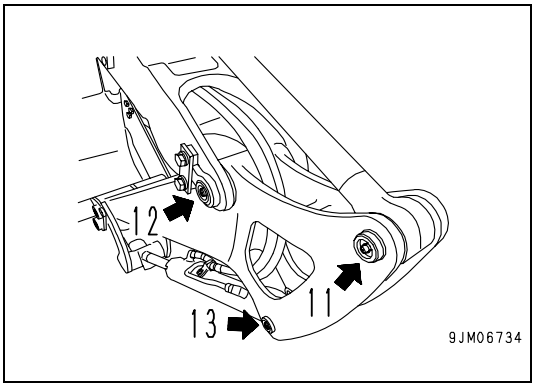
(6) Boom swing bracket pin (2 point)
(7) Boom base pin (1 point)
(8) Boom cylinder base pin (1 point)



(9) Boom cylinder rod end (1 point)
(10) Boom cylinder base pin (1 point)



(11) Boom cylinder rod end (1 point)
(12) Boom–arm connection pins (1 point)
(13) Bucket cylinder base pin (1 point)



NOTE
- Grease cartridge: See page parts book.

4.9.5 MAINTENANCE AFTER THE FIRST 500 HOURS OF OPERATION (Only for machines in which synthetic biodegradable oil type HEES is used)

The following maintenance operation must be carried out after the first 500 hours of operation, together with the maintenance operations to be carried out “EVERY 500 HOURS”.

a - CHANGE THE HYDRAULIC OIL AND CLEAN THE INTAKE FILTER

For further details, see paragraph “EVERY 2000 HOURS”.

4.9.6 MAINTENANCE EVERY 500 HOURS OF OPERATION

4.9.6.a CHANGING THE ENGINE OIL AND THE ENGINE OIL FILTER CARTRIDGE

⚠ WARNING

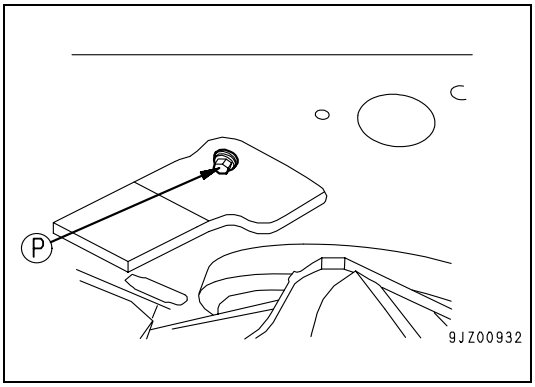
- **Change the oil with the machine parked on a level surface and the work equipment resting on the ground.**
- **Soon after the machine has been stopped the engine oil is very hot and may cause burns; let the engine cool down until it reaches a temperature of 40÷45°C before draining the oil.**
- **The oil that may be spilled during the oil change will make the ground slippery: use anti-slip shoes and immediately remove any trace of oil from the floor.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

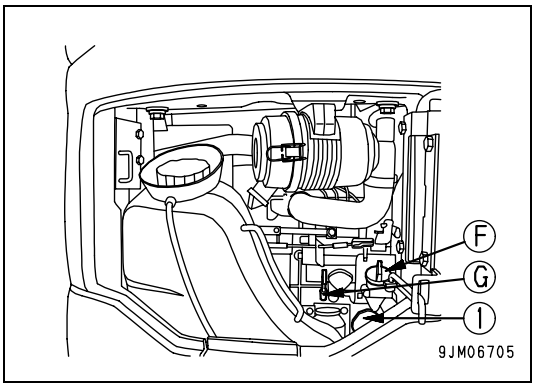
NOTE

- Replace the engine oil and filter cartridge every 6 months, even if the engine has not reached the 500 hours of operation.

Proceed as follows:

1. Open the engine hood (see "3.2.6 ENGINE HOOD").
2. Remove the drain plug (P) of the engine oil pan, gathering the used oil that flows out of it into a container with suitable capacity.
   While the oil flows out, remove the filler cap (F), so that the oil can flow out freely.
3. Screw the plug (P) onto the engine oil pan.
4. Using a filter wrench, unscrew the old filter (1) and reject it.
5. Clean the contact surface between the seal and the filter support (2).
6. Lubricate the seal of the new filter and tighten until it rests against the gasket.
7. Give another half turn by hand.
8. Fill the engine with the prescribed quantity of new oil, using the dipstick (G) to check that the level reaches the MAX. reference mark.
   Use oil suitable for the ambient temperature (see "4.4 FUEL, COOLANT AND LUBRICANTS").
9. Put back the filler cap (F), start the engine and stop it after 5 minutes.
   Check the level again and top up, if necessary.
10. Close the engine hood.





Start the engine, make sure that there are no leakages and that the engine oil pressure warning light goes out.

IMPORTANT

- **Do not use the wrench to lock the filter, in order to avoid damaging the filter itself and causing oil leakages.**

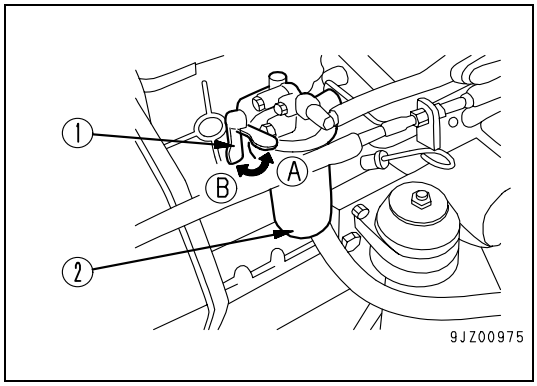
4.9.6.b CHANGING THE FUEL FILTER CARTRIDGE

⚠ WARNING

- **Change the filtering element after work, when the engine has cooled down to 40÷45°C.**
- **During these operations some fuel may be spilled; clean the dirty areas immediately, in order to prevent any risk of slipping or fire.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

FUEL FILTER

1. Open the engine hood.
   (For details, see "3.2.6 ENGINE HOOD").
2. Place a container under the filter to collect any spilt fuel.
3. Turn the valve (1) of the filter to the closed position (A).
4. Using a filter wrench, loosen the metal ring of the filter and remove the casing (2).
5. Clean the head of the filter holder and the inside of the casing, install a new filter and fill the casing with fuel.
6. Lubricate the casing seal, install it on the filter holder and tighten the metal ring until it touches the seal.
7. Give the metal ring a further 2/3 turn.



IMPORTANT

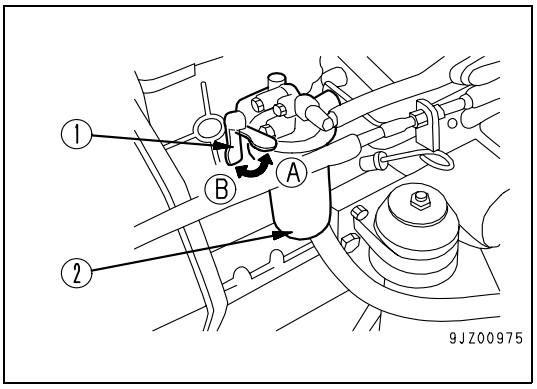
- **If the casing is tightened excessively, the seal may be damaged and cause fuel leakages. Fuel leakages may also be due to insufficient tightening. Therefore, it is advisable to fix the casing by tightening the metal ring correctly.**

BLEEDING THE FUEL CIRCUIT

⚠ WARNING

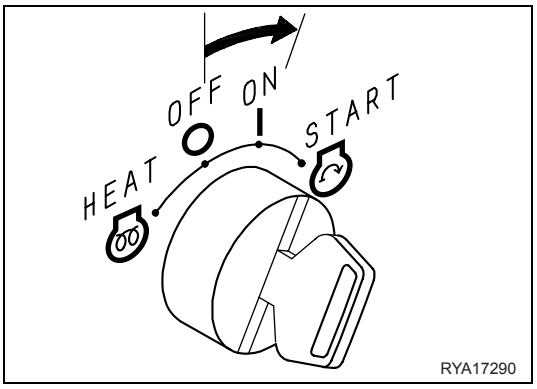
- **The engine may start during the bleeding operations; make sure that there is no one near the machine.**

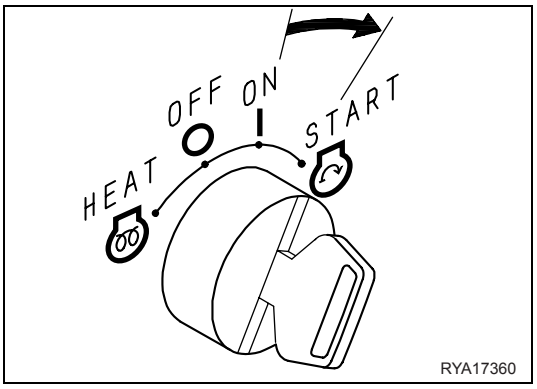
1. After filling the fuel tank, ensure that the filter valve (1) is in the open position (B).
2. Turn the ignition key to position ON and wait approximately 10-15 seconds, in such a way as to allow the fuel system to be automatically bled.
3. Turn the ignition key to position START and start the engine.



IMPORTANT

- **If the engine starts regularly and then stops or functions irregularly, check if there is air in the circuit; in this case, check the tightness of the fuel filter and of the fuel pump prefilter.**
- **When all the fuel in the tank has run out, bleed the circuit by proceeding as described above and repeat the operation at least twice.**



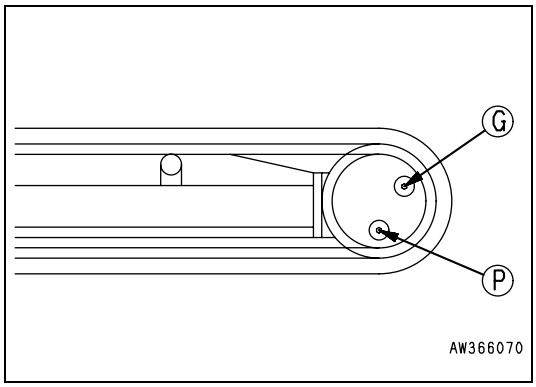


4.9.6.c CHECKING THE OIL LEVEL IN THE FINAL REDUCTION GEARS

⚠ WARNING

- **Soon after the machine has been stopped, the engine oil is very hot and may cause burns; let the oil cool down to 40÷45° C before carrying out any check.**
- **Loosen the cap slowly to release any residual pressure.**

1. The check must be carried out on each reduction gear, with the drain plug (P) in low position and perpendicular to the ground. If necessary, move the machine slightly until reaching the specified position, which is indispensable for an accurate check.
2. This is a visual check and serves to make sure that the lubricant reaches the height of the hole (G); if this is not the case, top up by proceeding as explained in paragraph "4.9.7.b CHANGING THE OIL IN THE FINAL REDUCTION GEARS" and using the oil prescribed in the lubricant chart (see "4.4 FUEL, COOLANT AND LUBRICANTS").

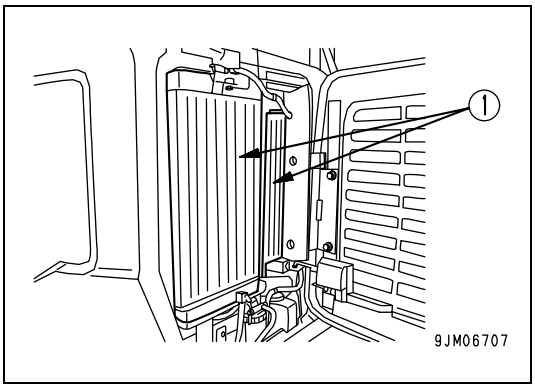


4.9.6.d CHECKING AND CLEANING THE FINS OF THE RADIATOR AND OF THE EXCHANGER

⚠ WARNING

- **If compressed air, steam or water hit someone, they may cause serious injury. Always wear a visor and safety shoes.**

1. Open the radiator cover. For details, see paragraph "3.2.7 RADIATOR COVER"
2. The radiator-exchanger assembly (1) must be cleaned with a jet of compressed air and, if necessary, with a low-pressure water or steam washing cycle; the specific products available on the market can be used, provided that the instructions given on the package are followed and that the washed parts are carefully dried.



IMPORTANT

- **Do not use products containing even a slight quantity of oily substances, since these facilitate the adhesion of dust, which affects the heat exchange adversely.**
- **Carry out this cleaning operation whenever the radiator or the heat exchanger are accidentally dirtied with oil, diesel oil or greasy or oily substances.**
- **If the machine is used in dusty places, clean the radiator and the heat exchanger more frequently, in order to prevent the fins from clogging.**

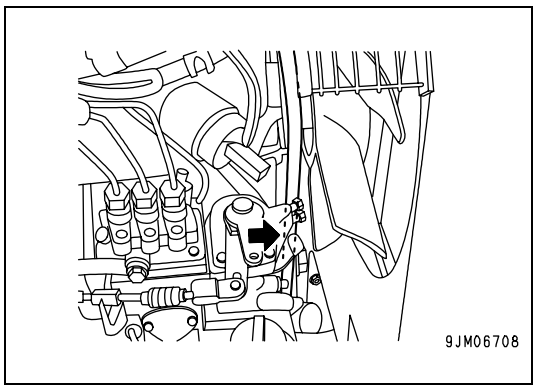
4.9.6.e CHECKING AND ADJUSTING THE FAN BELT TENSION

⚠ WARNING

- **Soon after the machine has been stopped, the engine is very hot and may cause burns; let the engine cool down before carrying out any check.**
- **To carry out this maintenance operation it is necessary to tilt the cab floor. Carefully follow the instructions given in paragraph "3.2.9 TILTING THE CAB FLOOR" or have this operation carried out by your Komatsu Distributor.**

CHECK

The fan belt can be reached after tilting the cab floor (see "3.2.9 TILTING THE CAB FLOOR").



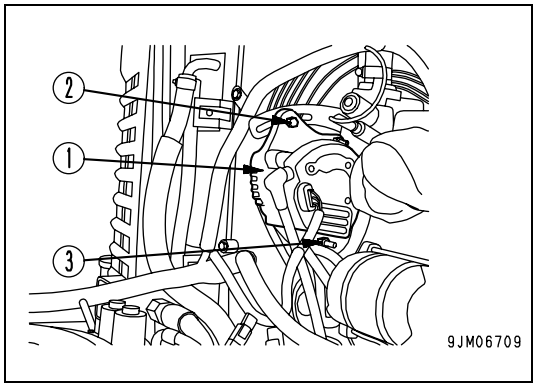
1. The check is manual: press the belt with a thumb on the intermediate point between the drive shaft pulley and the fan pulley with a force equal to 98 Nm (10 kg); the resulting deflection must be approximately 9-13 mm..
2. If the deflection exceeds this value, adjust by proceeding as indicated below.

IMPORTANT

- **Guards are installed in the area of the engine to protect personnel from moving parts.**
  These guards should only be removed by a Komatsu service engineer unless specific instructions are given in this manual.

ADJUSTMENT

1. Lift the platform, see "3.2.9 TILTING THE CAB FLOOR".
2. Loosen the adjusting screw (2) and the alternator fastening screws (3).
3. With a lever inserted between the alternator (1) and the engine block, make the alternator slide.
4. Lock the adjusting screws and the alternator fastening screws, then check again.
5. Close the cab floor, see "3.2.9 TILTING THE CAB FLOOR".



