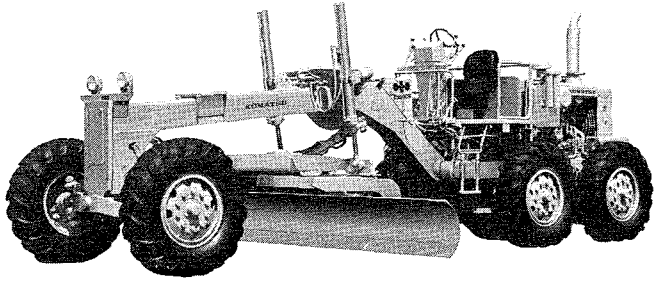
SEAM23ABO I

Operation & Maintenance Manual

KOMATSU

GD500R-2
MOTOR GRADER



SERIAL NUMBERS

GD500R-2-11002 and up

FOREWORD

Thank you for purchasing this Komatsu machine.

This manual describes procedures for operation, handling, lubrication, maintenance, checking, and adjustment. It will help the operator realize peak performance through effective, economical and safe machine operation.

- Please read this manual carefully BEFORE operating the machine.
- Please continue studying this manual until proper operation is completely reinforced into personal habit.

★ Operation, inspection, and maintenance should be carefully carried out, and the safety must be given the first priority. Safety precautions are indicated with ⚠ marks in this manual.

★ Some of the photographs and diagrams used for describing the various parts of this machine show parts with optional specifications.

BREAKING IN YOUR NEW MACHINE

Each machine is carefully adjusted and tested before shipment. However, a new machine requires careful operation during the first 100 hours to run in various parts. Unreasonably hard use during the run-in period will weaken the machine and reduce its service life. **A new machine must be operated with care,** particularly with regard to the following items.

- After starting, idle the engine for about 5 minutes to allow proper engine warm-up prior to actual operation.
- Avoid running the engine at high speed.
- Avoid abrupt starting, acceleration, unnecessarily abrupt braking and sharp turning.
- At the initial 250 hours of operation, the oil and filter elements should both be totally replaced with new oil and new filters.
- Be sure to perform periodical maintenance and checking as indicated in this manual.
- Be sure to use recommended fuel and lubricant.

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SAFETY HINTS · · · ⚠

For Operators and Maintenance Personnel

- Wear a well-fitting helmet, safety shoes and working clothes.
  When necessary, also wear safety goggles, protective mask and gloves.

Observe the following items without fail, prior to machine operation.

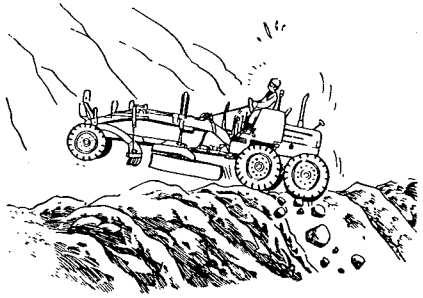
- Thoroughly read the Operation and Maintenance Manual and the Caution Plates for the operational instructions and performance of the machine.
  Operate the machine slowly and in a careful manner until you are completely familiar with it.
- Do not attempt to jump off the machine.
- Keep fire away from stored fuel, lubricants and anti-freeze.
- When removing radiator cap or hydraulic tank cap, loosen the cap carefully and slowly so as to gradually discharge high-pressure vapors.
- Use seat belt if equipped.

BEFORE OPERATION

- Before starting the machine, perform all necessary checks as stated in the Operation and Maintenance Manual.
- Before starting the engine, place every control lever in the neutral.
- Confirm that guards and safety devices operate properly.
- When the engine starts and operation begins, sound the horn.
- Confirm that lighting means and other devices to be prepared for work during the night work normally and inspect from time to time every section of the body of the stopped machine, when you work at night time.
- Don't forget to advise the responsible supervisor of parts or components to be repaired later which you discovered during operation of the machine.

OPERATING

- During operation of the machine, pay careful attention to any gauges indicating abnormalities, any controls functioning abnormally and any parts emitting abnormal sounds. If any are detected, immediately stop the machine and engine and call a mechanic to check the trouble.
- Do not attempt to force the machine to perform any job which exceeds its working capability, or any unreasonable work deviating from its main application of the machine.
- Operate the machine at proper traveling speeds depending on load. Avoid unnecessary heavy-duty operation or rough handling of the machine.
- When operating in a city area, be sure to locate underground pipes and cables before starting the machine to prevent them from being broken.
- During driving along road—
  Do not protrude the blade from the side of the machine.
- When driving side by side with another vehicle, be careful not to disturb travelling of it by excessive leaning operation.
- Pay attention to earth laid on the ground and possible collapses of the road shoulder.

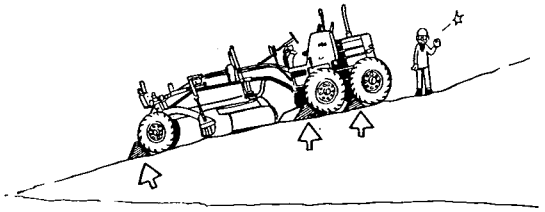


- Be fully aware of your surroundings when backing your machine.
- Never let anyone unauthorized approach the machine while in operation.
- Always keep your eyes on your work when operating the machine.

- When a service operation or other operation is to be performed by two or more workers, proceed with each operation step only after confirming that everyone is familiar with all prearranged signals.
- Confirm that the steering device and brake work normally and properly by slowly moving the machine prior to operation.
- Be sure to avoid stopping the machine at dangerous places such as weak ground or place beneath an overhang.
- Never get on or off the machine while travelling.

AFTER OPERATION

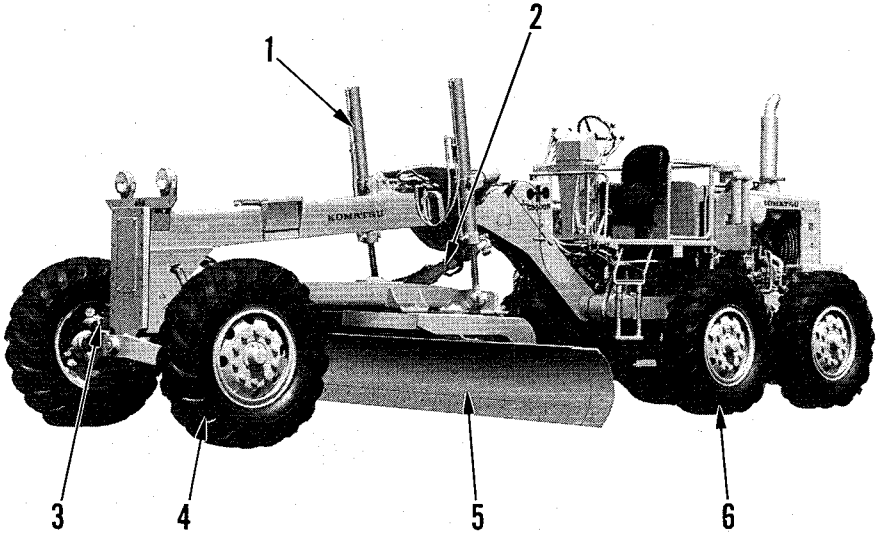
- Park the machine on firm, flat ground. Avoid the dangerous places.
- Lower the work equipment and lock every control lever in neutral when parking the machine.
- When parking on a slope, lock the machine with the hand brake and chock the wheels. It is safer when the machine is parked with its front facing downward, with the blade, or the scarifier biting into the ground.



- Be sure to apply parking brake, stop the engine, and pull out the starting key before leaving the machine.

GENERAL LOCATIONS

1. Blade lift cylinder
2. Drawbar side shift cylinder
3. Leaning cylinder
4. Front tire
5. Blade
6. Rear tire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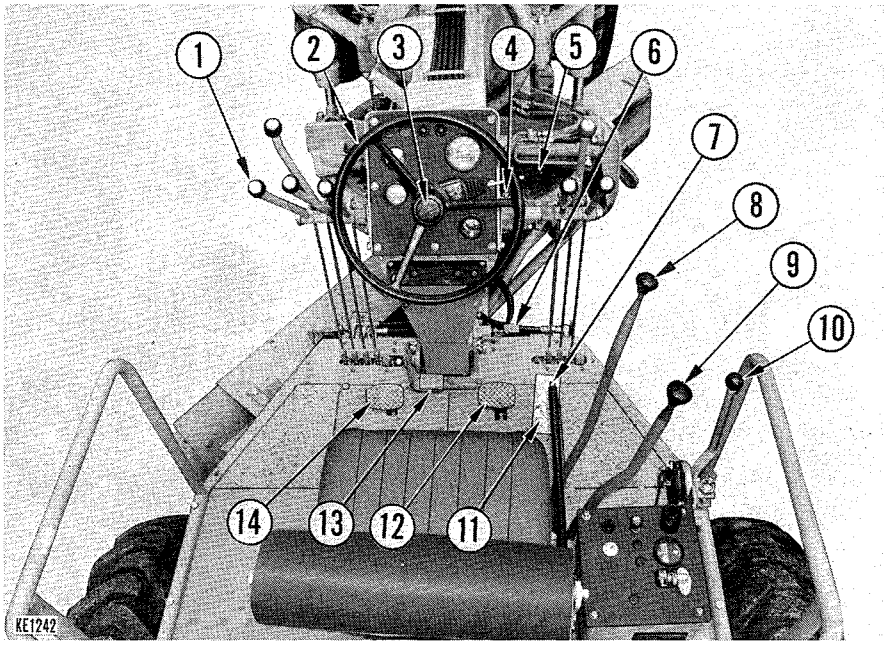
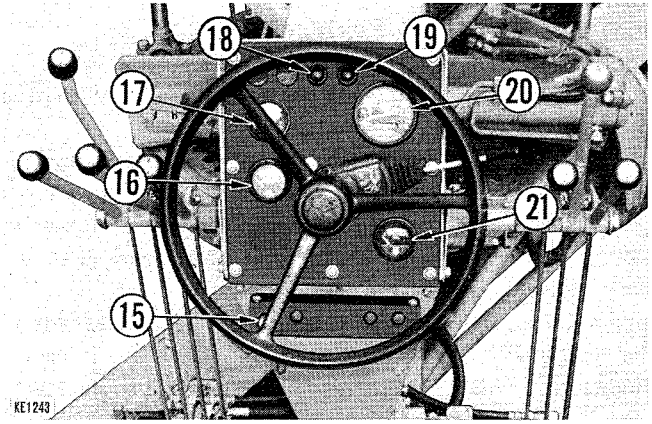
OPERATOR'S COMPARTMENT

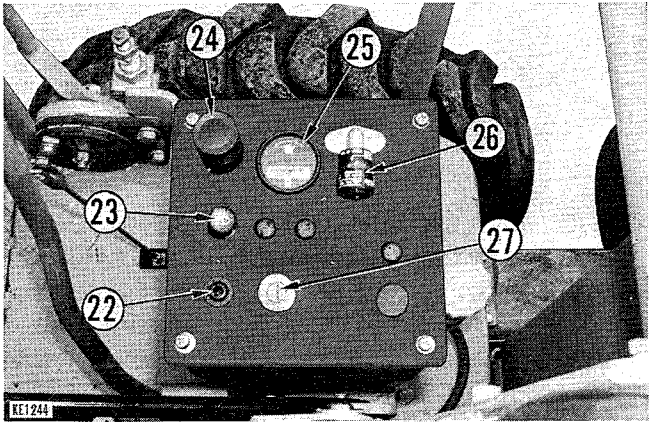


1. Work equipment control lever
2. Steering wheel
3. Horn button
4. Safety lock (for work equipment control lever)
5. Turn signal dimmer switch (OP)
6. Steering post tilt lever
7. Parking brake lever
8. Gear shift lever
9. Forward-reverse lever
10. Fuel control lever
11. Accelerator pedal
12. Brake pedal
13. Bank cut control lock pin removing pedal
14. Clutch pedal

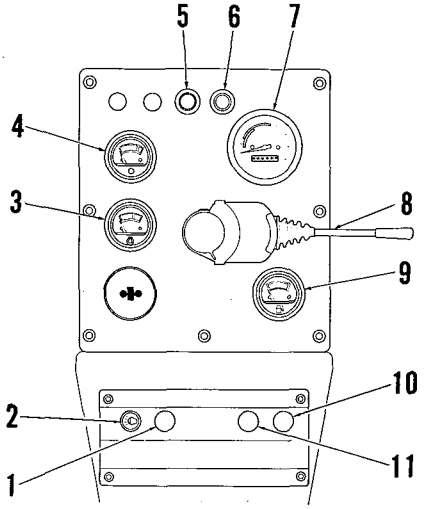
15. Head lamp switch
16. Engine oil pressure gauge
17. Water temperature gauge
18. Battery charging lamp
19. Parking brake indicator lamp (acts also as brake oil level caution (OP))
20. Speedometer
21. Fuel gauge
22. Heater signal
23. Working lamp switch (OP)
24. Panel lamp
25. Service meter
26. Dust indicator
27. Starting switch

(OP): Optional Parts





INSTRUMENTS AND CONTROLS



1. FOG LAMP SWITCH (OP)

When this switch is pulled, the fog lamps will come on.