IMPORTANT

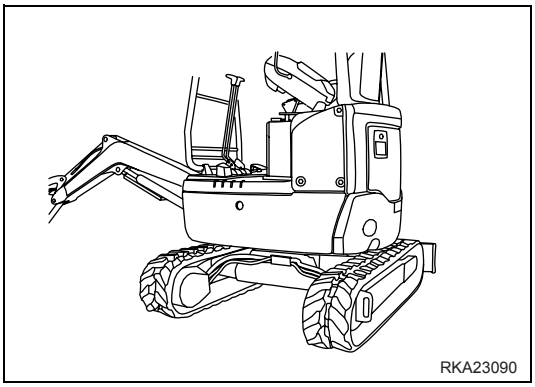
- **If the belt is worn, change it and check the tension again after a few hours of operation.**

4.9.6.f DRAINING THE HYDRAULIC OIL TANK (Only for machines in which synthetic biodegradable oil type HEES is used)

⚠ WARNING

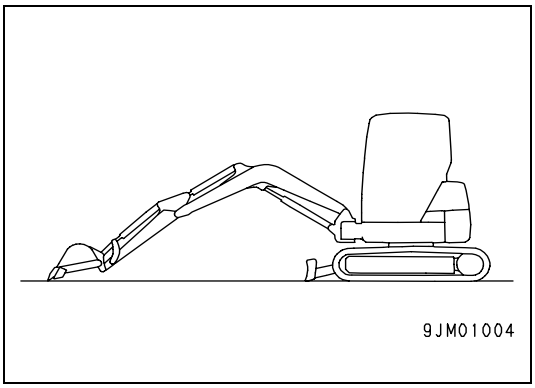
- **To carry out this maintenance operation it is necessary to tilt the cab floor. Carefully follow the instructions given in paragraph "3.2.9 TILTING THE CAB FLOOR" or have this operation carried out by your Komatsu Distributor.**
- **Retract the arm and bucket cylinders completely, rest the bucket teeth on the ground and, after stopping the engine, eliminate the residual pressures from the equipment (by shifting the controls more than once) and from the tank (by slowly loosening the filler cap).**
- **Let the oil cool down until it reaches 40÷45°C before carrying out this maintenance operation.**
- **Immediately clean any area dirty with oil.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

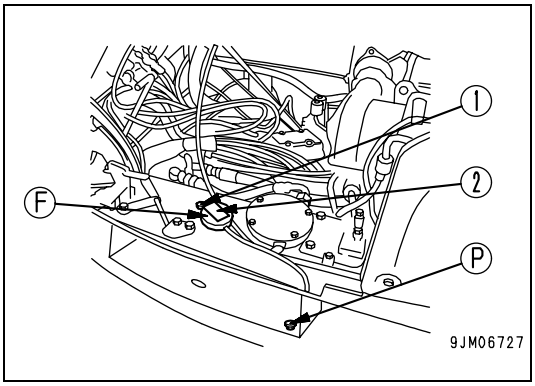
1. Turn the revolving frame so that the lower part of the hydraulic oil tank is not covered by the tracks.
2. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
3. Lower the blade to the ground.
4. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).
5. Tilt the cab floor (see "3.2.9 TILTING THE CAB FLOOR").
6. Loosen the screws (1), remove the plate (2) and slowly loosen the filler cap (F) to release the residual pressure from the tank.
7. Loosen the drain cap (P) and drain all condensation completely. Collect the condensate in a container with suitable capacity.
8. Put back the filler cap (F).
9. Close the cab floor, see "3.2.9 TILTING THE CAB FLOOR".



IMPORTANT

- **The tank must be drained before starting the engine, with temperatures exceeding 0°C; when the temperature is below 0°C, the tank must be drained at the end of work or in any case with the machine at operating temperature, to prevent the condensate from freezing.**





4.9.7 MAINTENANCE EVERY 1000 HOURS OF OPERATION

Carry out these operations together with those to be performed every 500 HOURS.

4.9.7.a CHANGING THE HYDRAULIC OIL FILTER

⚠ WARNING

- **To carry out this maintenance operation it is necessary to tilt the cab floor. Carefully follow the instructions given in paragraph "3.2.9 TILTING THE CAB FLOOR" or have this operation carried out by your Komatsu Distributor.**
- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before changing the filter.**
- **The hydraulic system is under pressure; slowly loosen the filler cap to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

⚠ CAUTION

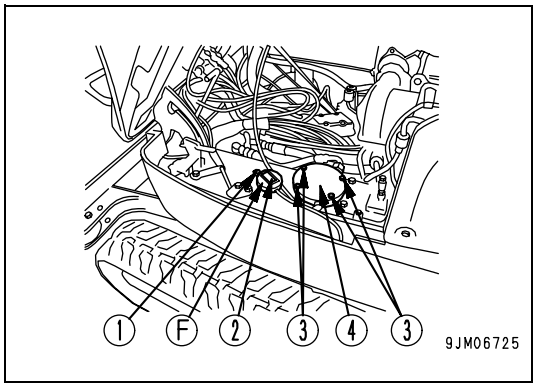
- **On machines containing synthetic biodegradable oil type HEES , this must be changed for the first time after the first 50 hours of operation and successively every 1000 hours.**

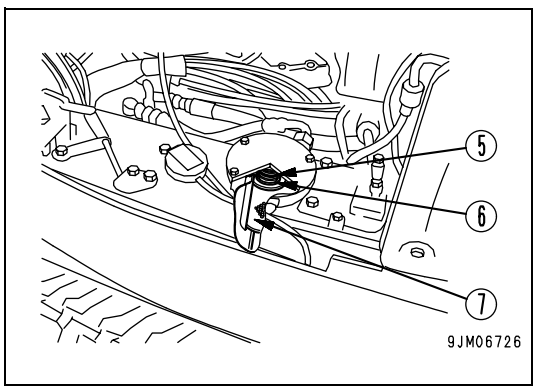
IMPORTANT

- **If the machine is equipped with demolition hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

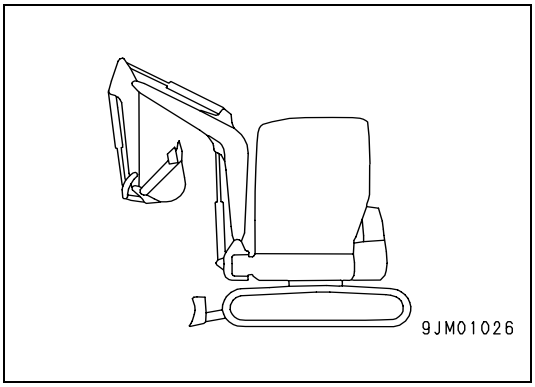
The filter is positioned on the hydraulic system drain outlet and it holds the metal particles that come off the various components due to wear. The filter can be reached after tilting the cab floor (see "3.2.9 TILTING THE CAB FLOOR").
To change it, proceed as indicated below:

1. Loosen the screws (1) and remove the plate (2).
2. Slowly loosen the filler cap (F) to release any residual pressure from the tank.
3. Remove the screws (3) that hold the filter cover (4).
4. Remove the spring (5), the valve (6) and extract the cartridge (7).
5. Carefully clean the filter casing and change the cartridge (7).
6. Reassemble the whole by proceeding in the reverse order and make sure that the gasket (7) of the cover (4) is not damaged and is correctly housed in its seat.





7. Extend the boom, arm and bucket cylinders completely, as shown in the figure, and remove the filler cap (F).
   Put back the cap and pressurize the tank by lowering the equipment to the ground.



NOTE
- Make sure the hydraulic tank is pressurised. If it is not pressurised, the pump will suck air, affecting tool operation.

8. Close the cab floor, see "3.2.9 TILTING THE CAB FLOOR".

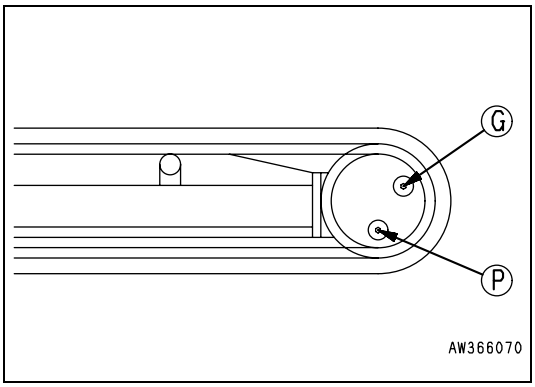
4.9.7.b CHANGING THE OIL IN THE FINAL REDUCTION GEARS

⚠ WARNING

- **As soon as the machine has been stopped the oil is very hot and may cause burns; let the oil cool down until reaching 40÷45°C before changing it.**
- **Loosen the cap slowly to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

This operation must be carried out on each reduction gear with the machine parked on level ground and at a temperature of 40-45°C, so that the oil becomes fluid and can be drained easily, which facilitates the elimination of any suspended solid particles.

1. Move the machine until the drain plug (P) is in low position and perpendicular to the ground.
2. Remove the drain plug (P) and let the used oil flow out completely, gathering it into a container with suitable capacity.
   While the oil flows out, remove the level plug (G).
3. Once the oil has been drained, put back the plug (2) and pour oil of the prescribed type through the hole (G), until reaching the lower edge of the hole itself.
4. Put back the plug (G).



Carry out some forward and backward movements, stop the machine and check the levels again. Always use oil of the prescribed type (see "4.4 FUEL, COOLANT AND LUBRICANTS").

4.9.7.c CHECKING AND ADJUSTING THE ENGINE VALVE CLEARANCE

Since these checks and adjustments require the use of special tools, have them carried out by qualified personnel supplied by your Komatsu Distributor.

4.9.8 MAINTENANCE EVERY 1500 HOURS OF OPERATION

Carry out these operations together with those to be performed every 500 HOURS.

4.9.8.a FUEL INJECTION SYSTEM CHECK AND CLEANING

To obtain the best engine performance, the fuel injection valves must operate perfectly. Then, it is necessary to carry out the fuel injection valves check and cleaning. Given that special tools are needed for these operations, it is advisable to commission your Komatsu Distributor to perform them.

4.9.9 MAINTENANCE EVERY 2000 HOURS OF OPERATION

Carry out these operations together with those to be performed every 500 HOURS and every 1000 HOURS.

4.9.9.a CHANGING THE OIL IN THE HYDRAULIC TANK AND CLEANING THE FILTER

⚠ WARNING

- **To carry out this maintenance operation it is necessary to tilt the cab floor. Carefully follow the instructions given in paragraph "3.2.9 TILTING THE CAB FLOOR" or have this operation carried out by your Komatsu Distributor.**
- **Retract the arm and bucket cylinders completely, rest the bucket teeth on the ground and, after stopping the engine, eliminate the residual pressures from the equipment (by shifting the controls more than once) and from the tank (by slowly loosening the filler cap).**
- **Soon after the machine has been stopped, the hydraulic oil is very hot and may cause burns; let it cool down to 40÷45° C before carrying out this maintenance operation.**
- **Immediately clean any area dirty with oil.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

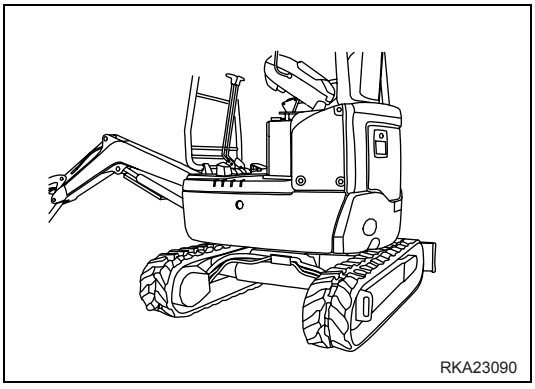
⚠ CAUTION

- **On machines containing synthetic biodegradable hydraulic oil type HEES, this must be changed after the first 500 hours of operation and successively every 2000 hours, and in any case at least once a year.**

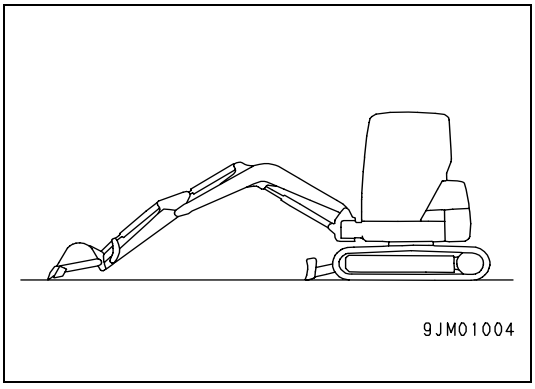
IMPORTANT

- **If the machine is equipped with demolition hammer, the hydraulic oil deteriorates much earlier than during normal bucket operations. For further details on maintenance, see "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER".**

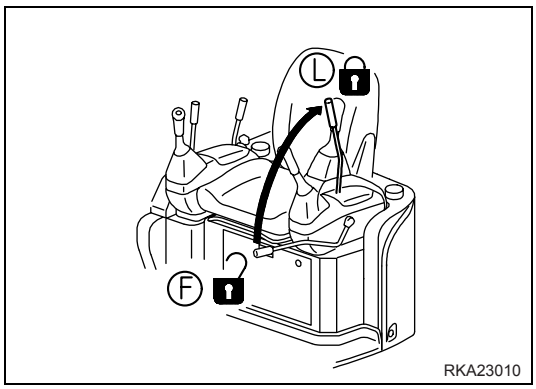
1. Turn the revolving frame so that the lower part of the hydraulic oil tank is not covered by the tracks.



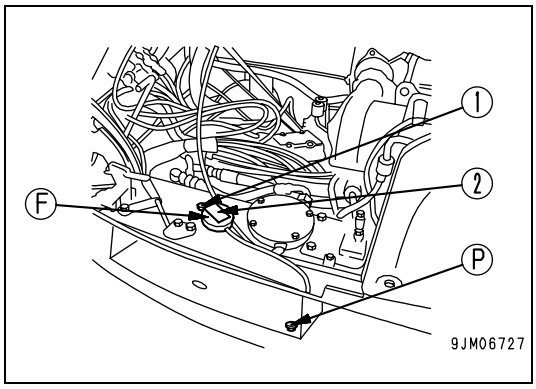
2. Retract the arm and bucket cylinders completely and lower the boom until the bucket teeth rest on the ground.
3. Lower the blade to the ground.
4. Stop the engine and eliminate the residual pressure from the work equipment (by shifting the controls more than once).



5. Shift the safety lever to the “locked” position (L).
6. Tilt the cab floor (see "3.2.9 TILTING THE CAB FLOOR").



7. Loosen the screws (1), remove the plate (2) and slowly loosen the filler cap (F) to release the residual pressure from the tank.
8. Remove the drain plug (P) and let the oil flow out, gathering it into a container with suitable capacity.

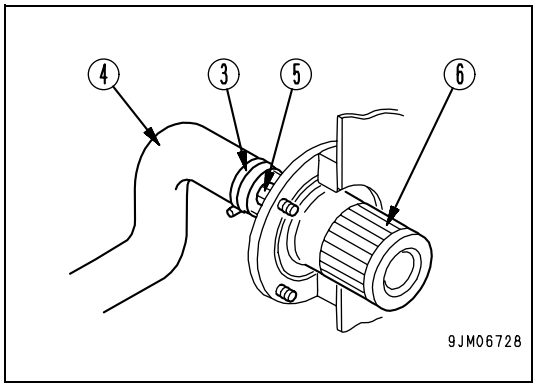


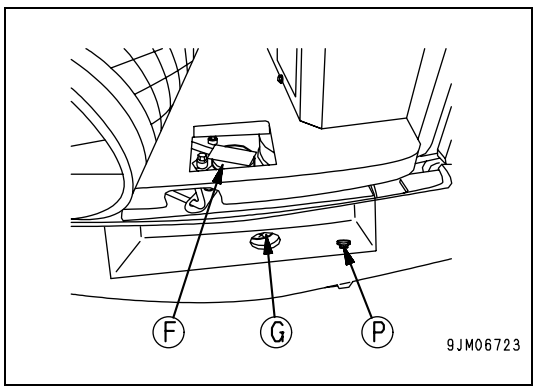
9. Loosen the clamps (3), remove the suction pipe (4) and let the oil that is still in the tank flow out.
10. Take out screws (5) and remove the flange with filter (6).
11. Remove any dirt from the filter (6), then wash it with clean diesel oil or wash oil.

IMPORTANT

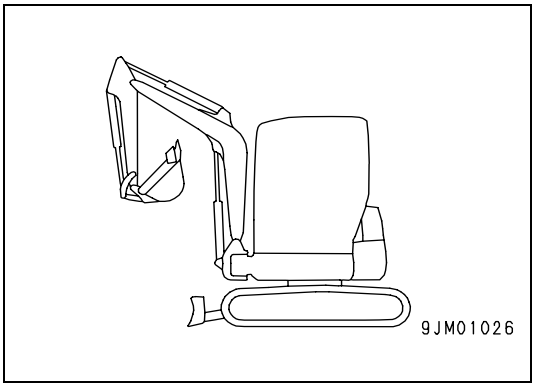
- **Carefully check the filtering element grid and if it is not in perfect conditions, change it.**

12. Put back the drain plug (P), the lower flange with the filter (6), checking the soundness of the gasket, and the suction pipe (4) with the clamps (3).
13. Fill with prescribed oil until reaching the level (G).
    Use only oil of the prescribed type (see «4.4 FUEL, COOLANT AND LUBRICANTS »).





14. Extend the boom, arm and bucket cylinders completely, as shown in the figure, and remove the filler cap (F).
    Put back the cap and pressurize the tank by lowering the equipment to the ground.



NOTE
- Make sure the hydraulic tank is pressurised. If it is not pressurised, the pump will suck air, affecting tool operation.

15. Close the cab floor, see "3.2.9 TILTING THE CAB FLOOR".
16. Make sure that all the control levers are in neutral position and let the engine idle for at least 2÷3 minutes before operating the work equipment.
    Move each piston more than once to deaerate the system; check and top up if necessary.

⚠ CAUTION

- **Do not start the engine with empty tank, since this would certainly damage the pump.**

4.9.9.b CHANGING THE COOLANT

⚠ CAUTION

- **The coolant must be changed every 2000 hours of operation or every 2 years, whichever occurs first.**

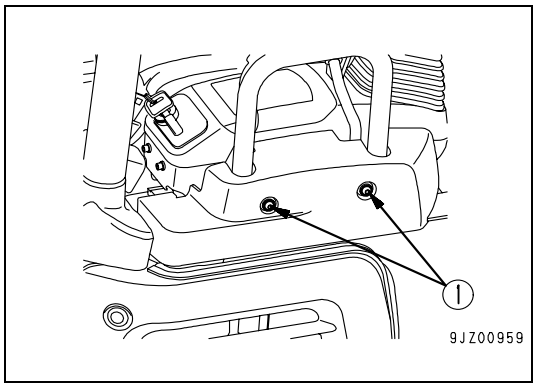
⚠ WARNING

- **Soon after the machine has been stopped the coolant is very hot and under pressure and it may cause serious burns; let the engine cool down until it reaches approximately 40÷45°C before changing the coolant.**
- **Slowly loosen the radiator cap, in order to release any residual pressure.**
- **Oils, filters, the coolant and the battery are considered special waste and must be collected and disposed of according to the regulations in force.**

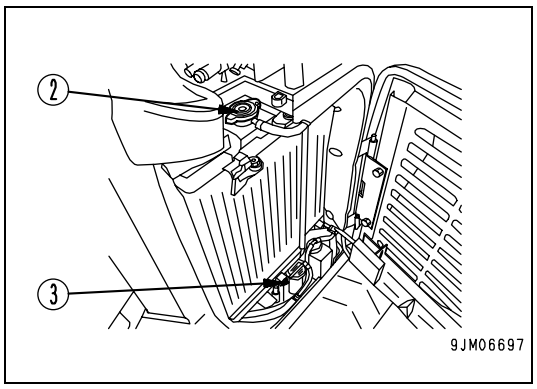
IMPORTANT

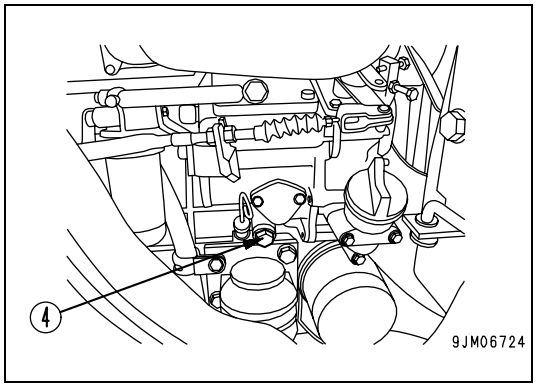
- **The change of the permanent coolant does not require any washing cycle for descaling the circuit.**

1. Remove the screws (1) and remove the radiator cap guard located on the right hand side of the machine.
2. Open the engine hood and the radiator cover. For further details, see paragraphs "3.2.6 ENGINE HOOD" and "3.2.7 RADIATOR COVER".

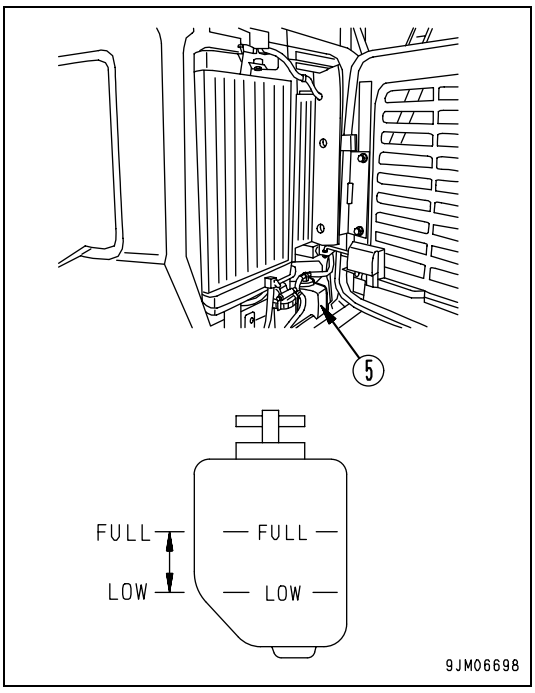


3. Loosen and remove the upper cap (2) of the radiator.
4. Open the radiator drain valve (3), remove the drain plug (4) on the engine block and let the fluid flow out, gathering it in a container with suitable capacity. Drain the coolant tank (5) while the fluid flows out.
5. Close the drain valve (3), put back the plug (4) on the engine block and fill the radiator with new fluid (see "4.4 FUEL, COOLANT AND LUBRICANTS").
6. Start the engine and let it run at high idling speed for a few minutes; check the level again and top up before putting back the upper cap (2).





7. Fill the tank (5) until reaching the maximum level.
8. Fit the guard on the right hand side of the machine and close the covers.



4.9.9.c CHECKING THE ALTERNATOR AND THE STARTER

The brush may be worn or the bearing may be without grease. Contact the Komatsu Distributor for check or repair operations.
If the engine is frequently started, carry out checks every 1000 hours.

4.9.9.d NITROGEN LOADING PRESSURE CHECK IN THE ACCUMULATOR (FOR THE CONTROL CIRCUIT)

⚠ WARNING

- **The accumulator is loaded with high pressure nitrogen; therefore, an incorrect operation may cause an explosion with consequent serious injuries or damage. When handling the accumulator, always proceed as indicated below.**
- **Hydraulic circuit pressure cannot be completely eliminated. When the hydraulic equipment is removed, do not stand in the oil jet outlet direction. Moreover, loosen the bolts slowly during this operation.**
- **Do not remove the accumulator;**
- **Do not bring the accumulator near sparks or naked flames.**
- **Do not make holes in the accumulator, do not weld or use oxyhydrogen flames.**
- **Do not hit or press the accumulator.**
- **The gas must be released when disposing of the accumulator. Refer to your Komatsu Distributor to have this operation carried out.**

IMPORTANT

- **If the nitrogen loading pressure in the accumulator is low and operation continues, it will be impossible to release the pressure remaining inside the hydraulic circuit in case of a machine failure.**

ACCUMULATOR OPERATION

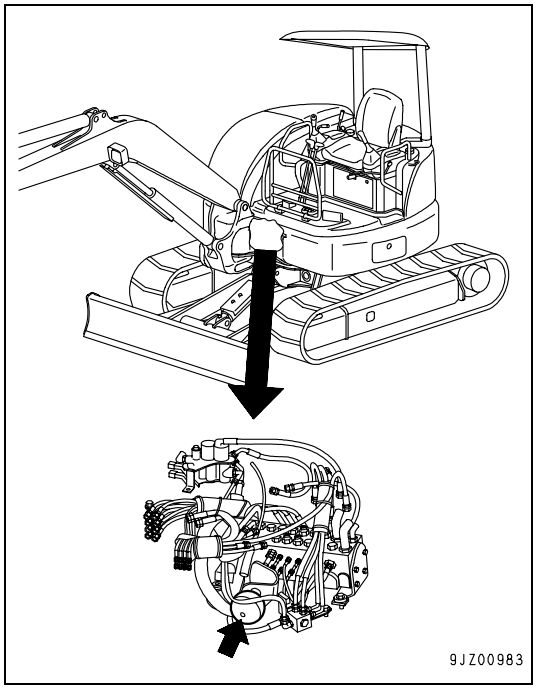
The accumulator stores the pressure in the control circuit. Even when the engine is stopped, the control circuit can be enabled and the following operations are activated.

- If the control lever is activated to lower the working tool, the latter may descend because of its own weight.
- Hydraulic circuit pressure can be released.

NOTE

- This function is only available when the start-up key is in (ON) position and the safety device lever is in working position (F).

The accumulator is fitted in the position illustrated in the diagram on the right.



ACCUMULATOR OPERATION CHECK

⚠ CAUTION

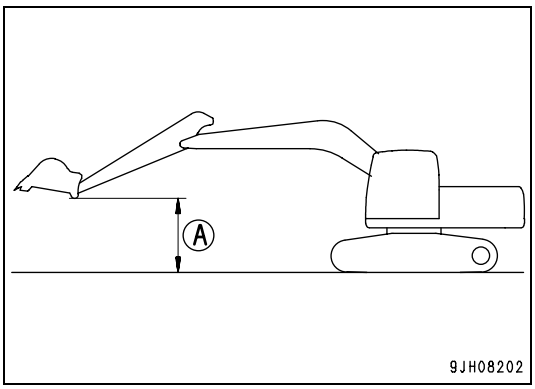
- **Before starting check operations, make sure that no person or other obstacles are in the surrounding area.**

Check nitrogen loading pressure as follows.

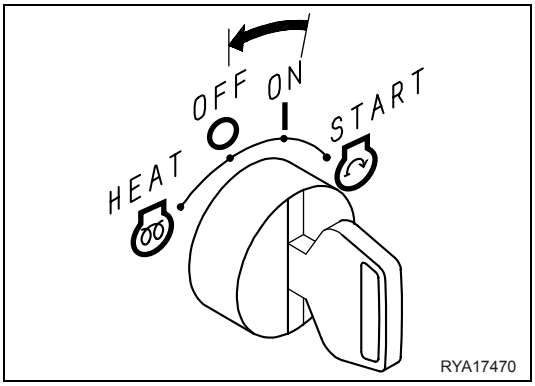
1. Stop the machine on a solid and flat surface.
2. Place the working tool as extended as possible (fully extended boom and bucket in discharge position) and keep it 1.5 m (A) away from the ground..

Carry out the operations described in points 3-5 within 15 seconds.

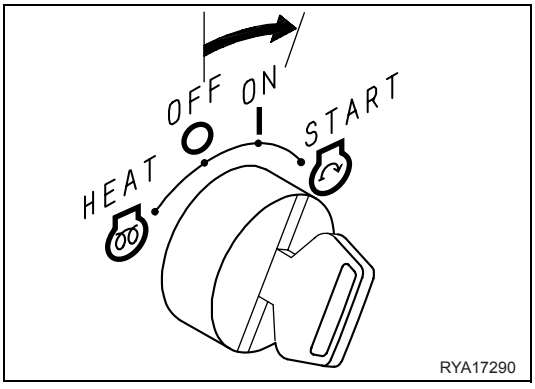
Pressure in the accumulator descends gradually when the engine is stopped. Therefore, the check must be carried out immediately after the engine is stopped.



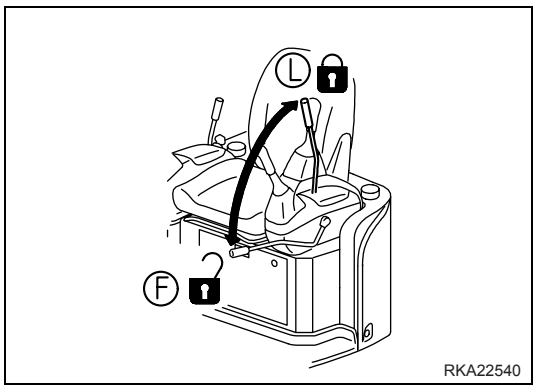
3. Keep the working tool at the maximum distance, turn the start-up key to OFF and stop the engine.



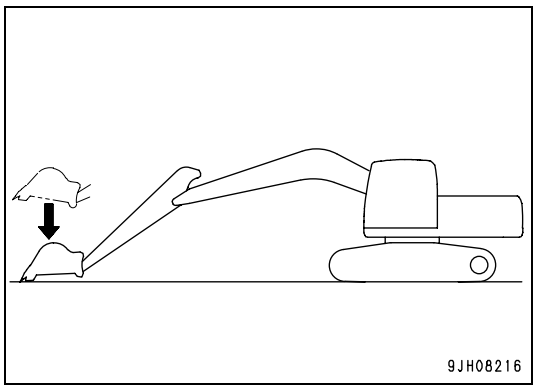
4. Turn the start-up key to ON.



5. With the safety device lever in working position (F), activate the working tool control lever and check that the tool is lowered to the ground.



6. If the tool descends because of its own weight and touches the ground, the accumulator is correct.
   If the tool does not descend or stops at the middle of the course, the accumulator pressure is not enough.
   Refer to your Komatsu Distributor for check operations.
7. When the check is completed, take the safety device lever back to the locking position (L) and turn the start-up key to OFF.