2. HEAD LAMP SWITCH

When the switch is pulled as far as the first stop, the side marker lamps, tail lamps, licence plate lamps and panel lamp will light up.

When it is pulled as far as the second stop, the head lamps will also light up.

3. ENGINE OIL PRESSURE GAUGE

Engine is normal when indicator is on green range during operation. When engine is cool, indicator is over green range. In this case warm up engine until indicator points green range.

4. WATER TEMPERATURE GAUGE

Engine is normal when indicator is on green range during operation.

After starting engine, continue to warm up engine until indicator points green range.

If indicator is over green range, keep engine in low idling and wait till temperature drops.

5. BATTERY CHARGING LAMP

This lamp is used to indicate the generating condition of the alternator. Normally, when the starting switch is turned ON, the lamp will light up and then go out as the engine speed rises.

6. PARKING BRAKE INDICATOR LAMP

(Acts also as brake oil level caution lamp (OP))

When the parking brake lever is pulled, this lamp lights up. Before starting the machine, release the parking brake lever and check that the lamp goes out.

This lamp also acts as a caution lamp to indicate when there is insufficient oil in the brake oil supply tank.

If the lamp does not go out when the parking brake lever is released, check the level of oil in the brake supply oil tank and add more oil if necessary.

Check also if the brake oil is leaking from any damaged piping or cylinder cup, or from any loose joint. If any abnormality is found, repair it.

★ If the parking brake is left released for a long time, lowering of pressure in the vacuum tank will cause continuous sounding of the warning buzzer, and the battery charge will be wasted. The electric circuit of the warning buzzer can be switched off by pulling the parking brake lever.

7. SPEEDOMETER

Indicates the running speed of the machine. It also contains an odometer. For details of the white range, refer to OPERATING YOUR MACHINE.

8. TURN SIGNAL, DIMMER SWITCH (OP)

Push the switch lever downward to actuate the right-hand blinking lamps when the machine is to be turned to the right. Push the switch lever upward to actuate the left-hand blinking lamps when the machine is to be turned to the left.

Return the switch lever manually to the NEUTRAL position after the steering wheel is returned to the NEUTRAL position from right or left turning.

The dimmer switch lever is also used as the turn signal switch lever. The purpose of this switch is to change the head lamp beams to upper and lower. When the switch lever is lifted upward, the head lights are changed to upper beams. When the lever is pushed downward, the head lights are changed to lower beams.

9. FUEL GAUGE

The fuel gauge indicates the amount of fuel in the fuel tank.

E: Indicates that the fuel level is low.

F: Indicates that the tank is full.

10. REAR WIPER SWITCH (OP)

The wiper is actuated at low speed, when the switch is pulled as far as the first stop.

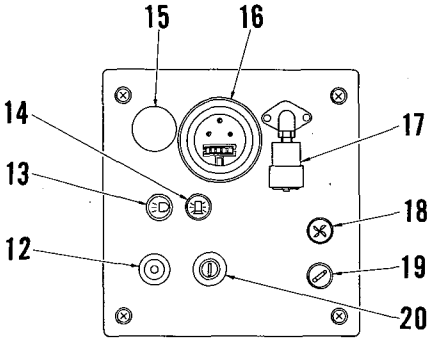
The wiper works at high speed, when it is pulled as far as the second stop.

11. FRONT WIPER SWITCH (OP)

The wiper is actuated at low speed, when the switch is pulled as far as the first stop.

The wiper works at high speed, when it is pulled as far as the second stop.

Turn the switch clockwise to spray solvent on the glass.



12. HEATER SIGNAL

When the starting switch is set to the HEAT position, the heater signal will glow red after about 40 seconds or so, indicating that both the ribbon heater and coil heater are on.

★ The preheating time will vary depending upon the ambient temperature. Accordingly refer to the section COLD WEATHER OPERATION.

13. WORKING LAMP SWITCH (OP)

When this switch is pulled, the working lamp will come on.

⚠ **Use only when machine is working.**

14. YELLOW ROTATING LAMP SWITCH (OP)

When this switch is pulled, the yellow rotating lamp will light up and start rotating.

15. PANEL LAMP

Control panel illumination.

16. SERVICE METER

The service meter indicates the total number of operating hours of the machine.

While the engine is running, the indicator of the meter will rotate to indicate that the meter is turning over.

17. DUST INDICATOR

This indicator shows if the air cleaner has been filled with the dust.

When the element is blocked, a red piston appears at the transparent section and will not disappear. This red signal is the alarm for blockage, and the element must be cleaned immediately.

When the cleaning is down, push the indicator button so that the red piston is reset to the original position.

18. CAR HEATER SWITCH (OP)

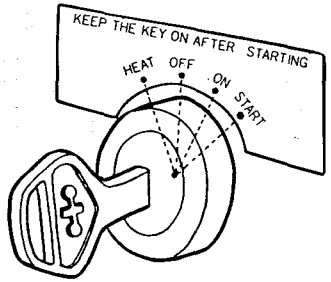
After starting the engine, pull this switch to operate the heater.

The temperature can be adjusted to three levels.

19. CIGARETTE LIGHTER (OP)

Depress the knob and wait for several seconds until it is returned automatically to its original position. Then the lighter is ready to use.

20. STARTING SWITCH



OFF

Key can be inserted and pulled out at this position and the switches of all the electric systems are set to off.

The parking lamps will remain on, however, when the switch is turned OFF.

ON

When this position (ON) is reached by rotating clockwise for one step, the charging circuit and the lamp circuit are electrified.

This position (ON) shall be held after the engine is started.

START

Starting motor starts revolution by rotating the switch clockwise further for one step. And the engine is started.

The key will be automatically restored to the position ON by releasing your hand. So, you shall release your hand once the engine is started.

HEAT

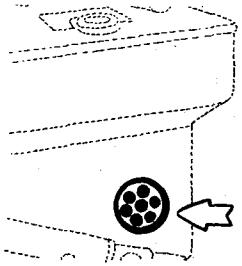
Use this position when starting a cold weather.

Release the key to allow it to return automatically to OFF and then, without delay, turn it to START.

★ Never place starting switch key in OFF position while engine is running. This will damage the alternator.

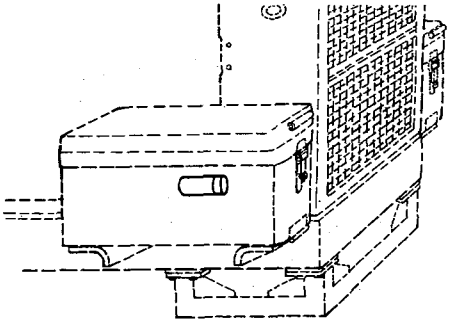
★ When starting, be sure to use the starting key.

VACUUM PRESSURE WARNING BUZZER



- Sounding of this buzzer during machine operation is the indication of some abnormality.
- When vacuum pressure drops due to frequent use of brake in a short time, the buzzer will start sounding. Temporarily stop the machine and wait for stopping of sound. When the parking brake lever is pulled, buzzer is not actuated. When frequent sounding of the buzzer is noticed, check for air leakage caused by damaged pipe or loose joint. If any, consult your Komatsu distributor for service.

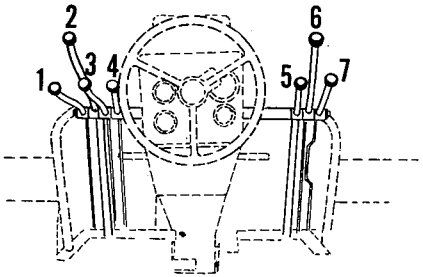
BACK-UP BUZZER (OP)



This buzzer is provided inside of rear frame.

The buzzer starts sounding when the gear shift lever is shifted to a reverse speed position.

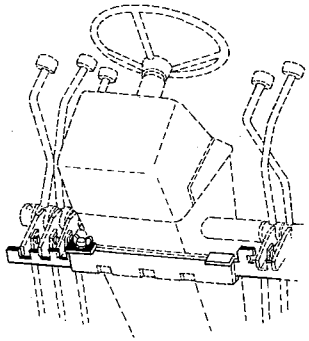
WORK EQUIPMENT CONTROL LEVER



1. Left blade lift lever
2. Scarifier lift lever (OP)
3. Blade roration control lever
4. Drawbar side shift lever
5. Blade side shift lever
6. Leaning lever
7. Right blade lift lever

For each work equipment operation, see the section OPERATING OF WORK EQUIPMENT.

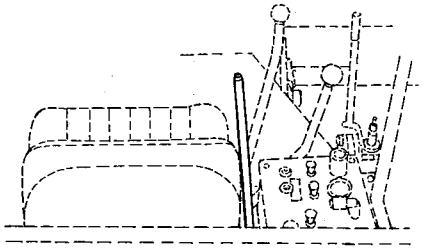
WORK EQUIPMENT CONTROL LEVER SAFETY LOCK



- Locking mechanism for control levers.
- Even if lever is locked, right and left leaning and rise of blade and rise of scarifier are effected.

⚠ **Be sure to use this lock when machine is parking, travelling or maintained.**

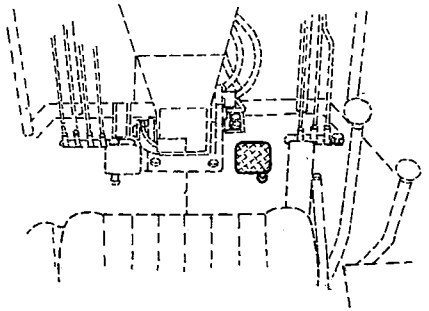
PARKING BRAKE LEVER



The brake is applied to the output shaft of the transmission by pulling this lever to the limit.

⚠ **When parking or leaving the machine, be sure to apply the hand brake.**

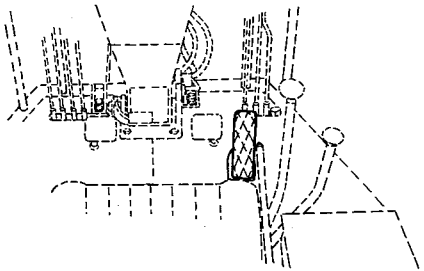
BRAKE PEDAL



The brake are applied on the four rear wheels when this pedal is depressed.