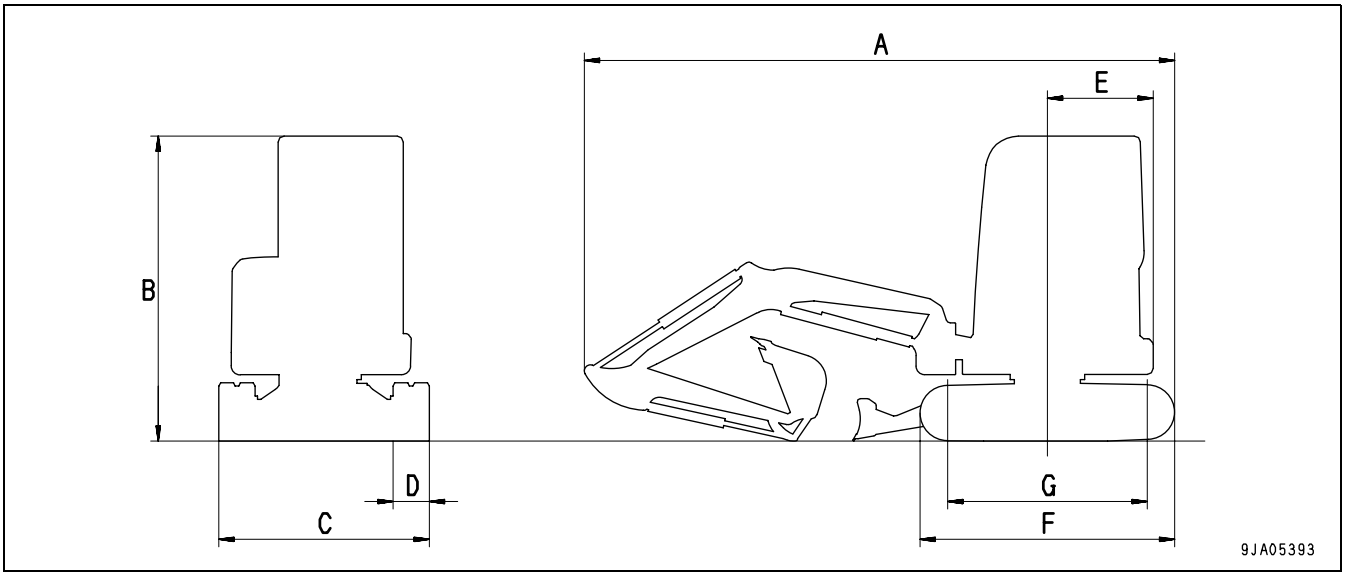
4.10 END OF SERVICE LIFE

For safe dismantling of the machine at end of service life, please contact your local Komatsu Distributor.

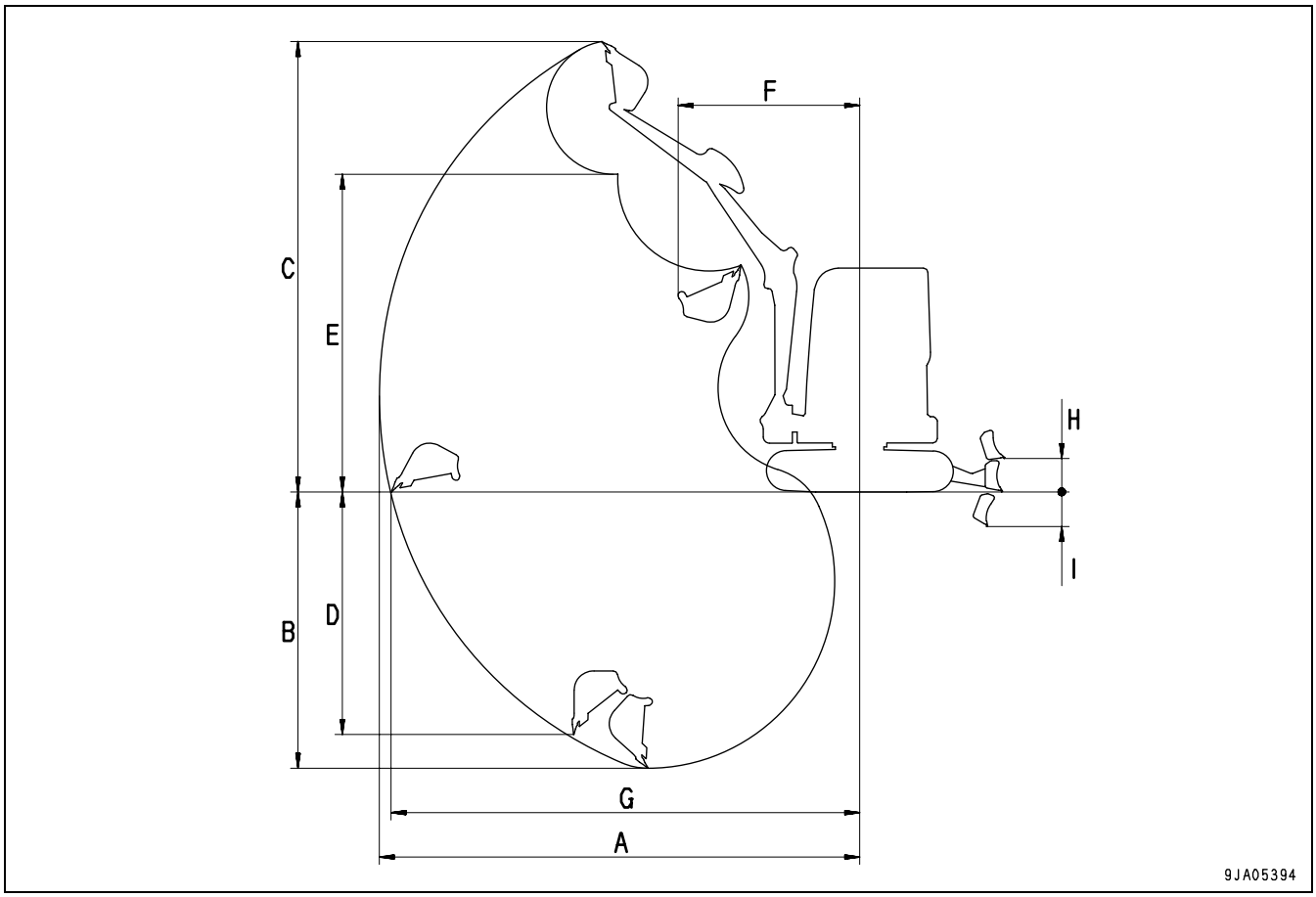
TECHNICAL SPECIFICATIONS

5.1 TECHNICAL SPECIFICATIONS

			Unit of measurement	PC18MR-3
	Operating mass (ISO 6016)		(kg)	1910
	Bucket capacity (ISO 7451)		(m^3)	0,044
	Engine		-	Komatsu 3D67E-2 diesel engine
	Engine power (ISO 14396: 2002)		KW (HP)/rpm	11.8(16.0)/2600
A	Total length		mm	3650
B	Total height (Min/Max)	With canopy	mm	2320
		With cab		2410
C	Total width		mm	980/1300
D	Track width		mm	230
E	Swing radius	With canopy	mm	715
		With cab		715
F	Total length of the tracks		mm	1550
G	Tumbler distance		mm	1212
	Min. ground clearance		mm	170
	Travel speed (low/high)		km/h (MPH)	2,3/4,3 (1,4/2,7)
	Swing speed		rpm	8,9



	Operating characteristics		Unit of measurement	PC18MR-3
A	Max. digging outreach		mm	4025
B	Max. digging depth		mm	2160
C	Max. digging height	With canopy	mm	3615
		With cab	mm	3615
D	Max. vertical wall digging depth		mm	1785
E	Max. dumping height	With canopy	mm	2610
		With cab	mm	2610
F	Work equipment min. swing radius		mm	1670
	Work equipment min. swing radius (with boom swing)		mm	1355
G	Max. outreach at ground level		mm	3935
H	Max. blade lifting height		mm	280
I	Max. blade working depth		mm	255



5.2 LIFTING CAPACITIES

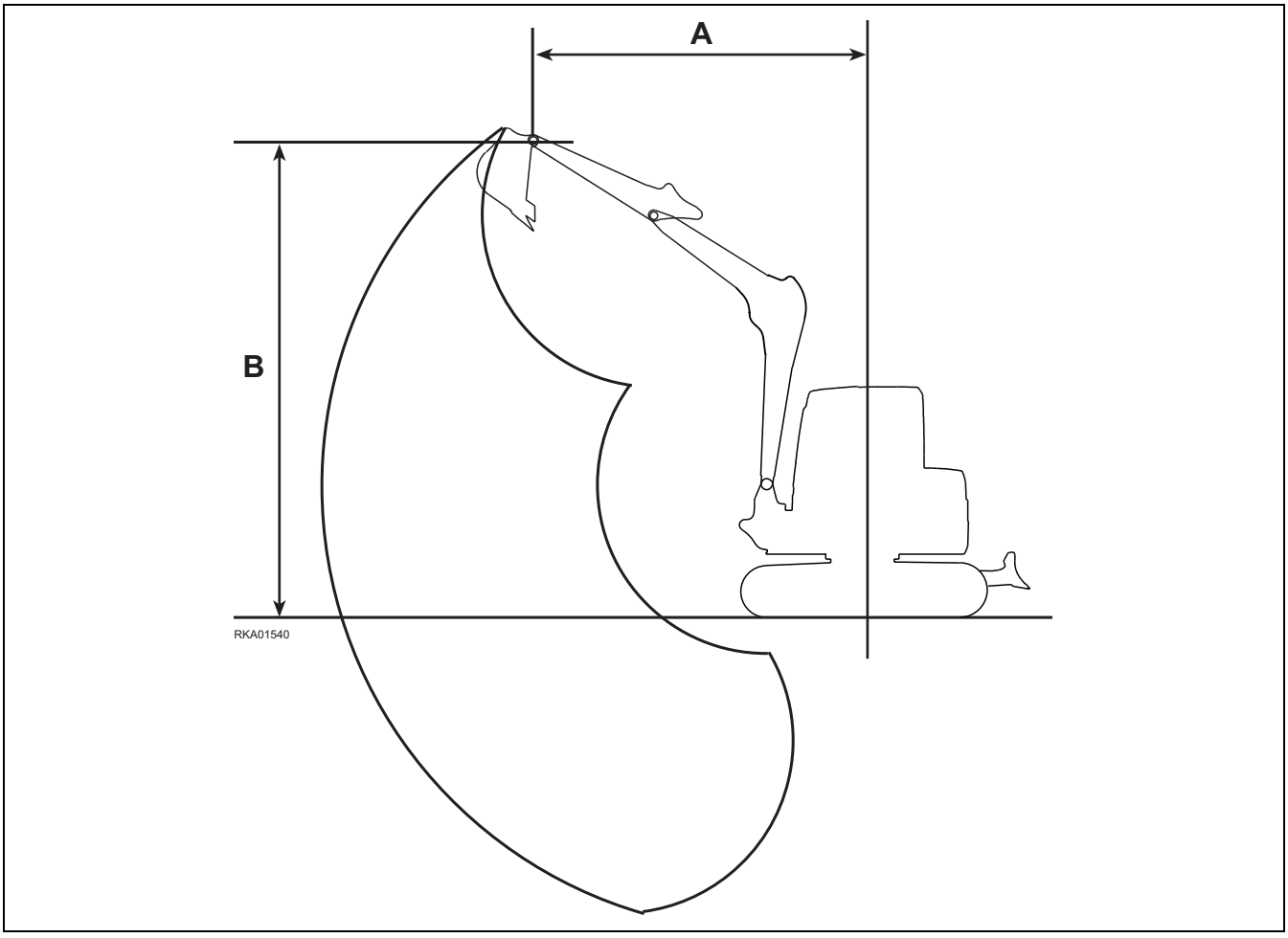
5.2.1 LIFTING CAPACITIES PC18MR-3

DANGER

- **According to the harmonized standard EN474-5 (§ 4.1.7.5), the machine cannot lift weights exceeding 1000 kg, unless it is provided with appropriate equipment.**
- **Carry out lifting operations only with the machine positioned on firm and flat ground.**

NOTE

- The load does not exceed 87% of the hydraulic lifting capacity or 78% of the tipping limit.



***** Load limited by the hydraulic lifting capacity and not by the tipping limit.

STANDARD ARM 965mm + STANDARD COUNTERWEIGHT + LOWERED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	-	-	-	-	-	-	*355	335
2.5 m	-	-	*305	273	-	-	-	-	*322	223
2.0 m	-	-	*318	272	*314	198	-	-	*318	181
1.5 m	*460	381	*373	266	*333	196	-	-	*319	160
1.0 m	*653	358	*454	255	*367	191	-	-	*324	150
0.5 m	*782	339	*522	246	*400	186	-	-	*336	152
0 m	*806	333	*551	240	*412	183	-	-	*338	154
-0.5 m	*752	333	*531	239	*386	183	-	-	*345	170
-1.0 m	*635	338	*446	242	-	-	-	-	*342	205
-1.5 m	*394	249	-	-	-	-	-	-	*309	299

STANDARD ARM 965mm + STANDARD COUNTERWEIGHT + LOWERED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	-	-	-	-	-	-	*355	205
2.5 m	-	-	*305	166	-	-	-	-	*322	132
2.0 m	-	-	*318	166	*314	116	-	-	*318	104
1.5 m	*460	232	*373	160	*333	114	-	-	*319	89
1.0 m	*653	211	*454	150	*367	109	-	-	*324	82
0.5 m	*782	194	*522	141	*400	105	-	-	*336	84
0 m	*806	188	*551	136	*412	102	-	-	*338	84
-0.5 m	*752	188	*531	134	*386	101	-	-	*345	94
-1.0 m	*635	193	*446	137	-	-	-	-	*342	116
-1.5 m	*394	203	-	-	-	-	-	-	*309	174

STANDARD ARM 965mm + STANDARD COUNTERWEIGHT + RAISED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	-	-	-	-	-	-	*355	335
2.5 m	-	-	*305	273	-	-	-	-	*322	223
2.0 m	-	-	*318	272	234	198	-	-	214	181
1.5 m	458	381	315	266	232	196	-	-	190	160
1.0 m	433	358	304	255	227	191	-	-	179	150
0.5 m	413	339	294	246	222	186	-	-	181	152
0 m	406	333	288	240	219	183	-	-	183	154
-0.5 m	406	333	287	239	218	183	-	-	202	170
-1.0 m	411	338	290	242	-	-	-	-	244	205
-1.5 m	*394	249	-	-	-	-	-	-	*309	299

STANDARD ARM 965mm + STANDARD COUNTERWEIGHT + RAISED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	-	-	-	-	-	-	*355	205
2.5 m	-	-	*305	166	-	-	-	-	*322	132
2.0 m	-	-	*318	166	234	116	-	-	214	104
1.5 m	458	232	315	160	232	114	-	-	190	89
1.0 m	433	211	304	150	227	109	-	-	179	82
0.5 m	413	194	294	141	222	105	-	-	181	84
0 m	406	188	288	136	219	102	-	-	183	84
-0.5 m	406	188	287	134	218	101	-	-	202	94
-1.0 m	411	193	290	137	-	-	-	-	244	116
-1.5 m	*394	203	-	-	-	-	-	-	*309	174

STANDARD ARM 965 mm + ADDITIONAL COUNTERWEIGHT + LOWERED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	-	-	-	-	-	-	*355	*355
2.5 m	-	-	*305	*305	-	-	-	-	*322	264
2.0 m	-	-	*318	*318	*314	235	-	-	*318	216
1.5 m	*460	444	*373	313	*333	233	-	-	*319	193
1.0 m	*653	421	*454	302	*367	229	-	-	*324	182
0.5 m	*782	402	*522	293	*400	224	-	-	*336	184
0 m	*806	396	*551	287	*412	221	-	-	*338	187
-0.5 m	*752	396	*531	286	*386	220	-	-	*345	205
-1.0 m	*635	401	*446	289	-	-	-	-	*342	245
-1.5 m	*394	412	-	-	-	-	-	-	*309	*309

STANDARD ARM 965 mm + ADDITIONAL COUNTERWEIGHT + LOWERED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	-	-	-	-	-	-	*355	250
2.5 m	-	-	*305	205	-	-	-	-	*322	166
2.0 m	-	-	*318	204	*314	147	-	-	*318	133
1.5 m	*460	282	*373	198	*333	145	-	-	*319	117
1.0 m	*653	261	*454	188	*367	140	-	-	*324	109
0.5 m	*782	244	*522	179	*400	136	-	-	*336	111
0 m	*806	238	*551	174	*412	133	-	-	*338	111
-0.5 m	*752	238	*531	173	*386	132	-	-	*345	123
-1.0 m	*635	243	*446	176	-	-	-	-	*342	149
-1.5 m	*394	253	-	-	-	-	-	-	*309	219

STANDARD ARM 965 mm + ADDITIONAL COUNTERWEIGHT + RAISED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	-	-	-	-	-	-	*355	*355
2.5 m	-	-	*305	*305	-	-	-	-	311	264
2.0 m	-	-	*318	*318	277	235	-	-	254	216
1.5 m	*460	444	370	313	275	233	-	-	227	193
1.0 m	507	421	359	302	270	229	-	-	215	182
0.5 m	487	402	349	293	265	224	-	-	217	184
0 m	480	396	343	287	261	221	-	-	221	187
-0.5 m	480	396	341	286	261	220	-	-	243	205
-1.0 m	485	401	344	289	-	-	-	-	291	245
-1.5 m	*394	412	-	-	-	-	-	-	*309	*309

STANDARD ARM 965 mm + ADDITIONAL COUNTERWEIGHT + RAISED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	-	-	-	-	-	-	*355	250
2.5 m	-	-	*305	205	-	-	-	-	311	166
2.0 m	-	-	*318	204	277	147	-	-	254	133
1.5 m	*460	282	370	198	275	145	-	-	227	117
1.0 m	507	261	359	188	270	140	-	-	215	109
0.5 m	487	244	349	179	265	136	-	-	217	111
0 m	480	238	343	174	261	133	-	-	221	111
-0.5 m	480	238	341	173	261	132	-	-	243	123
-1.0 m	485	243	344	176	-	-	-	-	291	149
-1.5 m	*394	253	-	-	-	-	-	-	*309	219

LONG ARM 1215 mm + STANDARD COUNTERWEIGHT + LOWERED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	*279	273	-	-	-	-	*294	250
2.5 m	-	-	*239	*239	*270	200	-	-	*281	186
2.0 m	-	-	*257	*257	*268	201	-	-	*280	156
1.5 m	-	-	*318	269	*294	198	*283	149	*282	140
1.0 m	*548	366	*404	258	*336	192	*297	147	*287	132
0.5 m	*725	343	*486	249	*376	186	*314	144	*293	131
0 m	*798	331	*535	238	*404	181	*319	142	*300	135
-0.5 m	*783	328	*543	235	*403	179	-	-	*306	146
-1.0 m	*704	330	*493	235	*350	180	-	-	*310	170
-1.5 m	*535	338	*357	242	-	-	-	-	*301	223

LONG ARM 1215 mm + STANDARD COUNTERWEIGHT + LOWERED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	*279	166	-	-	-	-	*294	150
2.5 m	-	-	*239	172	*270	118	-	-	*281	108
2.0 m	-	-	*257	170	*268	119	-	-	*280	87
1.5 m	-	-	*318	163	*294	116	*283	83	*282	76
1.0 m	*548	218	*404	152	*336	110	*297	80	*287	70
0.5 m	*725	197	*486	142	*376	104	*314	78	*293	69
0 m	*798	186	*535	134	*404	100	*319	75	*300	71
-0.5 m	*783	183	*543	131	*403	98	-	-	*306	77
-1.0 m	*704	185	*493	131	*350	99	-	-	*310	93
-1.5 m	*535	192	*357	137	-	-	-	-	*301	127

LONG ARM 1215 mm + STANDARD COUNTERWEIGHT + RAISED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	*279	273	-	-	-	-	*294	250
2.5 m	-	-	*239	*239	237	200	-	-	220	186
2.0 m	-	-	*257	*257	238	201	-	-	185	156
1.5 m	-	-	*318	269	234	198	178	149	167	140
1.0 m	442	366	307	258	228	192	155	147	158	132
0.5 m	417	343	295	249	222	186	172	144	156	131
0 m	404	331	286	238	217	181	170	142	161	135
-0.5 m	400	328	283	235	214	179	-	-	174	146
-1.0 m	403	330	284	235	216	180	-	-	203	170
-1.5 m	411	338	290	242	-	-	-	-	267	223

LONG ARM 1215 mm + STANDARD COUNTERWEIGHT + RAISED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
										
3.0 m	-	-	*279	166	-	-	-	-	*294	150
2.5 m	-	-	*239	172	237	118	-	-	220	108
2.0 m	-	-	*257	170	238	119	-	-	185	87
1.5 m	-	-	*318	163	234	116	178	83	167	76
1.0 m	442	218	307	152	228	110	155	80	158	70
0.5 m	417	197	295	142	222	104	172	78	156	69
0 m	404	186	286	134	217	100	170	75	161	71
-0.5 m	400	183	283	131	214	98	-	-	174	77
-1.0 m	403	185	284	131	216	99	-	-	203	93
-1.5 m	411	192	290	137	-	-	-	-	267	127

LONG ARM 1215 mm + ADDITIONAL COUNTERWEIGHT + LOWERED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	*279	*279	-	-	-	-	*294	*294
2.5 m	-	-	*239	*239	*270	238	-	-	*281	222
2.0 m	-	-	*257	*257	*268	239	-	-	*280	188
1.5 m	-	-	*318	316	*294	235	*283	181	*282	170
1.0 m	*548	429	*404	305	*336	230	*297	178	*287	162
0.5 m	*725	406	*486	293	*376	223	*314	175	*293	160
0 m	*798	394	*535	285	*404	219	*319	173	*300	165
-0.5 m	*783	390	*543	282	*403	216	-	-	*306	178
-1.0 m	*704	393	*493	282	*350	218	-	-	*310	205
-1.5 m	*535	400	*357	289	-	-	-	-	*301	267

LONG ARM 1215 mm + ADDITIONAL COUNTERWEIGHT + LOWERED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	*279	205	-	-	-	-	*294	186
2.5 m	-	-	*239	210	*270	149	-	-	*281	137
2.0 m	-	-	*257	208	*268	150	-	-	*280	114
1.5 m	-	-	*318	201	*294	147	*283	109	*282	101
1.0 m	*548	268	*404	191	*336	141	*297	106	*287	95
0.5 m	*725	247	*486	180	*376	135	*314	104	*293	93
0 m	*798	238	*535	172	*404	131	*319	101	*300	96
-0.5 m	*783	233	*543	169	*403	129	-	-	*306	104
-1.0 m	*704	235	*493	170	*350	130	-	-	*310	122
-1.5 m	*535	242	*357	176	-	-	-	-	*301	162

LONG ARM 1215 mm + ADDITIONAL COUNTERWEIGHT + RAISED BLADE + WIDE TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	*279	*279	-	-	-	-	*294	*294
2.5 m	-	-	*239	*239	*270	238	-	-	261	222
2.0 m	-	-	*257	*257	*268	239	-	-	222	188
1.5 m	-	-	*318	316	277	235	213	181	201	170
1.0 m	516	429	362	305	271	230	211	178	191	162
0.5 m	491	406	350	293	265	223	208	175	189	160
0 m	478	394	341	285	260	219	205	173	195	165
-0.5 m	474	390	337	282	257	216	-	-	211	178
-1.0 m	477	393	338	282	259	218	-	-	244	205
-1.5 m	485	400	345	289	-	-	-	-	*301	267

LONG ARM 1215 mm + ADDITIONAL COUNTERWEIGHT + RAISED BLADE + NARROW TRACK GAUGE Unit: kg

A / B	2 m		2.5 m		3 m		3.5 m		Max.	
3.0 m	-	-	*279	205	-	-	-	-	*294	186
2.5 m	-	-	*239	210	*270	149	-	-	261	137
2.0 m	-	-	*257	208	*268	150	-	-	222	114
1.5 m	-	-	*318	201	277	147	213	109	201	101
1.0 m	516	268	362	191	271	141	211	106	191	95
0.5 m	491	247	350	180	265	135	208	104	189	93
0 m	478	238	341	172	260	131	205	101	195	96
-0.5 m	474	233	337	169	257	129	-	-	211	104
-1.0 m	477	235	338	170	259	130	-	-	244	122
-1.5 m	485	242	345	176	-	-	-	-	*301	162

AUTHORISED OPTIONAL EQUIPMENT

6.1 GENERAL PRECAUTIONS FOR SAFETY

When installing attachments or options to the machine, it is necessary to pay attention to safety. Please obey the following precautions strictly when selecting, installing, or using attachments or options.

For attachment items other than those described in this operation manual please refer to your Komatsu Distributor.

6.1.1 PRECAUTIONS WHEN SELECTING

- Please consult your Komatsu distributor before installing attachments or options to the machine. Depending on the type of attachment or option, it may be necessary to install a front guard, overhead guard, or other safety structure to the machine. There may also be problems of the attachment or option hitting the operator's cab.
- Install only attachments or options authorized by Komatsu. Komatsu cannot accept any responsibility for any accident, damage, or failure caused by the use of attachments or options not authorized by Komatsu.

6.1.2 READ THE INSTRUCTION MANUAL THOROUGHLY

- Before installing or using any attachment or option, make sure that you thoroughly read and understand the instruction manuals for the machine and the attachment or option.
- If you lose the instruction manual or it is damaged, always obtain an new copy from the attachment manufacturer or your Komatsu Distributor.

6.1.3 PRECAUTIONS WHEN REMOVING OR INSTALLING

When removing or installing the attachment or option, obey the following precautions, and take care to ensure safety during the operation.

- Carry out the removal and installation operation on a flat, firm ground surface.
- When the operation is carried out by two or more workers, choose the leader and follow his instructions.
- Use a crane when handling heavy objects (more than 25 kg). (The crane must be operated by a qualified operator.)
- Never go under a load raised by the crane.
- Do not carry out operations with the load kept raised by the crane. Always use a stand to prevent the load from falling.
- When removing a heavy part, consider the balance after it is removed. To prevent the machine from tipping over, set a support in position if necessary before removing the part.
- Before installing or after removing the attachment or option, set it in a stable condition to prevent it from falling over.
- For details of the removal or installation operation, please consult your Komatsu Distributor.

6.1.4 PRECAUTIONS WHEN USING

When long or heavy work equipment is installed, remember the following precautions. Before starting operations, move the machine to a safe place and carry out a test operation to make sure that you fully understand the movement, centre of gravity, and working range of the machine.

- Do not swing the work equipment if the machine is at an angle. If the work equipment is swung with the machine at an angle, there is danger that the machine will tip over.
- Always maintain a safe distance from obstacles in the surrounding area when operating. If long work equipment is installed, the working range becomes larger.
- If heavy work equipment is installed, pay careful attention to the following precautions.
  - The swing overrun (the distance the work equipment moves before completely stopping after the swing brake is applied) will be greater. There is danger of hitting objects if the swing overrun is miscalculated, so allow extra space to the swing position when swinging.
  - The hydraulic drift of the work equipment (the amount of the work equipment moves down under its own weight when it is stopped in a raised position) also becomes greater. Do not stop the work equipment in a raised position; always lower it to the ground.
  - Do not swing, lower, or stop the work equipment suddenly. There is danger that the machine may tip over.
  - Do not suddenly extend or retract the boom cylinder. The shock may cause the machine to tip over.

⚠ WARNING

- **When calculating the allowable mass of attachments, the mass of the bucket, see the explanation of lifting capacity chart PC18MR-3 ("5.2.1 LIFTING CAPACITIES PC18MR-3").**

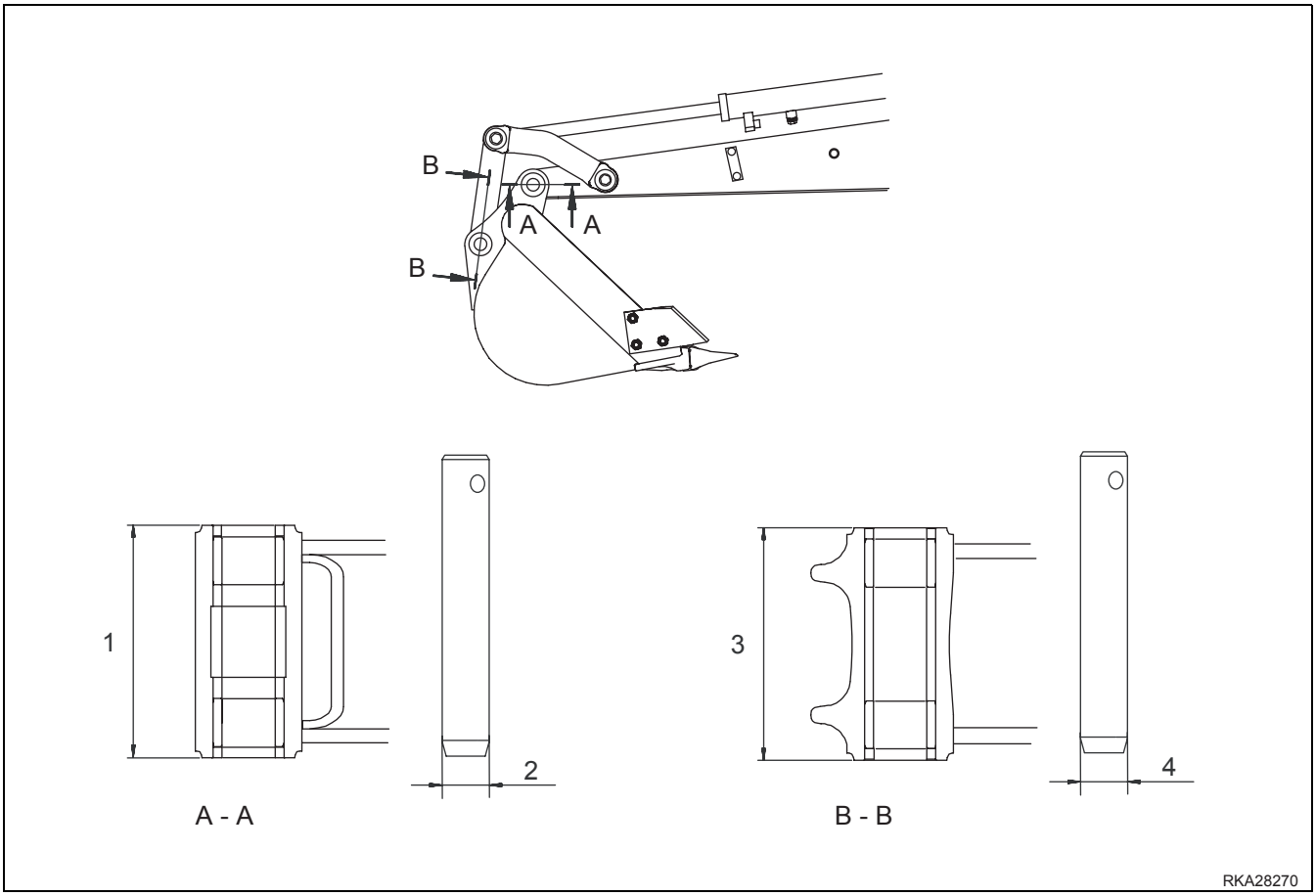
  For an attachment not intended to bear a load, for example a breaker, it should not exceed the minimum lift capacity of the machine as shown on the related lift capacity charts (see "5.2.1 LIFTING CAPACITIES PC18MR-3").
  For attachment intended to bear a load, for example clamshell bucket or grapple, the combined mass of the attachment plus load, should not exceed the maximum lift capacity figures as shown in the related lift capacity charts (see "5.2.1 LIFTING CAPACITIES PC18MR-3").