⚠ **Do not put your foot on this pedal unnecessarily.**

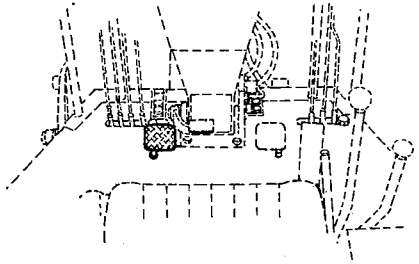
ACCELERATOR PEDAL



This pedal is interconnected with the fuel control lever. Therefore, the engine is easily controlled from low idling to full running by means of the accelerator pedal, with the fuel control lever held at LOW IDLING position.

If the pedal is raised from the LOW IDLING position, the engine will stop.

CLUTCH PEDAL

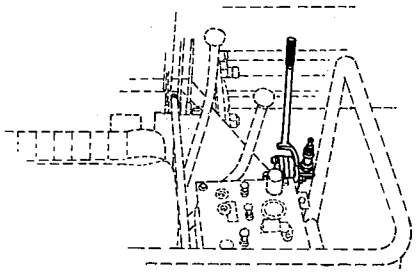


The main clutch is disengaged by depressing this pedal. When the pedal is depressed, the inertia brake is actuated.

The action of the inertia brake during the speed up enables easy gear engagement.

(For adjustment, see the section ADJUSTMENT.)

FUEL CONTROL LEVER



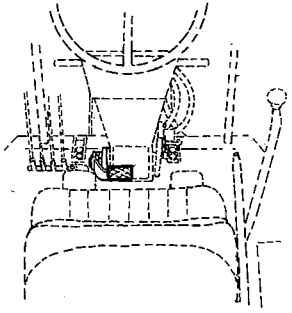
The low idling position is the extreme forward position in which the lever is pressed against the stopper.

When the lever is pulled back, the engine speed will increase until it becomes a maximum when the lever is pulled back all the way.

When stopping the engine, push the lever further forward against the stopper from the low idling position. When the engine stops, turn OFF the starting switch.

★ Use the fuel control lever only during actual work. When running the machine along a road, use the accelerator pedal.

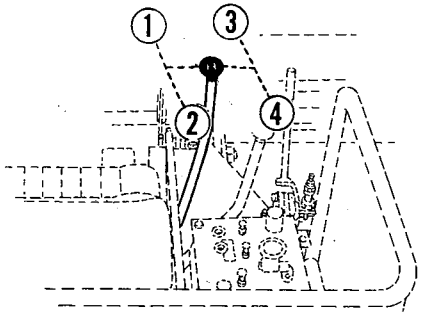
BANK CUT CONTROL LOCK PIN REMOVING PEDAL



The pin fixing the blade lift cylinder installation base to the frame is released by depressing this pedal.

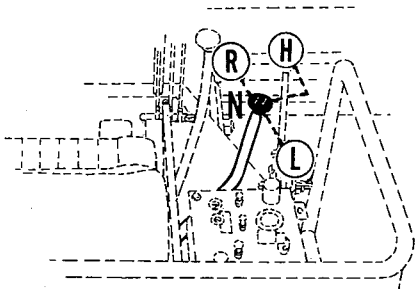
This pedal is used for controlling the blade to the bank cut position and shoulder reach position.

GEAR SHIFT LEVER



This gear shift lever is operated in conjunction with the forward-reverse lever, and can control the speed in 8 stages for forward and 4 stages for reverse.

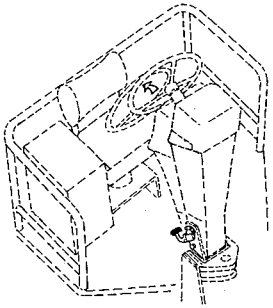
FORWARD-REVERSE LEVER



Four lever positions shown above are H (high), N (neutral), L (low) and R (reverse). In combination with the gear shift lever, this lever provided various travelling speeds of the machine.

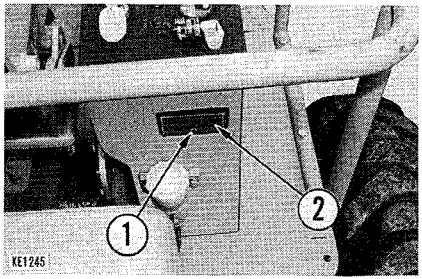
As a rule, use "H" position when the machine is only travelling and "L" position when the machine is brought in work.

ADJUSTING STEERING WHEEL AND WORK CONTROL LEVERS FORWARD-BACKWARD



Step pedal and pull wheel forward you. When instrument box hits stopper, release your foot from pedal, insert pen to fix steering wheel.

FUSE BOX

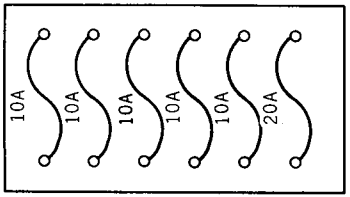


Loosen bolt (1) and remove cover (2).

★ Replace a fuse with another of the same capacity.

⚠ **Before replacing a fuse, be sure to turn off the starting switch.**

Fuse arrangement



OPERATOR'S SEAT

You are required to set the operator's seat according to the following description so that an operator may operate the machine conveniently.

Forward and Backward Adjustment of the Seat

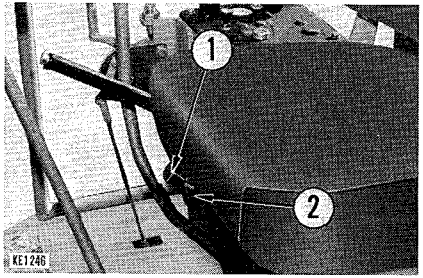
Move the lever (1) to right and set the seat at the desired position. Then release the lever.

The amount of forward and backward adjustment is up to 125 mm (6 steps).

Vertical Adjustment of the Seat

Move the lever (2) to left and set the seat at the desired position. Then release the lever.

The amount of vertical adjustment is up to 103 mm (5 steps).



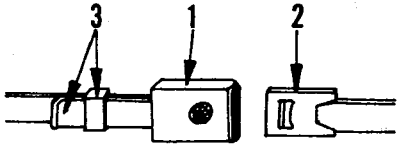
SAFETY BELT (OP)

Mounted on assistant operator's seat (OP).

⚠ Assistant operator should use safety belt during traveling and operation. The assistant operator's seat is option.

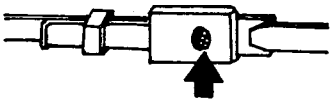
Method of use

Insert (2) into (1) and adjust the length with (3).



Method of release

Push the portion indicated by an arrow.



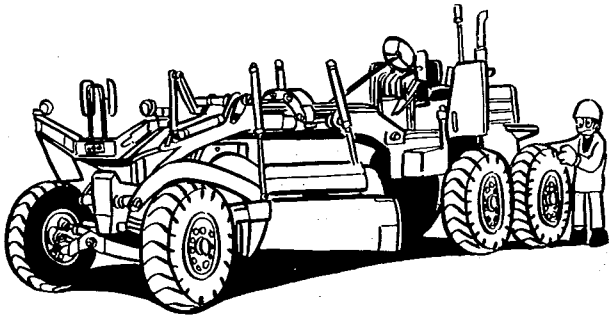
CHECK BEFORE STARTING

The check before starting shall never be neglected as troubles are prevented beforehand by the check.

a. Walk around the machine body and check whether there is any trace of leakage of oil or water. In particular, the joint of high pressure hose and hydraulic cylinder should be paid special attention.
In case leakage is found, inspect the leaking location and stop the leakage. When leakage is not stopped, you are begged to request repair to Komatsu distributor.

b. Inspect the tightening of bolts and nuts on every section. When loosened ones are found, apply increased tightening. In particular, attachment positions of air cleaner and muffler should be paid special attention.

c. Inspect disconnection and shortcircuit of electric wirings, and loosened terminal connections should be paid special attention.



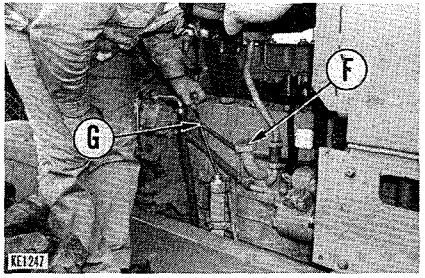
d. CHECK AND CORRECT ENGINE OIL LEVEL

Check oil level of engine oil pan with oil level gauge (G). If oil level is insufficient, add engine oil from oil filler (F).

★ Make an oil level check before starting engine or 5 minutes or more after the engine is stopped. If oil remains at various portions of the engine, the correct oil level cannot be measured.

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

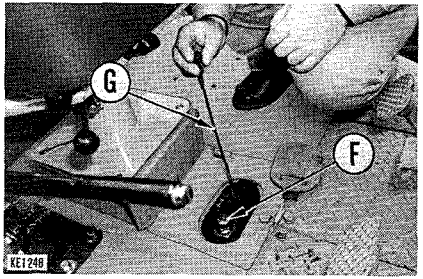
★ Proper oil level is between "H" and "L" marks.



e. CHECK AND CORRECT TRANSMISSION OIL LEVEL

Stop the engine and pull out dipstick (G). Wait for about five minutes, then check the oil level. If the oil level is low, add engine oil through oil filler (F).

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.



f. DRAIN WATER AND SEDIMENT IN FUEL TANK

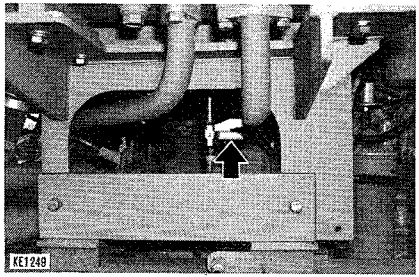
Loosen fuel tank drain cock and drain sediment and water accumulated at bottoms together with fuel.

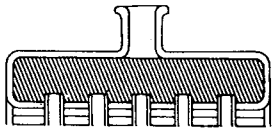
g. CHECK AND CORRECT COOLING WATER

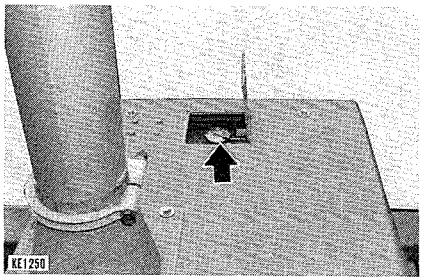
Remove radiator cap on rear machine body, and check that cooling water is filled up to depth indicated by shadowed portion. If not, add water. When water has to be added very frequently, this is usually an indication of leakage at some place. Check for a leak and take necessary measures.

⚠ **Do not remove the cap while cooling water is hot. Hot water may spout out.**

When removing radiator cap, lift the lever to relieve inner pressure.

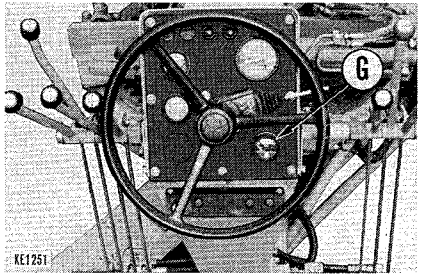


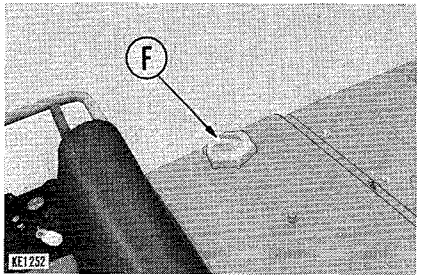




h. CHECK AND REFILL FUEL TANK

Check by the fuel gauge (G). Fill up the tank through the filler (F) after the day's work is over.



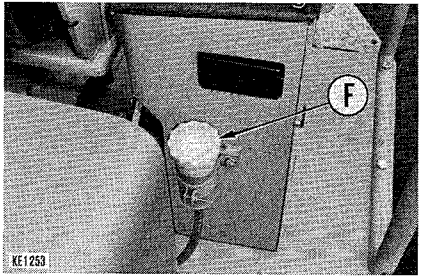


i. CHECK AND ADD BRAKE FLUID

Visual check the fluid level of the brake fluid supply tank in the operator's compartment. Add brake fluid through the filler (F), if necessary.

If the brake fluid has to be topped up very frequently, an oil leak is indicated. Check the pipings for the leak.

★ Keep the brake oil always at the MAX level.



★ Use caution to prevent the mixing of the mineral oil with the brake fluid when refilling, as this will cause the rubber part of the brake oil line to perish, leading to defective brake operation. The special vessel must be used only for refilling the brake fluid.

★ When refilling with brake fluid, be careful not to splash fluid about on the painted surfaces. Brake fluid, if splashed, will affect the painted surfaces.

j. CHECK AND ADJUST STEERING WHEEL

When checking steering wheel play, start engine and raise front wheels off ground. The standard steering wheel clearance is 10 to 12mm. If the clearance is beyond standard or steering is abnormal, contact your Komatsu distributor.

k. CHECK AND ADJUST TRAVEL OF BRAKE PEDAL

The standard pedal play is 5 to 15mm. Height (H) of pedal above floor is;

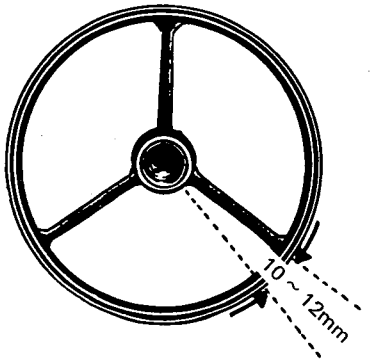
185 ~ 195 mm
(when pedal is released)
76 ~ 116 mm
(when pedal is depressed)

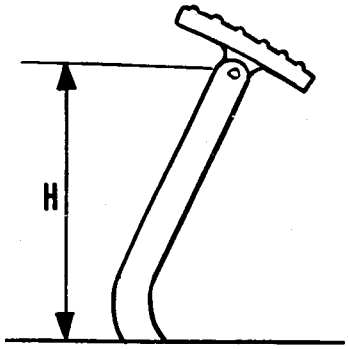
When an excessive pedal travel is found, adjust it using the procedure described in EVERY 250 HOURS SERVICE section.

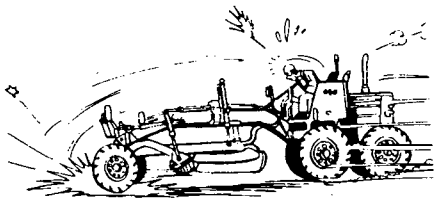
l. CHECK AND ADJUST BRAKING ABILITY

The braking ability is enough if the braking distance is 14m or below at the initial speed of 35km/h.

For insufficient braking ability, refer to EVERY 250 HOURS SERVICE (SERVICE BRAKE.)





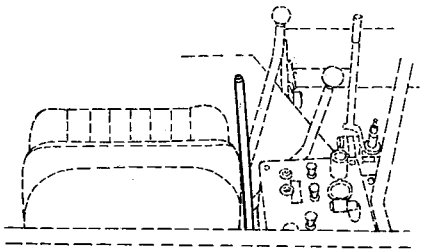


m. CHECK PARKING BRAKE FOR NORMAL LEVER TRAVEL

The lever travel is found normal if the brake is normally applied when the lever grip is pulled until two or three ratchet clicks are felt. If six or more clicks are counted before the parking brake comes into effect, refer to the EVERY 250 HOURS SERVICE for inspection and adjustment procedures.

★ If the machine is started in travel with the parking brake lever left in pulled position, brake lining will be burnt and braking effect will be greately deteriorated. Mostly, this will be accompanied with discoloration of the brake drum.

★ If a brake lining is once burnt, normal braking effect will not recover unless very thin, burnt layer on the lining surface is polished with sandpaper.



n. CHECK FOR NORMAL RISING OF VACUUM PRESSURE

Try repeatedly depressing the brake pedal about 10 times to expel vacuum.

With sounding buzzer, start the engine. Rising of vacuum pressure is found normal if the buzzer stops sounding after running the engine at full speed for approx. 10 seconds.

o. CHECK TIRE

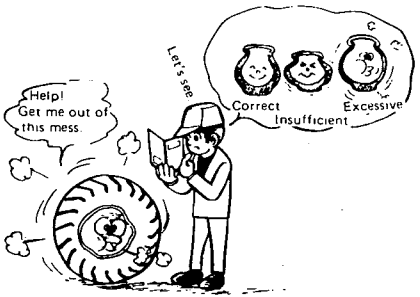
- Tire inflation pressure

Standard pressure

Front wheels (13.00-24-8PR)
1.8 kg/cm^2

Rear wheels (13.00-24-8PR)
1.8 kg/cm^2

Make sure that tire and rim is free from wear and damage, and that hub nuts are not loose.



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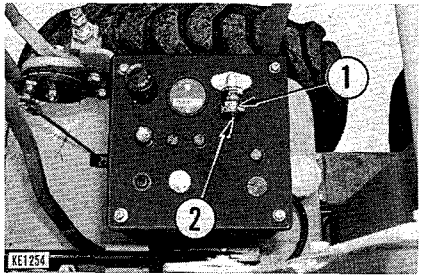
p. CHECK DUST INDICATOR

When air cleaner element is clogged, the red piston (1) appears.

In that case, clean element referring to section "WHEN REQUIRED".

After cleaning element, push button (2) to return red piston.



q. CHECK LAMPS FOR SWITCHING, DIRT AND DAMAGE.

r. CHECK REARVIEW MIRROR (OPTION) FOR POSITIONING, DIRT AND DAMAGE.

s. CHECK NUMBER PLATES FOR DIRT AND DAMAGE.

t. CHECK HORN

u. IS THE COLOR OF EXHAUST GAS NORMAL?

v. DO THE INSTRUMENTS FUNCTION NORMALLY?

w. HAVE ANY DEFECTS WHICH WERE FOUND DURING THE PREVIOUS DAY'S OPERATION BEEN CORRECTED?

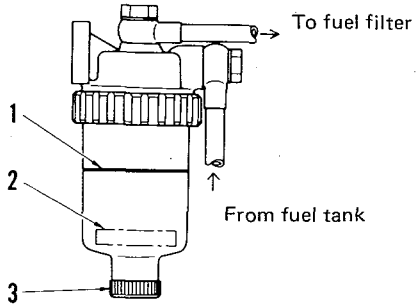
x. CHECK THE SEAT BELT (OPTION) FOR NORMAL FUNCTION

y. CHECK THE DOOR LOCK FOR NORMAL FUNCTION (MOTOR GRADER WITH CAB)

z. CHECK THE WINDSHIELD WIPER, WINDOW WASHER AND DEFROSTER FOR NORMAL FUNCTION. CHECK FOR SUFFICIENT WASHER FLUID LEVEL. (MOTOR GRADER WITH CAB)

a'. CHECK FOR SEDIMENT AND WATER IN THE WATER SEPARATOR (OPTION)

The water separator separates water mixed in the fuel. If the float (2) is at or above the red line (1), drain the water. For the draining procedure, see section "WHEN REQUIRED".



1. Allowable water level (red line)
2. Float
   (Floats on water to indicate the water level)
3. Drain plug

★ Even if a water separator is installed, be sure to check the fuel tank to remove water and sediment in the fuel.

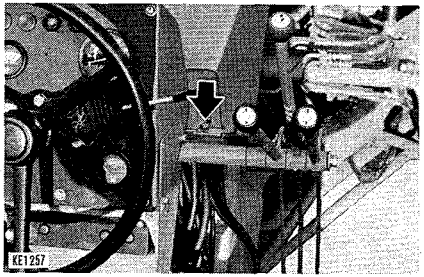
OPERATING YOUR MACHINE

HANDLING THE ENGINE

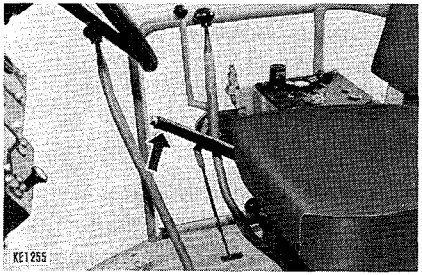
Before Starting

Perform CHECK BEFORE STARTING.

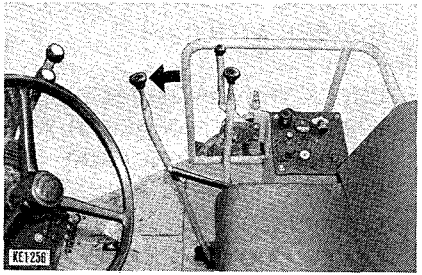
- Is work equipment control lever at the neutral position and locked?



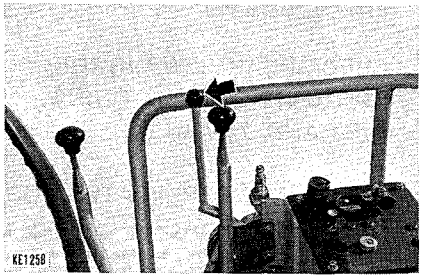
- Is the parking brake pulled back?



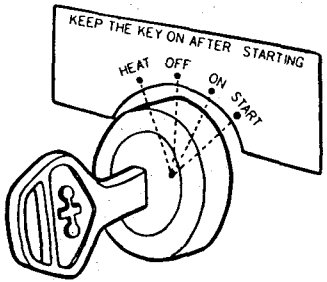
- Is gear shift lever at the neutral position?



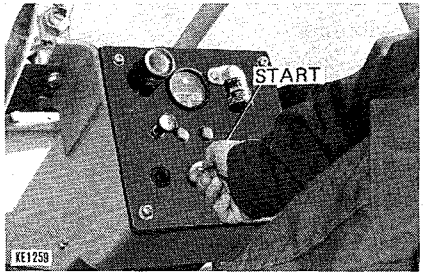
- Is the fuel control lever in the low idling position?



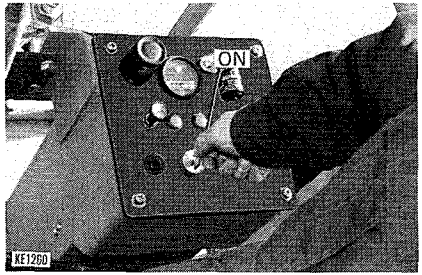
Starting the Engine



1. To start the engine, put the key to the START position and turn over the starting motor.



2. As soon as the engine starts, release the starting switch key to allow it to return automatically to ON position.



★ Do not leave key in START for more than 20 seconds.
If engine will not start, repeat the starting procedure after about 2 minutes.

★ When using low cetane fuel, starting ability at normal temperatures will be reduced. In such cases, starting will be facilitated by adopting the procedure for low-temperature starting.

★ To start engine in cold weather, refer to COLD WEATHER OPERATION.

CHECK AFTER START UP

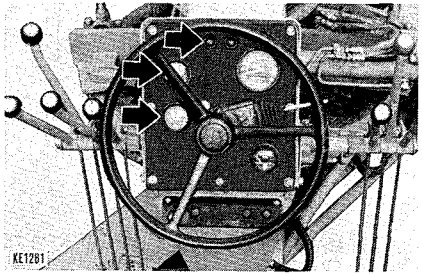
When the engine has started, observe the following instructions before putting the machine to work.

1. Run the engine without load, with the fuel control lever kept at LOW IDLING position, until the engine oil pressure gauge pointer reaches the green range.
2. Run the engine without load for five minutes, with the fuel control lever left at IDLING position.
3. Run the engine with light load until the water temperature gauge pointer reaches the green range.

★ This operation is called the warm up operation.