6.2 SPECIFICATIONS

Hydraulic specifications

- Max. Service valve flow (1st attachment) 35 litres/min
- Standard Service valve working pressure (1st attachment) 23 MPa (230 bar)
- Optional Safety service valve working pressure (1st attachment) — MPa (—bar)
- Standard Service valve safety pressure (1st attachment) 27.9 MPa (279 bar)

6.2.1 ARM-PIN INFORMATION



1	118 mm	0 - 0.5	3	118 mm	0 - 0.5
2	30 mm	- 0.090 - 0.130	4	30 mm	- 0.090 - 0.130

6.3 ATTACHMENT GUIDE

⚠ WARNING

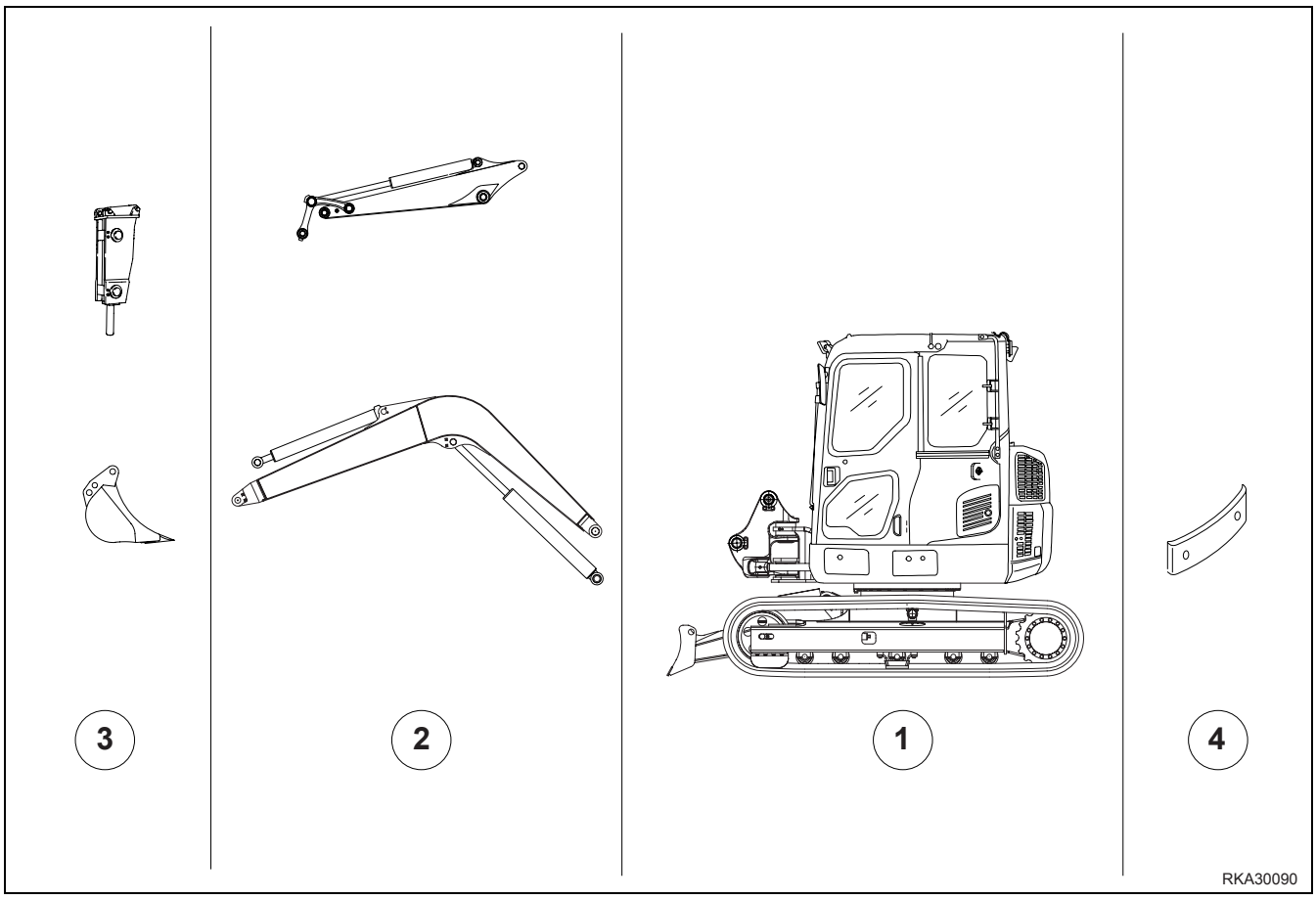
- **Please read the instruction manual for the attachment and the sections of this manual related to attachments and options.**
- **When installing any attachment or option, there may be problems with safety, so please contact your Komatsu distributor before installing.**
- **Installing attachments or options without consulting your Komatsu distributor may not only cause problems with safety, but may also have an adverse effect on the operation of the machine and the life of the equipment.**
- **Any injuries, accidents, or damage resulting from the use of unauthorized attachments or options will not be the responsibility of Komatsu.**

6.3.1 COMBINATIONS OF WORK EQUIPMENT

⚠ WARNING

- **Depending on the type or combination of work equipment, there is danger that the work equipment may hit the cab or machine body.**
  When using unfamiliar work equipment for the first time, check before starting if there is any danger of interference, and operate with caution.

6.3.2 ATTACHMENT CONFIGURATION



NOTE:

1. Bucket size based on ISO 7451, heaped material with a 1:1 angle of repose.
2. Max Bucket Volume/Weight are for reference only and are not necessarily available from the factory.
3. Table is based on General Purpose buckets and both conditions of Volume (m^3) and Weight (kg) must not be exceeded.
4. Please consult with your distributor for the correct selection of buckets and attachments to suit the application. The recommendations are given as a guide only, based on typical conditions.

- For digging or loading hard soil or soft rock, it is recommended that the strengthened bucket with high durability and high wear resistance be employed.

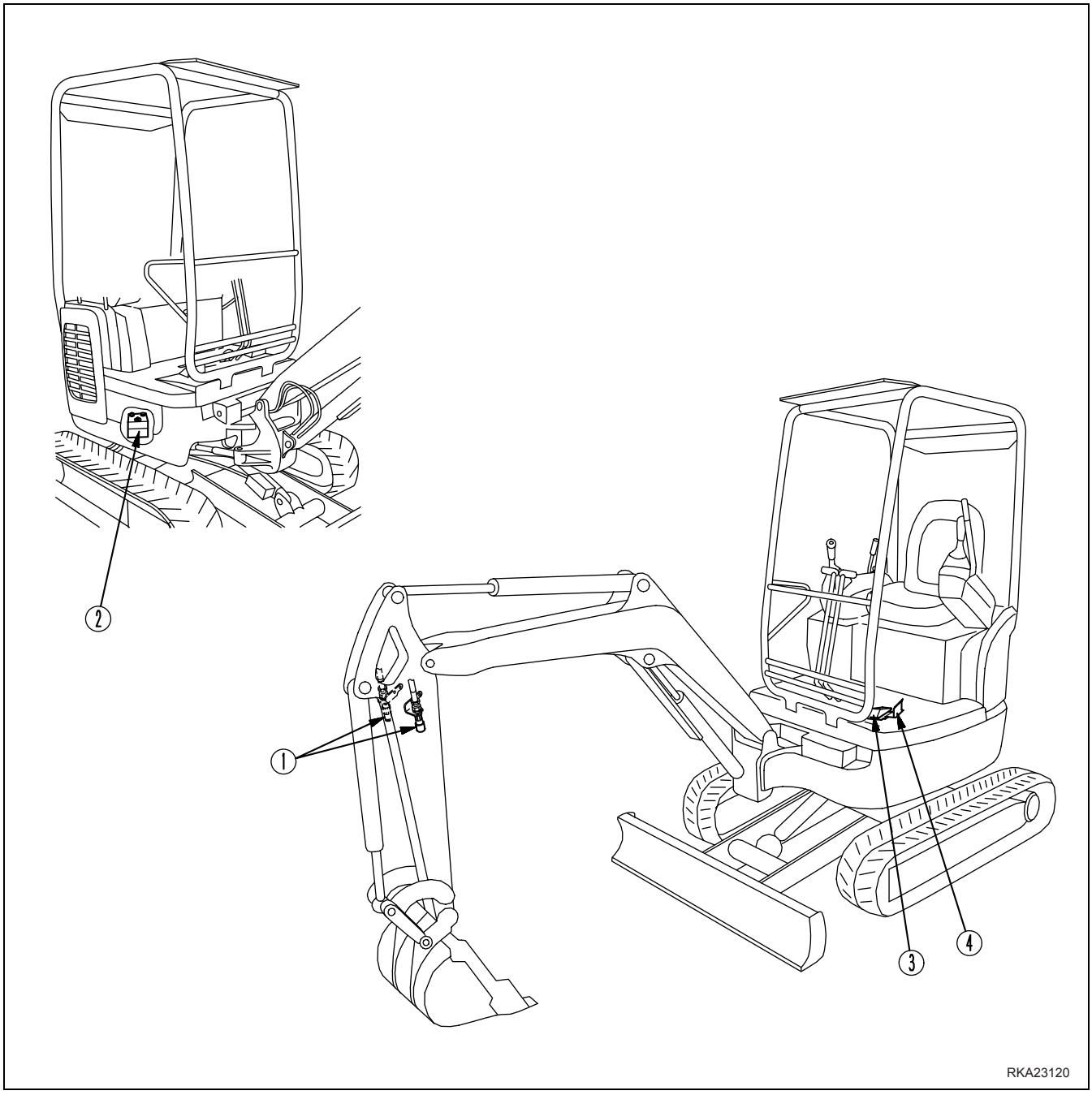
Machine layout: Equipments characteristics (to be managed only by Komatsu or Komatsu Distributor)										
Picture reference	Description		Category	Weigth	Working pressure	Working flow	Main dimension		ISO capacity	Lift capacity
							Height	Width		
				kg	Mpa	l/min	mm	mm	m^3	kg
1	Core machine			1660	—	—	—	—	—	—
2	Work Equipment	Boom 1760 mm	Equipment	82.2	—	—	—	—	—	—
		Standard Arm 965 mm	Equipment	45.9	—	—	—	—	—	—
		Long Arm 1215 mm	Equipment	54.2	—	—	—	—	—	—
		Mechanical Quick Hitch	Interchangea-ble equipment	19	—	—	—	—	—	—
4	Additional counterweight			111.3	—	—	—	—	—	—

Machine layout: Tools & Interchangeable Equipments characteristics (to be managed by Operator)										
Picture reference	Description		Category	Weigth	Working pressure	Working flow	Main dimension		ISO capacity	Lift capacity
							Height	Width		
				kg	Mpa	l/min	mm	mm	m^3	kg
3	Attachment	Bucket 250 mm	Tool	18.4	—	—	—	—	0.018	—
		Bucket 300 mm	Tool	20.0	—	—	—	—	0.022	—
		Bucket 350 mm	Tool	21.5	—	—	—	—	0.027	—
		Bucket 400 mm	Tool	22.8	—	—	—	—	0.031	—
		Bucket 450 mm	Tool	24.0	—	—	—	—	0.035	—
		Ditch cleaning bucket 1000 mm	Tool	75.0	—	—	—	—	0.054	—
	Attachment (for quick hitch)	Bucket 250 mm	Tool	30.5	—	—	—	—	0.019	—
		Bucket 300 mm	Tool	32.5	—	—	—	—	0.025	—
		Bucket 350 mm	Tool	35.0	—	—	—	—	0.030	—
		Bucket 400 mm	Tool	38.5	—	—	—	—	0.035	—
		Bucket 450 mm	Tool	41.0	—	—	—	—	0.041	—
		Ditch cleaning bucket 1000 mm	Tool	56.0	—	—	—	—	0.081	—

Values shown are in accordance with EN474-5:2006

6.4 MACHINE CONFIGURATION FOR THE INSTALLATION OF ATTACHMENTS

6.4.1 POSITION OF THE DEVICES



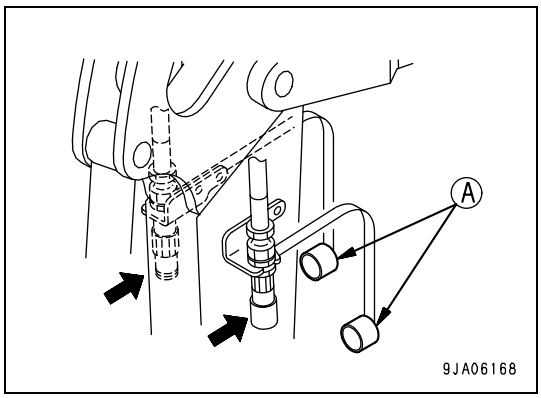
(1) Quick couplers
(2) Selection valve
(3) Optional tools control pedal
(4) Optional tools control pedal locking device

1. Quick couplers

The quick coupling (1) is used to connect the pipes equipped with quick coupling to the ends of the equipment.

NOTE

- When the tools are removed, fit the cap (A) in the quick coupling.
- When the tools are fitted, remove the cap (A) and clean the quick coupling carefully before connecting the hoses.

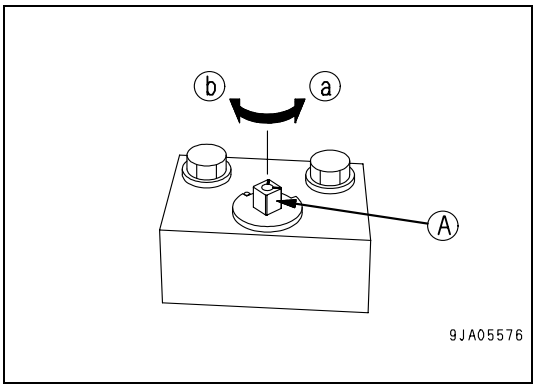


2. Selection valve

The selection valve (2) regulates the flow of the hydraulic oil and has two positions.