★ In case warm-up is continued for more than **20** minutes, apply load to the engine at intervals. If it is impossible to apply load, run engine at moderate speed. Low idling for every **20** minutes may cause oil leakage from turbine side of turbocharger.

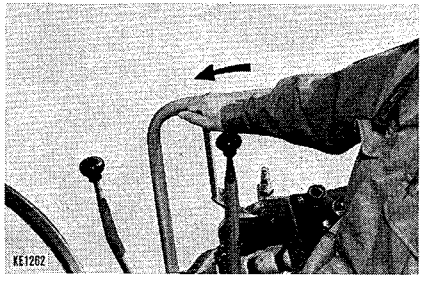
4. After warm-up run is completed, check gauges, caution lamp and charge lamp for proper operation.



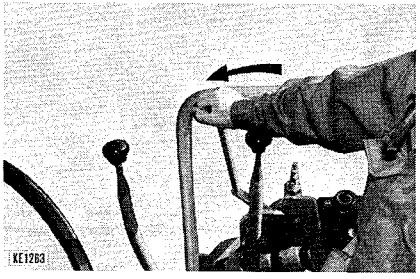
5. Check for normal coloration of exhaust, any abnormal sound or vibration.
6. Check for any leakage of oil, fuel or water.

Stopping the Engine

1. Idle the engine at a low speed for about 5 minutes to cool it gradually.

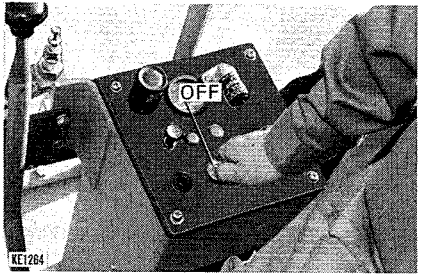


2. Push the fuel control lever fully forward and stop the engine.



★ It is also possible to pull the accelerator pedal to "STOP" position and stop the engine.

3. Return the starting switch to the OFF position, and withdraw the key.



★ Do not attempt to stop a hot engine immediately unless it is necessary. Such unreasonable operation will cause remarkable shortage of life of the various engine parts.

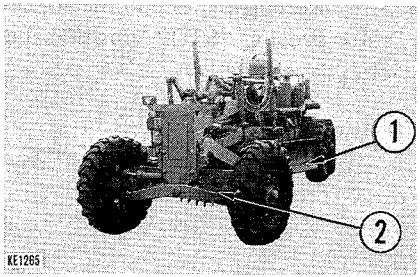
★ Specially when stopping an overheated engine, be sure to cool the engine gradually by idling it at a middle idling speed.

OPERATING THE MACHINE

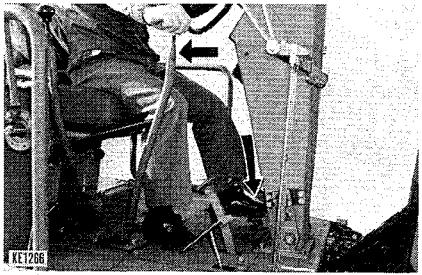
Run in the machine for the first 100 hours (as indicated on the service meter) or so. Although the new machine has been thoroughly adjusted and inspected before leaving the plant, both performance and life will be reduced if it is subjected to hard use from the beginning.

Starting the Machine

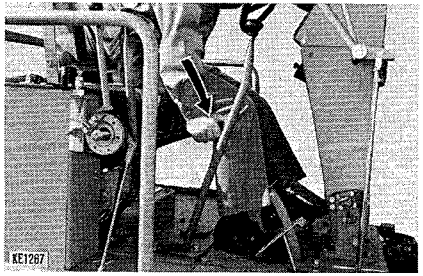
1. Disengage safety lock for work equipment control lever and bring the blade (1) and the scarifier (2) in the traveling posture.



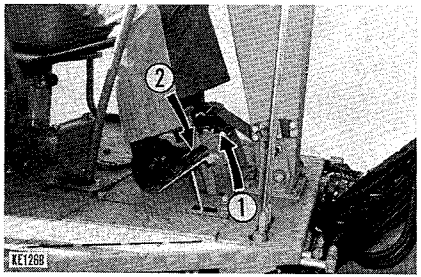
2. Depress the clutch pedal and put the gear shift lever in the desired speed position.



3. Release the parking brake lever.



4. Release the clutch pedal (1), depress the accelerator pedal (2), and machine will start.

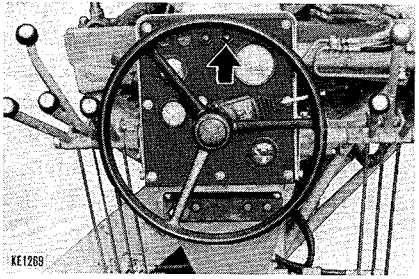


★ If some difficulty is felt for meshing gears, once place the gear shift lever in the neutral position. Try slightly depressing the clutch pedal repeatedly to vary gear position. Then, move the gear shift lever again to the desired position. If a difficulty still remains, do not attempt to engage the gears forcedly, but repeat the above-mentioned procedure.

★ Before starting to climb a steep hill, move the gear shift lever to the 1st speed position and depress the accelerator pedal while releasing the clutch pedal with the parking brake lever left locked. As soon as the machine moves, unlock the parking brake lever and release the clutch pedal completely.

★ When starting machine, keep the following care in mind.

- The vacuum pressure warning buzzer is not sounding.
- The parking brake indicator lamp goes out.

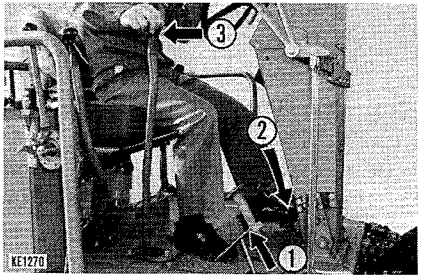


Gear Shifting

Release the accelerator pedal (1), depress the clutch pedal (2) and move the gear shift lever (3) to the desired position.

★ When the clutch pedal is depressed to its stroke end, inertia brake comes into effect on the way. (Inertia brake is used for shifting to the higher gear.)

⚠ **When shifting the forward-reverse lever, temporarily stop the machine to assure safety and to prevent a shock. The forward-reverse change gears do not mesh even if the lever is shifted during travelling of the machine.**



In addition to the above-mentioned fundamental gear shifting methods, the following practical procedures are useful to make gear shifting easy;

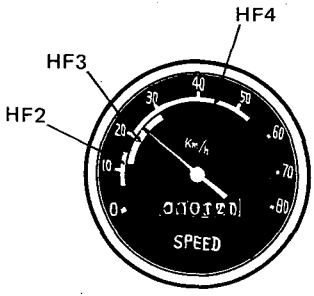
1) When shifting to the higher gear
   - Lightly push the gear shift lever toward the neutral position, previously, so that the lever can be returned to the neutral without delay when the clutch pedal is depressed. (Gears will be easily disengaged by this method.)
   - At the same time, partially release the accelerator pedal to decrease engine speed. (about 1/2 of the pedal stroke)
   - Depress the clutch pedal to its stroke end and, after waiting for about one second, move the gear shift lever to the next gear position (one-stage stepped up from the current gear speed) fully until a resistance is felt.
   - Gradually release the clutch pedal and depress the accelerator pedal.

2) When shifting to the lower gear
   - It is impossible to shift the gear at full engine speed.
     Decrease engine speed to the range of 1,300 to 1,500 rpm prior to shifting.
   - Lightly push the gear shift lever toward the neutral position, previously, so that the lever can be returned to the neutral without delay when the clutch pedal is depressed. (This method will make the gears easy to disengage.)
   - Release the clutch pedal and fully depress the accelerator pedal.
     After confirming that the full engine speed is reached, depress the clutch pedal and move the gear shift lever to the next gear position (one-stage stepped down from the current gear speed) until a resistance is felt.
   - Release the clutch pedal.

3) When changing the high and low speed ranges from each other
   - The above-mentioned precedures (shifting to the higher gear and shifting to the lower gear) are basically utilized when shifting the forward-reverse lever to the HIGH position and the LOW positon, respectively.
   - When shifting the lever to the HIGH position, decrease engine speed to about 1/2 of the current speed.
   - When shifting the lever to the LOW position, decrease engine speed to approximately 1,100 to 1,200 rpm.

4) Ranges indicated on the speedometer

The three white arcs indicated on the speedometer are related to HF4 (High, forward 4th speed), HF3 and HF2, from the left to the right. They are mainly used for guessing when the gear shift lever should be moved to the lower gear position. That is, the best timing at which the gear shift lever is to be moved to the lower speed gear is when the speedometer pointer turning to the left just reaches the right end of the corresponding speed range arc.



- The above-mentioned gear shifting method is applicable to the machine which is in up-hill travelling. When attempting to step down gear speed before the machine begins up-hill travelling, move the gear shift lever after the speedometer pointer enters the corresponding range beyond the right end of the arc.
- On the downhill travel, use the engine as the brake and apply the foot brake as necessary to prevent the speedometer pointer from swinging beyond the right end of corresponding speed range arc. If this is neglected, overrunning of the engine will cause damage to the power system or the like.

When the engine is stopped by failure of gear shifting

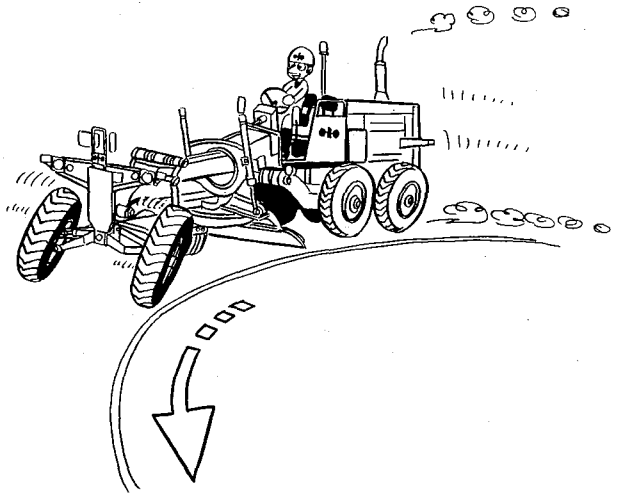
1. Return the gear shift lever to the neutral position and start the engine.
2. When the gears are difficult to disengage, proceed as follows:
   While lightly pushing (or pulling) either the gear shift lever or the forward-reverse lever toward the neutral position, try momentarily rotating the starting motor using the starting switch key. After the gear shift lever (or the forward-reverse lever) is returned to the neutral position, start the engine.

- When the engine stops on a slope, immediately depress brake pedal as far as they go down and stop the machine.
  Thereafter, move the gear shift lever to neutral position and proceed to the engine starting procedure again.

TURNING

The grader turns to the desired side by turning the steering wheel to that side. Leaning to the turning side will minimize the turning radius.

In case the grader turns while reversing, leaning to the opposite of the turning side will minimize the turning radius.

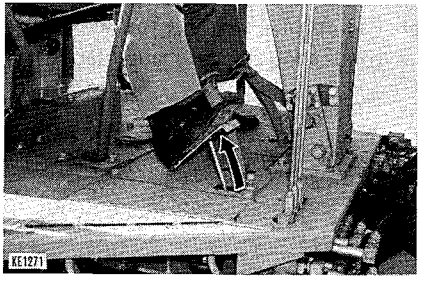


★ After the machine is turned into the desired direction by manipulating the leaning lever, first restore the leaning lever to its original position and then return the steering wheel to its original position.

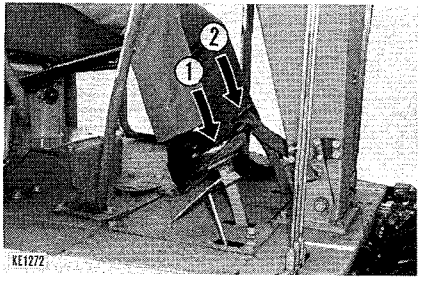
★ When turning the machine by the combined use of the leaning lever and the steering wheel, reduce the machine travel speed to provide enough time for the leaning lever and the steering wheel to return to their original positions.

Stopping the Machine

1. Release the accelerator pedal.

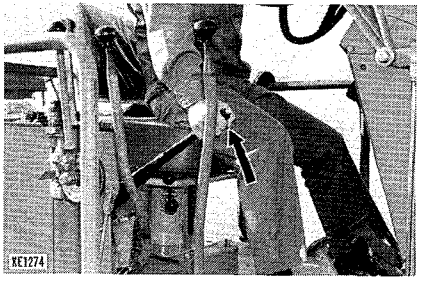


2. Depress the brake pedal (1). Before the machine comes to a stop, depress the clutch pedal (2).



3. Return the gear shift lever to the neutral (N) position.

4. Pull parking brake lever in LOCK position.



⚠ **When the machine is to be left stopped for a while, leave the engine in low-idling or stop the engine. Apply the work equipment control lever safety lock and the parking brake.**

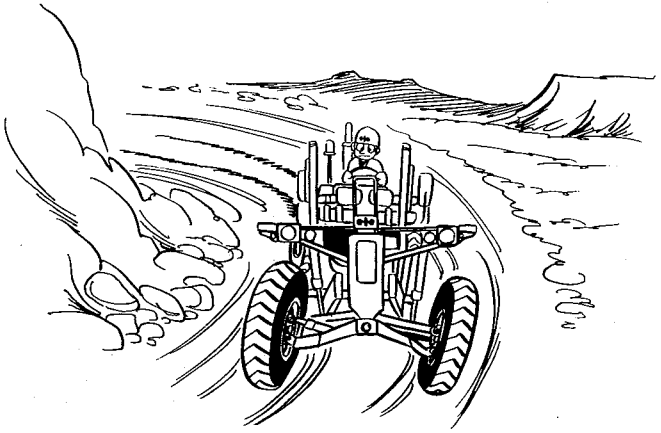
⚠ **Stop the machine on hard and even ground to prevent it from falling down or slipping.**

★ When stopping the engine, follow the procedure described in Stopping the Engine section.

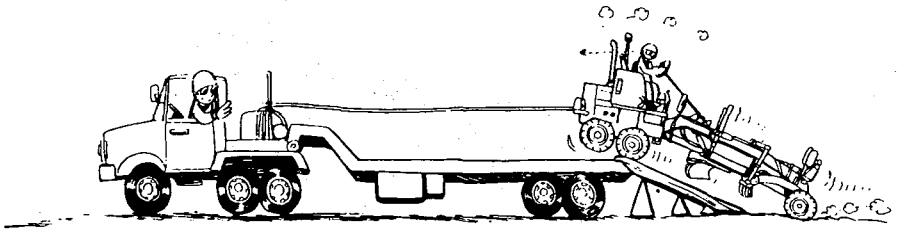
CAUTIONS FOR OPERATING

General

- Blow the horn before starting the engine or starting the machine as a warning to persons in the immediate areas.
- Keep persons far away from the area in which the machine is operating.
- Keep sufficient clearance from the road shoulder and obstructions during travelling.
- Always face the direction in which the machine is travelling.
- Be sure to check behind you before starting to back the machine.
- Pay special care not to run over the road shoulder or cause land-slips.



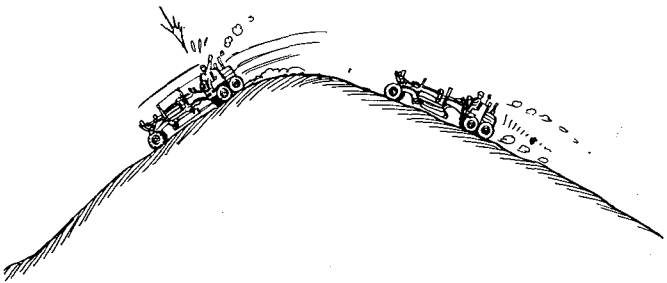
- When transporting a disabled machine by towing, the transportation distance should be within 600m at a speed of 8km/h or less. If the distance is more than the above mentioned, or if more than one day has elapsed since the engine trouble, be sure to use the trailer for transportation.
- When being towed for a long time with the engine stopped, gears and bearings in the transmission is rotated without being lubricated, which results in damage.
- The effective vacuum pressure used for the brake control system will be lost when the brake pedal is repeatedly depressed several times. Use the parking brake as necessary to compensate insufficient effect of the service brake.
- When a motor grader which involves some trouble in the engine, steering of the grader requires considerably large force. Drive the towing vehicle slowly to give the operator on the grader enough time of steering.

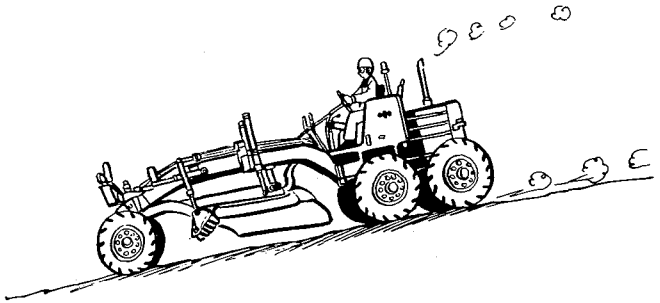


- When the grader reaches the top of an uphill slope or when a load to the grader is suddenly reduced, the grader promptly increases its speed. Special care must be given to sudden loss of load to the grader.

- In going down a common gentle slope, drive the grader at the same speed throughout. If the speed is too fast, apply the service brake at the same time.

★ Do not attempt to shift the gear shift lever to the neutral position during downhill travelling, but always keep the lever in a forward gear position to use the engine as a brake. Also, avoid disengaging the clutch during downhill travelling. If the clutch once disengaged is reengaged after travelling speed of the machine has been increased by inertia, the clutch and the engine may be damaged by over running.

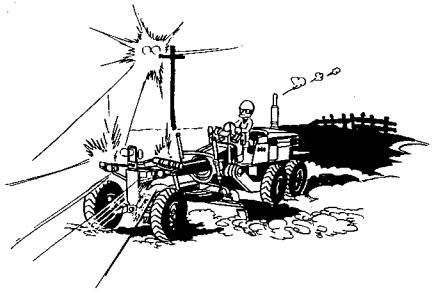




- Drive the machine straight during uphill or downhill travelling.
  Specially, turning the machine on the gravelly or clayey slant will cause the machine to slip easily.
- When the engine comes to a stop during uphill or downhill travelling. Depress the brake pedal to stop the machine.
  Return the gear shift lever to the neutral (N) position and start the engine.

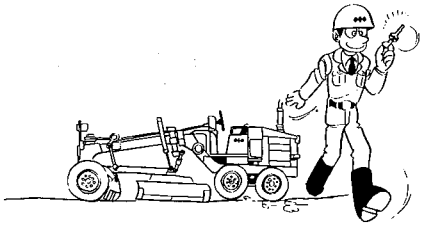
When Operating the Machine at Night

- Prepare the lighting facilities necessary to illuminate the job site. If no lighting facilities are available, turn on the head lamps and working lamp of the machine and carefully operate the machine.
- When driving the machine in the night time, special attention should be paid to prevent erroneous estimation of distance to an obstacle and of roughness of the ground.



When Stopping and Parking the Machine

- Stop the machine on a hard and even ground free from the posibility of falling of rocks and landslipping.
- When leaving the machine unattended, apply the parking brake, stop the engine, and pull the starting switch key out.
- When parking the machine on a slant, apply chocks to the tires. It is better to park the machine with its front faced downward and the blade or scarifier (option) slightly cut into the ground.



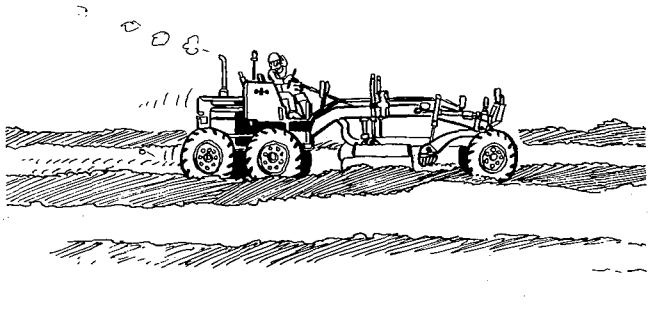
WORKS TO BE CARRIED OUT BY A MOTOR GRADER

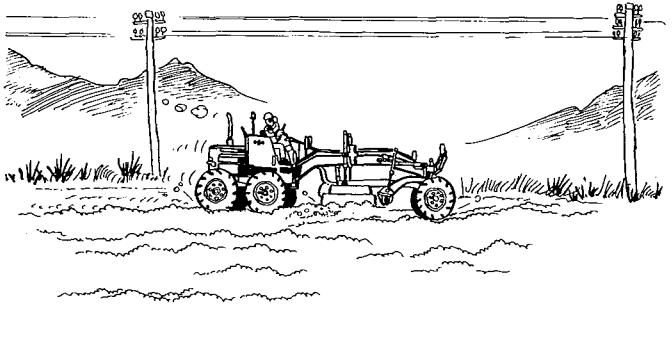
• LAND GRADING

To level-finish the scraped or turned up ground, drive the machine is 1st to 2nd, with the blade kept at a given level and propulsion angle of approx. 60°. The scraping angle is set at the standard angle of 30°. Take care not to run over the banking to avoid the machine pitching, otherwise uneven scraping of the roadface occurs and traction power will be decreased.

• REPAIRING OF GRAVEL ROAD

When repairing a gravel road, lower the blade so that it can just touches the surface of the road and drive the grader in 1st to 2nd speed range. Although it is desirable that the repairing operation should be finished by a minimum cycle times of travel, travelling too fast speed may cause rough finishing of the road.





• SNOW REMOVING

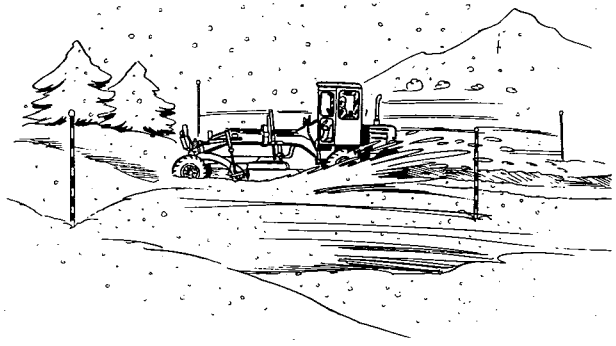
In the case of fresh snow, set the blade at the appropriate propulsion angle and drive the machine with enough high speed (3rd or 4th gear) as to throw aside the snow.

In case of heavy or a thick layer of snow, drive the machine in 1st or 2nd gear. The scarifier can also be used for turning up the snow.

The snow is thrown to one side of the machine.

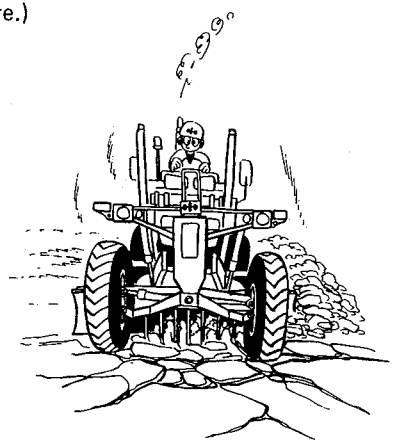
⚠ **Take enough caution to obstacles covered under the snow.**

★ In cases of extremely heavy snow, the snow plow attachment (optional) is more effective.