- Position (a): for applications requiring the use of the hydraulic breaker.
  Spool (A) completely rotated counterclockwise.
- Position (b): for applications requiring the use of the generic equipment.
  Spool (A) completely rotated clockwise.

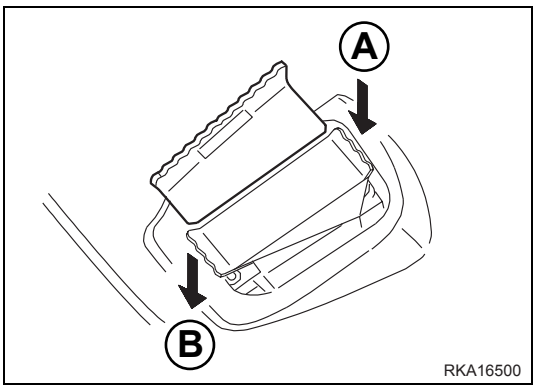
Width across face of square portion of spool (A):
9 mm



3. Optional equipment control pedal

The pedal (3) controls oil delivery to and return from the optional equipment.

- Upper part of the pedal (A) pressed:
  The oil flows to the right side of the arm (hydraulic tank side).
- Lower part of the pedal pressed (B):
  The oil flows to the left side of the arm (operator seat side).

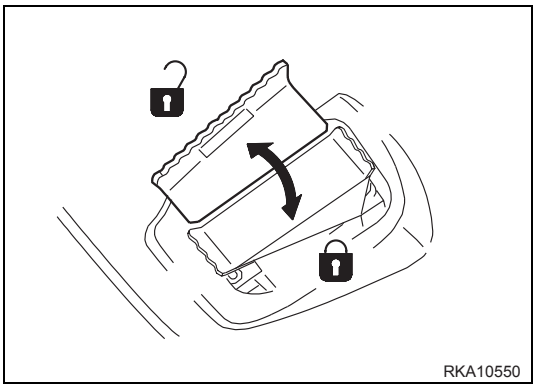


4. Optional tools control pedal locking device

⚠ WARNING

- **Always lock the optional equipment control pedal when the use of this control is not required, during travel and when parking the machine. If the control pedal is inadvertently pressed, this may cause serious accidents.**

The safety device (4) is used to lock the optional equipment control pedal.



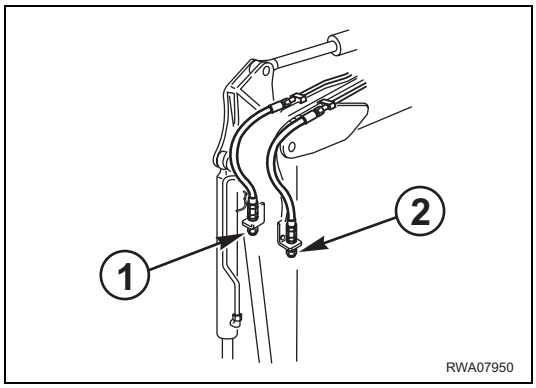
6.4.2 HYDRAULIC CIRCUIT

6.4.2.1 INSTALLING AND CONNECTING THE EQUIPMENT

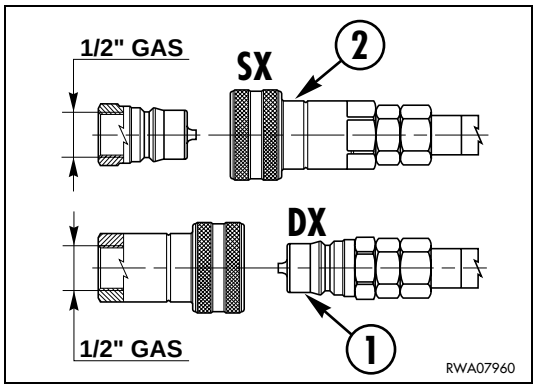
⚠ WARNING

- **The machine must be parked on a level surface, with the equipment resting on the ground.**
- **When the connecting pins are removed or installed, chips may come off; always wear gloves, safety goggles and helmet.**
- **The change of the equipment must be carried out by two operators, who must decide together the words and signals to be used during work.**
- **Avoid using your fingers to align the holes, since the may be injured or even cut off.**
- **Before carrying out any operation on the hydraulic circuit, stop the engine and completely drain the residual pressure from the pipes.**

For the installation of the equipment it is necessary to connect the mechanical constraints of the bucket as described in "3.3.13 CHANGING THE BUCKET" and to carry out the hydraulic connections using the pipes provided.
After connecting the mechanical constraints, carry out the hydraulic connections by proceeding as follows:



1 - Stop the engine and move the hydraulic controls in all directions, in order to release the residual pressures present in the circuits of the machine.
2 - Press the optional equipment control pedal to release the residual pressure from the delivery pipe.
3 - Slowly loosen the hydraulic oil filling cap, in such a way as to release the residual pressure from the tank.
4 - Remove the plugs of the quick couplers of both the machine and the equipment.
5 - Connect the right (1) and left (2) pipes. The quick couplings must be in compliance with the ISO 7241-1 standard, series «B».



⚠ CAUTION

- **When connecting the pipes, take care to prevent any impurities from getting into them.**

6 - Start the machine and perform several manoeuvres with the equipment control pedal, in order to check the seals.

⚠ WARNING

- **Wear thick gloves and safety goggles during this check.**
- **To check the system for leakages, use a piece of cardboard or a wooden board.**

6.4.2.2 MAINTENANCE

The hydraulic system does not require any maintenance operation or check other than the usual operations to be carried out for the machine.
For tool maintenance, refer to the specific manuals.

6.4.2.3 BLEEDING

1. After connecting the pipes, start the engine and let it idle for approximately 10 minutes (see "3.3.2 AFTER STARTING THE ENGINE").
2. Extend all cylinders 4-5 times, stopping them at approx. 100 mm from the end of stroke.

IMPORTANT

- **If the engine runs at maximum rpm or if the cylinders are brought to the end of stroke soon after starting, the air sucked in by the cylinders may damage the piston gaskets.**

3. Slowly make all cylinders reach the end of stroke for 3-4 times.
4. Press the optional equipment control pedal a dozen times to bleed the equipment circuit completely.

IMPORTANT

- **If the equipment bleeding procedure is explained in the specific manual of the equipment supplied by its manufacturer, follow the instructions contained therein.**

5. Once the bleeding operation has been completed, stop the engine and wait at least 5 minutes before starting work.
6. Make sure that there are no oil leakages and clean any dirty surface.

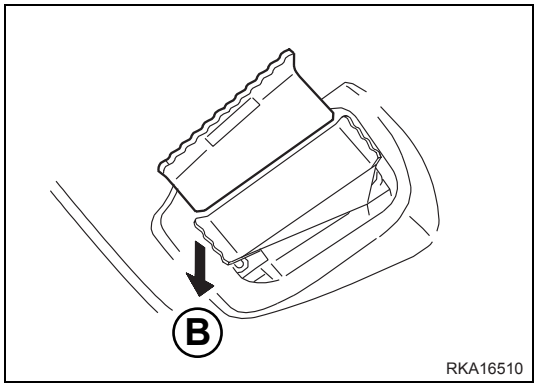
6.5 OPERATING THE EQUIPMENT

⚠ WARNING

- **Always lock the optional equipment control pedal when the use of this control is not required, during travel and when parking the machine. If the control pedal is inadvertently pressed, this may cause serious accidents.**

USING THE HYDRAULIC BREAKER

The breaker is operated by pressing the lower part of the equipment control pedal (B).

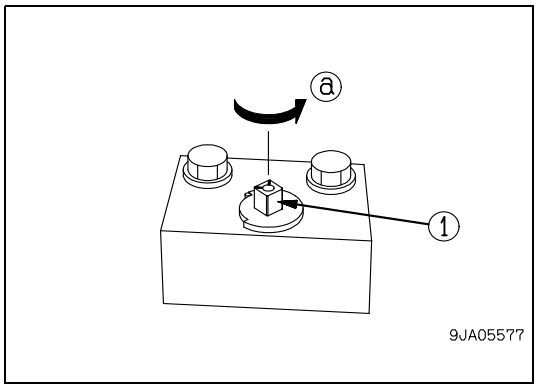


NOTE

- If it is necessary to adjust the oil flow, have this operation carried out by your Komatsu Distributor.

Precautions for use

- Before using the breaker, make sure that the spool of the selection valve (1) is completely rotated counterclockwise and resting against its retainer, position (a).
- When using the breaker, shift the accelerator almost to max. idling and keep it in this position during work (position corresponding approximately to 80% of the engine maximum power).
- When the hydraulic breaker is used, the hydraulic oil deteriorates more quickly and therefore it is necessary to change the filtering element more frequently. For details, see paragraph "4.8.2 MAINTENANCE INTERVALS IN CASE OF USE OF THE HYDRAULIC BREAKER"
- For further details and other precautions to be taken when handling the hydraulic breaker, carefully read the instruction manual provided by its manufacturer.



USE OF GENERIC EQUIPMENT SUCH AS THE CRUSHER

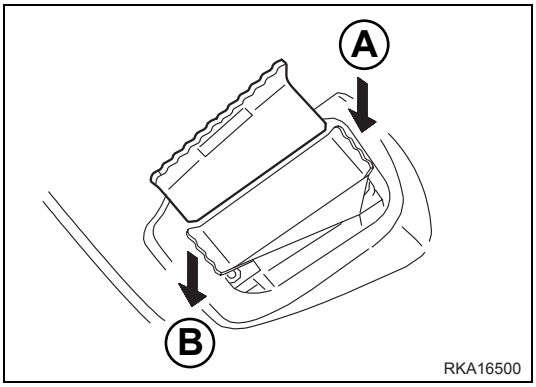
Generic equipment is operated by pressing the equipment control pedal as indicated below.

Upper part (A) pressed: the oil flows to right side of the arm (hydraulic tank side).

Lower part (B) pressed: the oil flows to the left side of the arm (operator seat side).

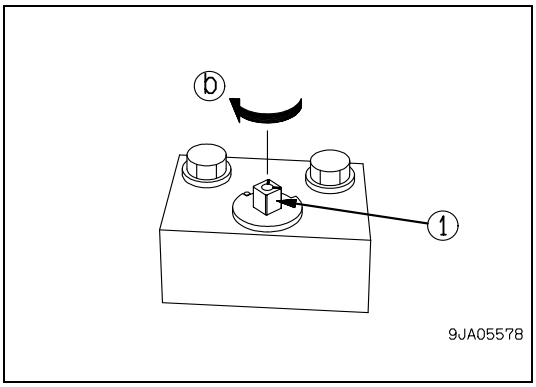
NOTE

- If it is necessary to adjust the oil flow, have this operation carried out by your Komatsu Distributor.



Precautions for use

- Before using a crusher or other generic equipment, make sure that the spool of the selection valve (1) is completely rotated clockwise and resting against its retainer, position (a).
- For further details and other precautions to be taken when handling the equipment, carefully read the instruction manual provided by its manufacturer.



6.5.1 LONG PERIODS OF INACTIVITY

If the machine is going to remain unused for a long period, proceed as indicated below.

- Put the plug on the quick couplers.
- Set the selection valve to the position indicated for generic equipment such as the crusher.
- Lock the equipment control pedal with the apposite locking device.

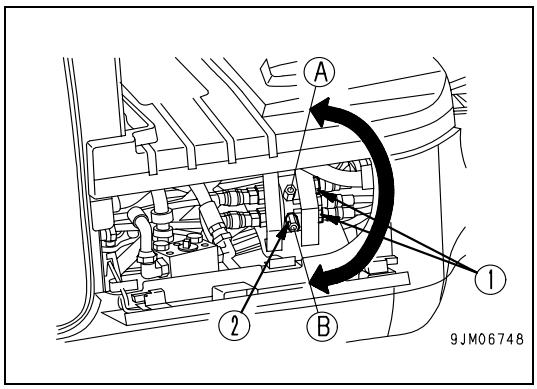
Operating the pedal when neither the breaker, nor generic equipment are installed on the machine may cause overheating or other problems.

6.6 MODIFYING THE MACHINE CONTROL PATTERN (ONLY ON MACHINES WITH PATTERN CHANGE VALVE)

⚠ WARNING

- **Before using the pattern change lever to modify the control pattern of the machine, lower the tools to the ground, stop the engine an ensure that the safety device lever is in the locked position.**
- **After modifying the control operating pattern, perform the first manoeuvres slowly and with particular caution as incorrectly performed manoeuvres may cause serious damage and even fatal injuries.**
- **After modifying the control operating pattern and before testing the machine functions, ensure that there are no obstacles in the area or persons in the operating radius of the machine.**

6.6.1 PROCEDURE FOR MODIFYING CONTROL PATTERN



1. Park the machine on stable, even ground, set the safety device lever to the locked position and stop the engine.
2. Open the cover on the right hand side of the machine.
3. Loosen the screw (1) and select a new control operating pattern by moving the lever (2) up or down.
   The lever has two positions:
   Position (A): ISO PATTERN control system
   Position (B): BACKHOE PATTERN control system
4. After selecting the control pattern, tighten the screw (1).
5. Replace the control pattern card with the card corresponding to the selected control pattern (insert card in card holder).
6. Start the engine, set the safety device lever to the work position (F) and operate the tool control levers slowly to verify that the control pattern has been changed successfully.

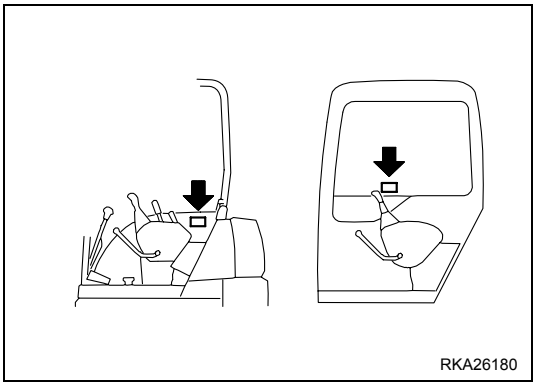
IMPORTANT

- **Before moving the machine, the operator must ensure that the control pattern card fitted in the machine corresponds to the control pattern selected with the lever (2).**

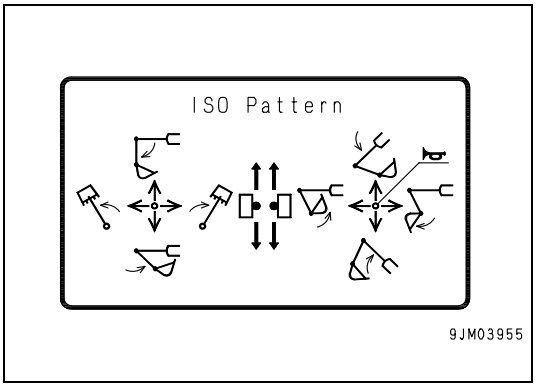
6.6.2 MACHINE CONTROL DIAGRAMS

⚠ WARNING

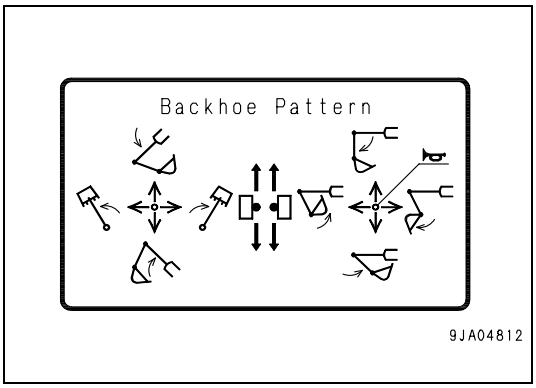
- **After having changed the operation diagrams, always replace the relevant card in the operator compartment.**



- ISO PATTERN control system



- BACKHOE PATTERN control system



6.7 PRECAUTIONS TO BE TAKEN WHEN USING OPTIONAL EQUIPMENT

The instructions given below must be strictly followed when the hydraulic excavator is fitted with a piece of equipment.