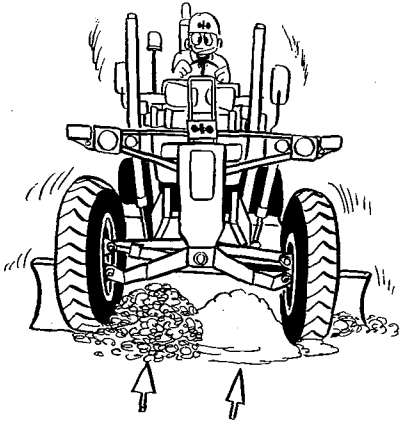
• SCARIFYING
(WITH SCARIFIER -OPTION- ATTACHED)

The scarifier (OP.) is attached to break up ground surfaces too hard to be penetrated with the blade. In this operation, the scarifier is usually driven in 1st and 2nd speed range. It is necessary for the teeth of the scarifier to penetrate deep into the ground. If the number of the scarifier teeth is not adequate to penetrate the teeth deep into the ground, reduce the teeth in number so as to allow proper scarifying. (The number of the scarifier teeth must be 5 or more.)



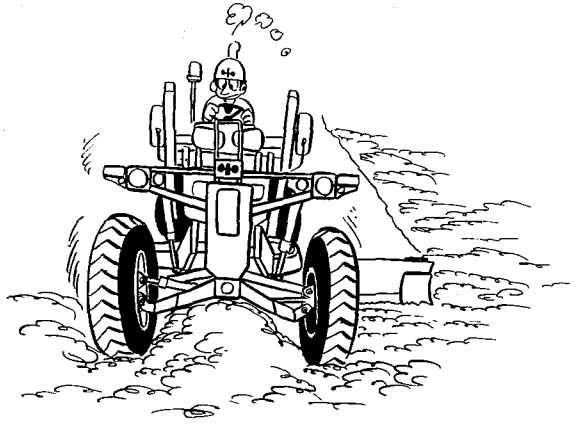
• MIXING

The blade of the grader is available for mixing up road construction materials by its rolling function. In this operation, the grader should be driven in the 2nd to 3rd speed range with the blade forward tilted and slightly angled. Too great a volume of mixing materials may prevent sufficient rolling of them.



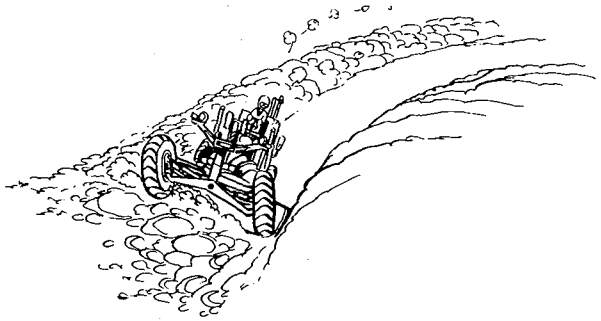
• SPREADING

The travelling speed of the grader is most suitable in the 2nd to 3rd speed range, with the blade sliding, as in the spreading operation. Avoid changing its travelling direction unnecessarily lest the newly flattened surface will be disturbed by the rear wheels of the grader. Be careful that the materials are spread to an adequate thickness.



• DITCHING

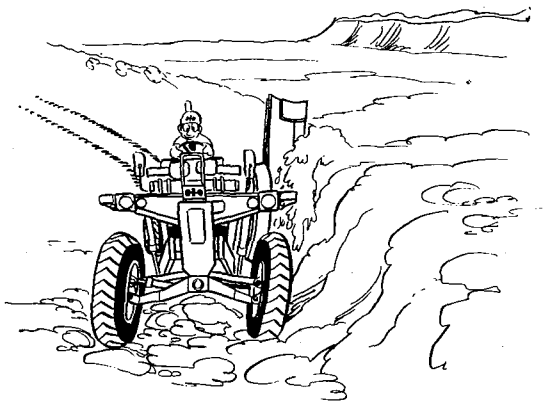
Ditching should be in the 1st to 2nd speed operation. The blade must positioned in such a manner that dug soil is inside the rear wheels. In addition, be sure to remove the earth heaped up under the chassis before it reaches the bottom of the machine. Lean the front wheels, correspondingly to the tilt of the machine.



• BANK CUTTING

Adjust the blade to the bank cutting position at the 1st speed range.

To allow the grader to run straight, lean the front wheels adequately for the tilt.



OPERATING OF WORK EQUIPMENT

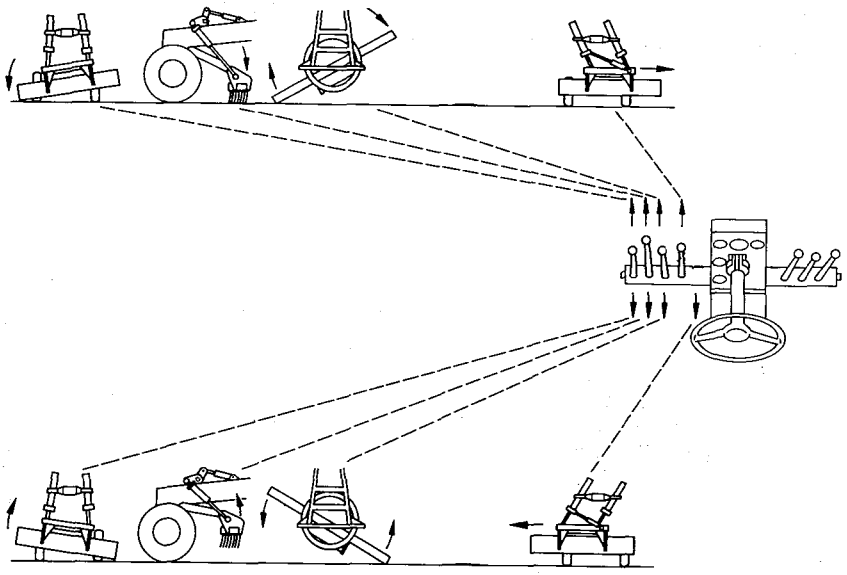
OPERATION METHOD OF WORK EQUIPMENT CONTROL LEVER

There are provided seven work equipment control levers, which are operated as air indicated in the following figures.

On operation, the safety lock is released from the lever. Apply the lock when the work attachment is not operated.

Left-side Control Lever

(Option)



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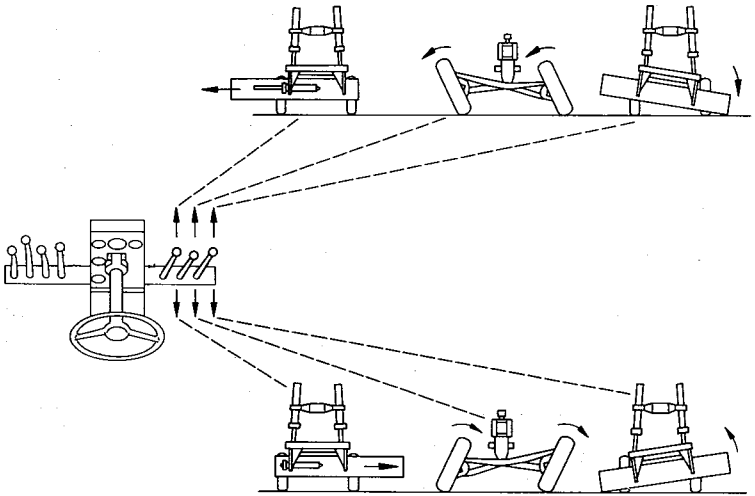
★ When operating the work equipment control lever, sufficient attention is required for the movement of the work equipment and its movement range must be limited, as the work equipment or the hydraulic cylinder possibly hit against parts, damaging them.

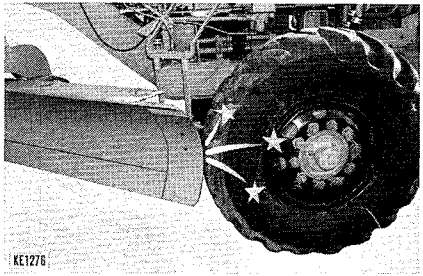
Right-side Control Levers



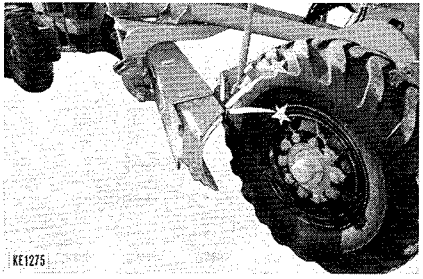
⚠ CAUTIONS IN OPERATION OF WORK EQUIPMENT

- When the work equipment is operated, special attention should be given to contacts at the following parts.

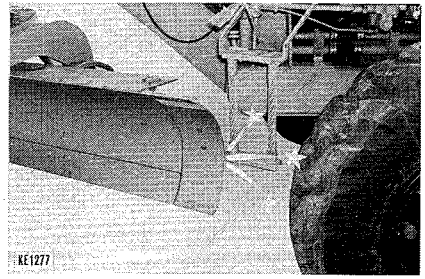
Rear wheel and blade



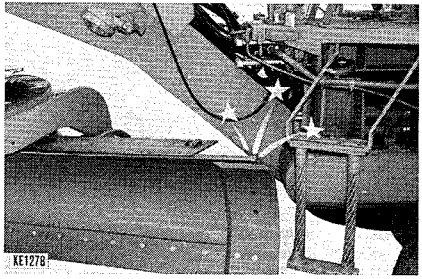
Front wheel and blade



Blade and step

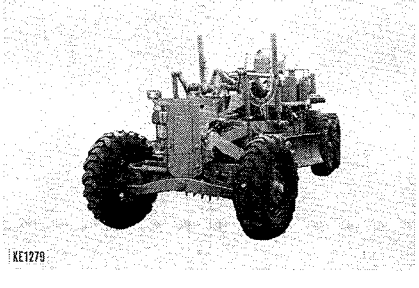


Blade and frame



POSITION OF BLADE WHEN TRAVELING

When traveling, set the blade at the minimum propulsion angle and raise the blade fully.



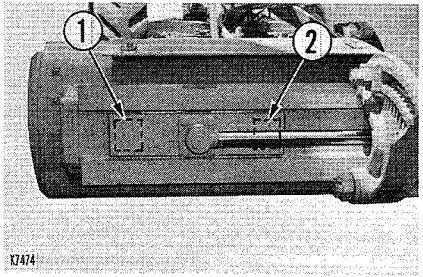
ADJUSTMENT IN SHIFTING OF WORK ATTACHMENT

It is essential to shift the work attachment to an optimum position for each work, to allow high job efficiency.

BLADE PROJECTION

The degree of projection is controllable by the control lever during operation. If further projection is needed, stop the grader for a while and change the installing position of the blade horizontal shifting cylinder piston rod, as follows.

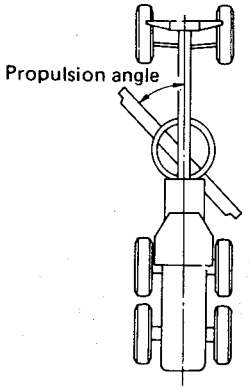
- Projection to right Position (1)
- Projection to left Position (2)



PROPULSION ANGLE OF BLADE

Angle of blade and body center line is called the blade propulsion angle.

In the normal scraping work, set the angle at 60°, more or less. Set at a lesser angle when the scraping resistance is great, or when the soil is hard, or when the soil in front of the blade is difficult to carry or throw to the side.



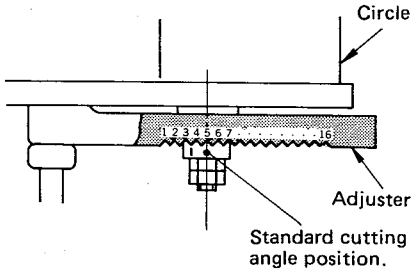
ADJUSTMENT OF BLADE CUTTING ANGLE

In hard soil cutting, it is advisable to lean the blade forward. As the soil becomes softer, lean the blade more backward. This operation will improve job efficiency.