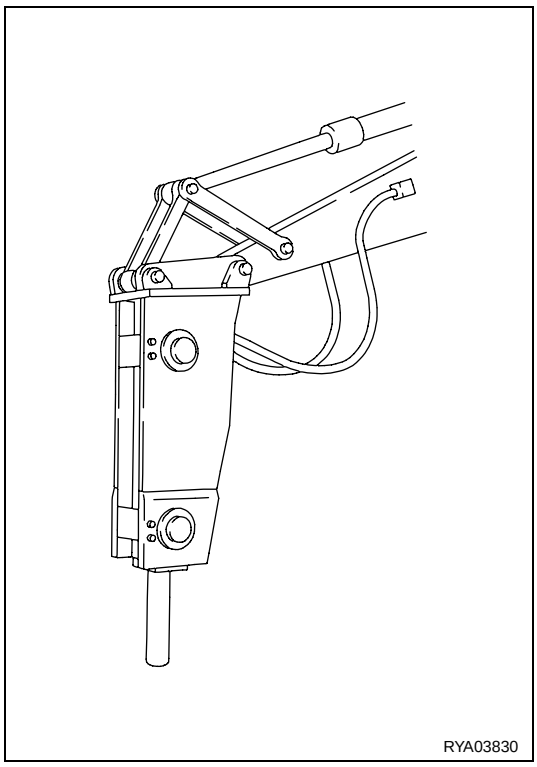
IMPORTANT

- **Choose the type of equipment that is most suitable to the hydraulic excavator on which it must be installed.**
- **Use only optional or special equipment recommended and approved by Komatsu and in compliance with the requirements indicated (see "6.3.2 ATTACHMENT CONFIGURATION").**

6.7.1 HYDRAULIC BREAKER

⚠ WARNING

- **The hydraulic breaker is very noisy, therefore always wear ear muffs when using it.**



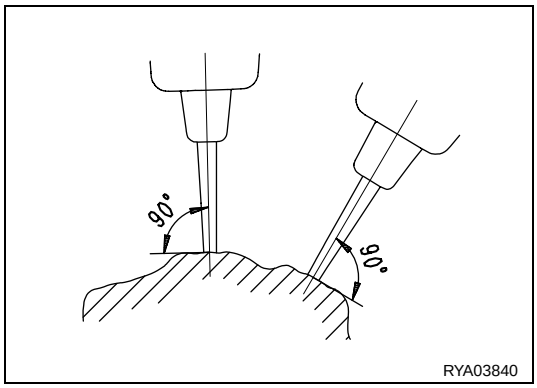
MAIN APPLICATIONS

- Crushing rocks
- Demolition work
- Road construction

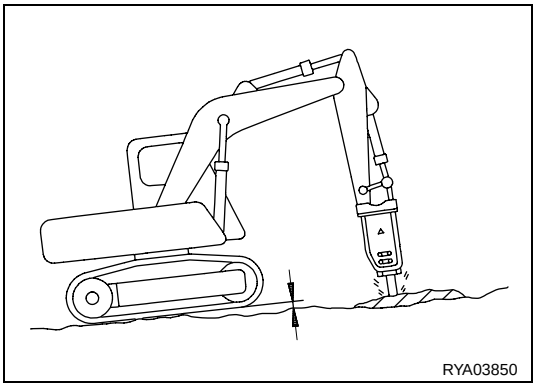
This attachment can be used for a wide range of applications, including demolition of buildings, breaking up of road surfaces or debris, tunnel work, rock crushing and breaking operations in quarries.

HOW TO USE THE BREAKER CORRECTLY

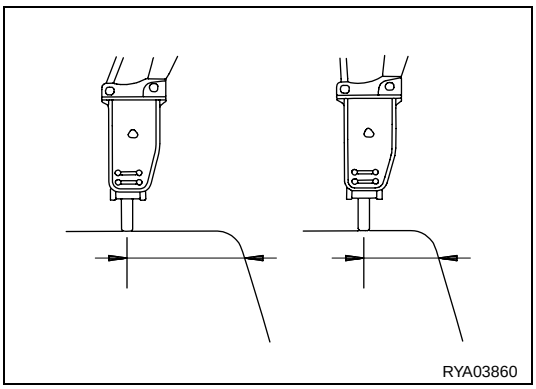
1. Make sure that the position of the breaker with respect to the material to be broken is as perpendicular as possible and that the arm thrust is sufficient, so that all the power of the breaker can be exploited.



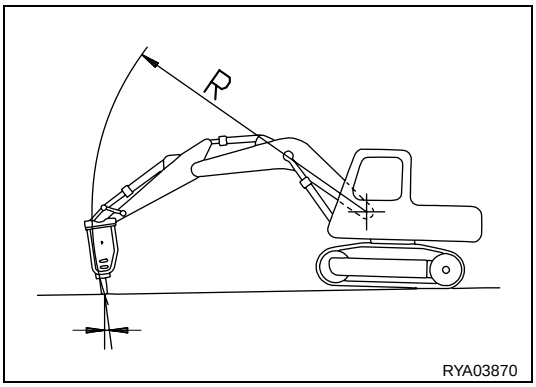
2. It is absolutely necessary to keep the pressure of the excavator on the breaker constant as the bit penetrates the ground. Always accompany the breaker as it penetrates and use the excavator arms to obtain such a pressure as to keep the undercarriage lifted approx. 5 cm from the ground.
Avoid lifting the undercarriage more than necessary.



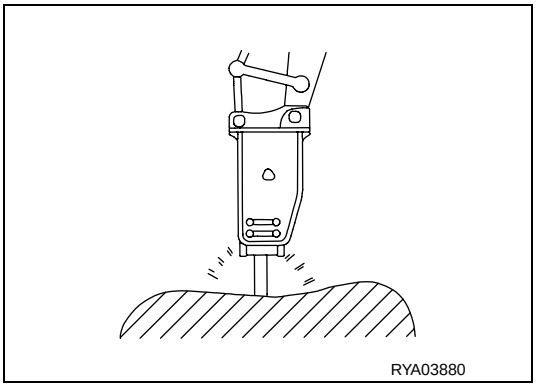
3. When working on very hard materials it is important to avoid hitting the same point for more than 30 seconds.
Hit the same point for a few seconds and change position continuously: in this way the material breaks more easily.



4. To facilitate the sliding of the tool on its seat, check the thrust direction and always correct the hitting position of the breaker using the bucket and arm control.



5. Always make sure that the thrust is optimal, in order to avoid dangerous and useless strokes.



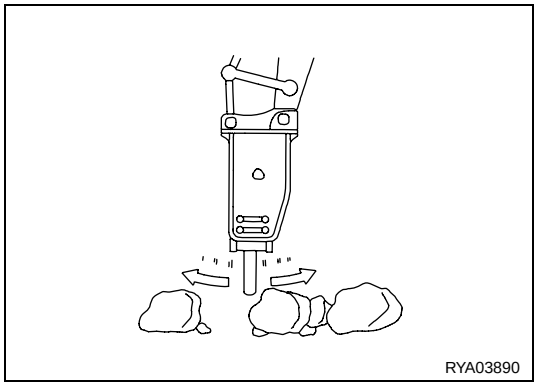
ALWAYS AVOID THE FOLLOWING INCORRECT USES:

To ensure long machine life and safe work, the following operations should be avoided.

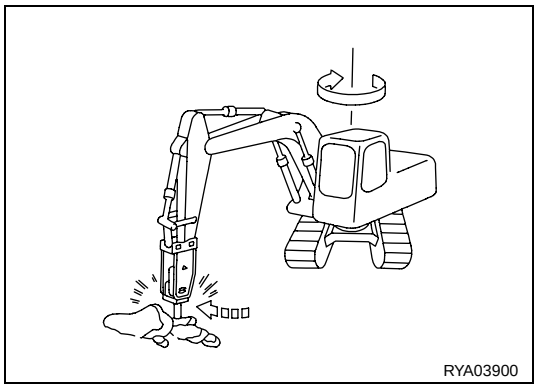
IMPORTANT

- **During work, do not use the hydraulic breaker with the bucket cylinder at the end of stroke, but always leave a minimum space of 5 cm.**

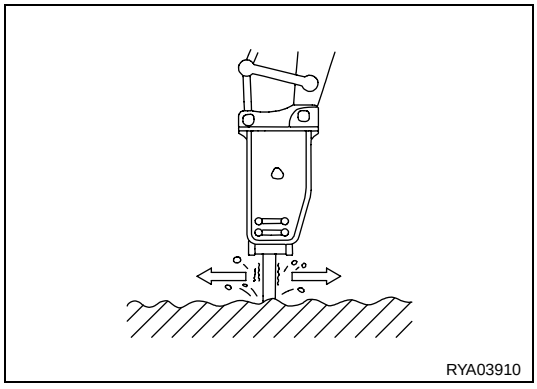
1. Gathering or moving stones with the hydraulic breaker.


RYA03890

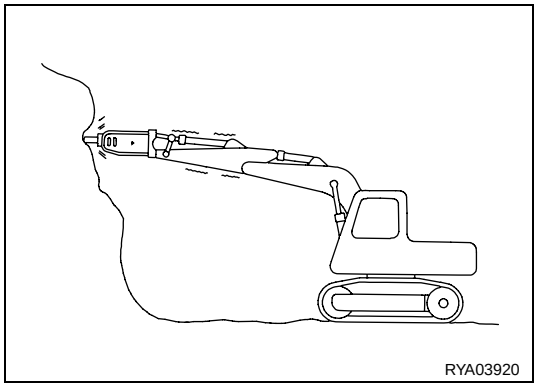
2. Swinging the revolving frame while using the breaker.


RYA03900

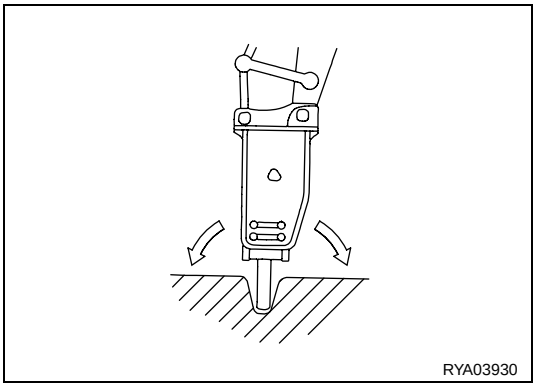
3. Moving the tool while it is hitting the material to be broken.


RYA03910

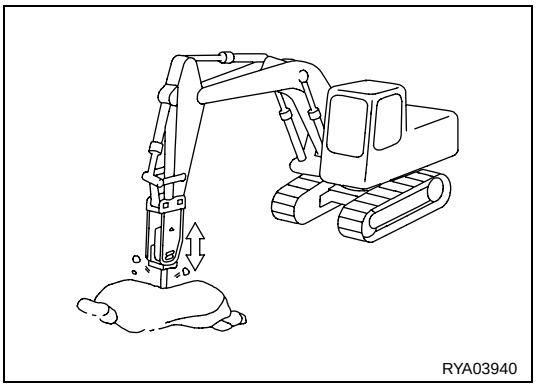
4. Working with the breaker in horizontal position or even more inclined.


RYA03920

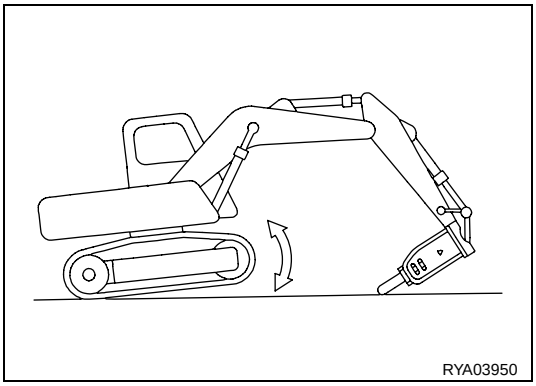
5. Levering with the tool after driving it into the material to be broken.



6. Hitting the ground with the breaker bit.

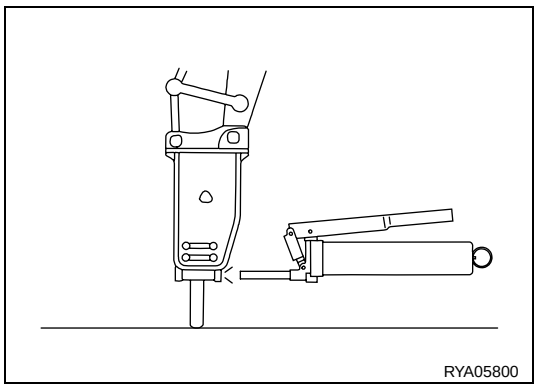


7. Lifting the machine by levering on the breaker bit with the bucket cylinder completely extended.



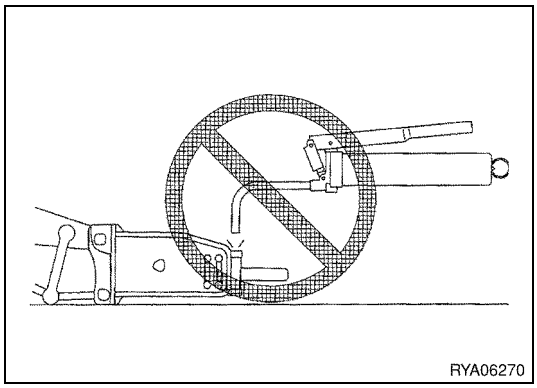
GREASING

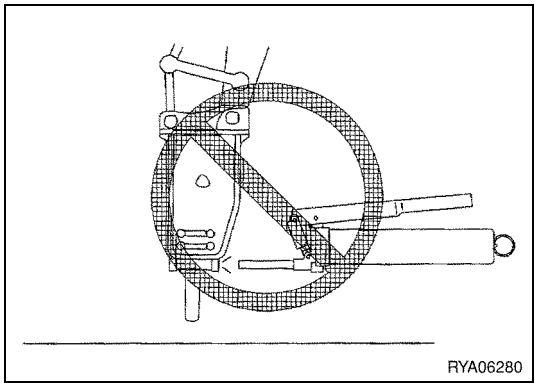
Supply grease in the correct position.



IMPORTANT

- **If grease is injected with the breaker in the wrong position, the breaker circuit will receive more grease than necessary. As a result, soil and sand may get into the hydraulic circuit and damage the hydraulic components while the breaker is being used.**
  Therefore, make sure to carry out the greasing operation with the breaker in the correct position.





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