It is essential to adjust the blade cutting angle, depending on the soil condition.

STANDARD BLADE CUTTING ANGLE (30°)

Standard cutting angle position can get by moving adjuster to 5th notch from blade rail.

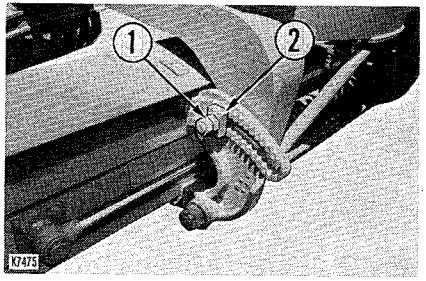


Adjustment

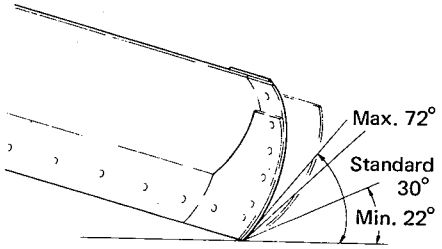
i) Turn the blade so as not to touch the grader body and set the blade in the same direction to the body. Then, place the blade on the ground

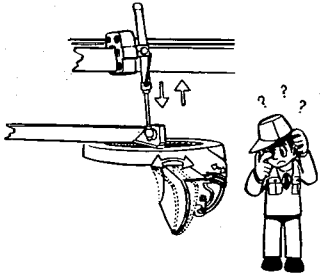
ii) Using an accessory tool, loosen the nut (1) until the lock plate (2) does not lock and is loose.

Release the lock plate on the opposite side, too. The adjuster cannot be rotated unless both lock plates are relieved from locking.



iii) Operate simultaneously both right and left lift cylinders and lock when the blade has the required angle.





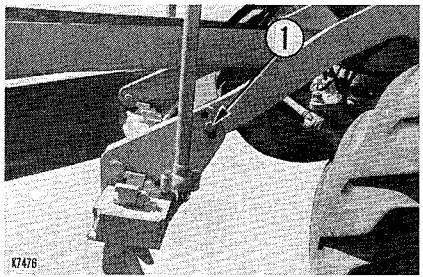
ADJUSTMENT OF SCARIFIER (OPTIONAL)

a. ADJUSTMENT OF CUTTING ANGLE

As the soil becomes harder, a wider cutting angle increases job efficiency.

Adjustment

Remove the bolt (1) and select a bolt hole adequate to the cutting angle. The cutting angle is adjustable from 62°, 68° (standard) to 74°.



b. ADJUSTMENT OF CUTTING DEPTH

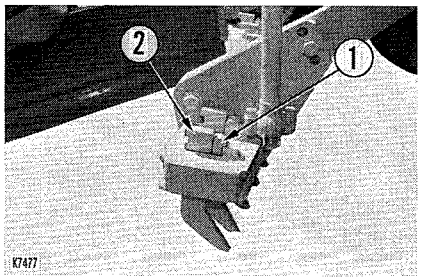
The cutting depth is adjustable with the following two portions. Select an adequate cutting depth corresponding to the job.

Adjustment (1) Tooth

Remove the cotter pin, pull the wedge (1) and change the notch of the tooth (2).

Adjustment (2) Rod

Remove the lock pin and shift to a desired hole position.



The standard digging depth can be obtained at the center hole among the three holes.

★ When some difficulty is found to protrude the rod, plate a thick board on the scarifier body and press the board with the drawbar. When pressing the board, keep the workers away from the scarifier body to assure safety even if falling of the scarifier body results from sudden protrusion of the rod.
To retract the rod, extend the scarifier cylinder piston rod.

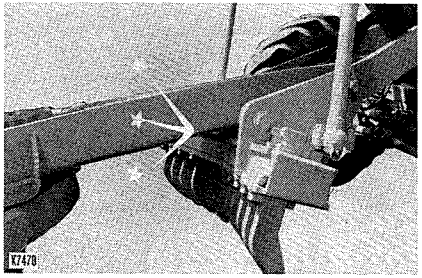
c. ADJUSTMENT OF SCARIFIER NECESSARY FOR ROTATING THE BLADE

The following adjustment of the scarifier, if equipped, permits the circle to bring the blade into a complete turn without interference with the scarifier:

1) Remove wedges and teeth from the scarifier.
2) Retract the rod.
3) Remove cutting angle adjustment bolt and reset the bolt hole adequate to the maximum cutting angle.
4) Fully raise the scarifier.
5) Now, the blade can be rotated 180° degrees to meet the requirement of reverse-travel operation of the machine. When recovering the forward-travel operation of the machine, rotate the blade 180° from this position.
6) When digging the blade into the ground, lower the scarifier.

d. PRECAUTIONS OF SCARIFIER OPERATION

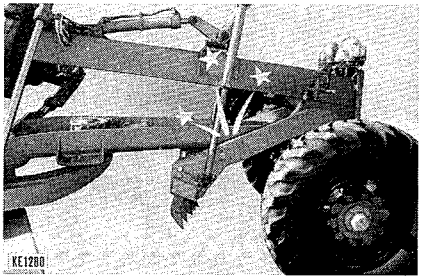
1) When the machine body is raised by using the blade as a jack, while the scarifier is left lifted to the top position, the drawbar will come into collision with the scarifier. This will cause damage to the drawbar, although scarifier lift cylinders and links are protected from serious damage by the safety valve provided in the scarifier control piping.

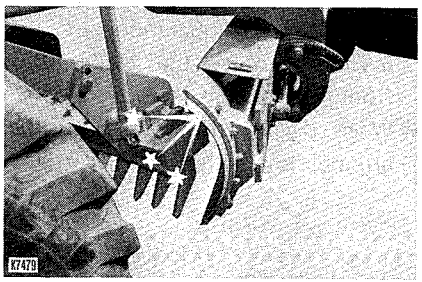


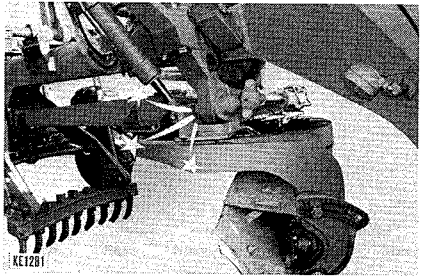
2) When the blade is positioned in the bank cutting position, with the scarifier lifted to the highest position, the scarifier sweeping board may touch the drawbar. This may damage the drawbar and scarifier.

3) When turning the blade raised several cm off the ground, the blade may touch the scarifier. This may damage the upper part of the blade. If the blade is retracted within the width of the grader, the upper part of the blade will touch the scarifier, when lowering the scarifier. This may damage the upper part of the blade.

4) Side-shifting of the drawbar, with the blade left lifted to the top position, will cause a collision of the drawbar stopper with the lifter bottom. This will cause damage to the lifter, although the drawbar side-shift cylinder is protected from serious damage by the safety valve provided in the cylinder piping.

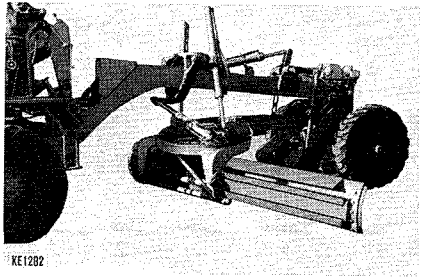


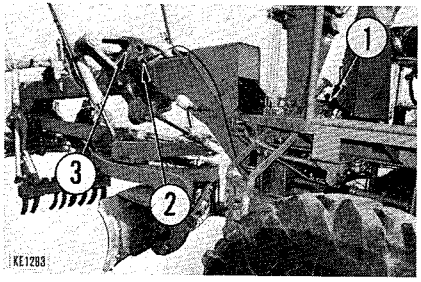




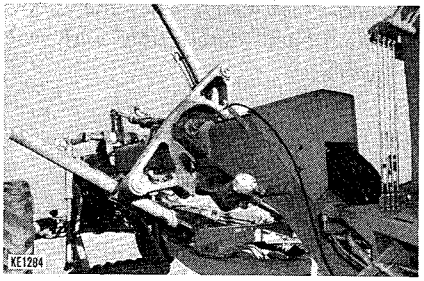
BANK-CUTTING POSTURE (RIGHT SIDE)

i) Fully protrude the blade drawbar to the right so that the blade angle shown in the figure below can be obtained. Depress the bank cut control lock pin removing pedal (1) on the operator's compartment to remove the pin (2). If the pin cannot be removed because of interference with the lifter (3), operate the blade lift cylinders as necessary.





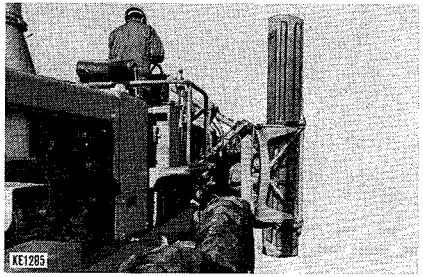
ii) Rotate the lifter (3) by protruding the right-hand blade lift cylinder piston rod and retracting the left-hand blade lift cylinder piston rod. When the top hole in the lifter approaches the pin (2), release the lifter lock pin removing pedal and slowly rotate the lifter until the pin enters the hole.



iii) Retract the right-hand lift cylinder and protrude the left-hand cylinder. Repeat this several times so that the circle is rotated with the blade raised on the right-hand side, and desired bank-cut posture can be attained. When bringing the blade into bank-cut posture, be careful not to clash the blade against various portions of the machine.

★ When bringing the blade into bank-cut posture on the left side of the machine, change every "right-hand" and "left-hand" in the above-mentioned description with each other.

★ Cutting edge of the blade may break pavement if the blade is brought into bank-cut posture on the roadway. Cover the pavement with iron plate at the portion with which the blade cutting edge may come into collision.



Relocating the blade side-shift cylinder piston rod mounting position to the right (when right-hand bank cutting is made) or to the left (when left-hand bank cutting is made) will improve bank cutting efficiency.
(See side-shifting of the Blade.)

⚠ Do not attempt to depress the bank control lock pin removing pedal unless the blade is rested on the ground. If the pin is removed with the blade raised off the ground, dangerous falling of the blade with rotation of the circle may result.

SHOULDER-REACH POSTURE (RIGHT SIDE)

i) Rotate the lifter using the same procedure as described for bank-cut posture and lock the lifter with the bank control lock pin.

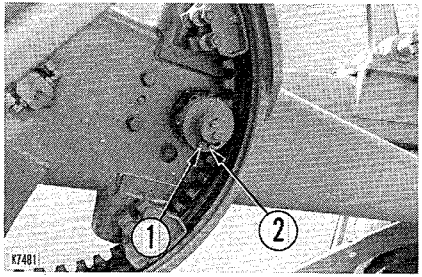
ii) Rotate the circle to the desired position.

★ Procedure for bringing the blade into the left-hand shoulder-reach posture is opposite to the procedure for bringing the blade into the right-hand shoulder reach posture.

★ When larger shoulder-reach is required, change the blade side-sift cylinder piston rod mounting position. (See Side-shifting of the Blade.)

SAFETY DEVICE OF BLADE

A shear pin (1) is provided on the CIRCLE to prevent the blade from unexpected failure, because of abnormal impact load placed on the blade edge during operation. If the shear pin is broken during operation, remove the bolt (2) and lock plate and pull out the shear pin to replace by new one.



REPLACEMENT OF CUTTING EDGE AND END BIT

Replace cutting edges and end bits before their blades' end faces wear out.
When wear is extended to the mounting faces, their repair must be done prior to replacing.

TURNING AND REPLACING

1. Lift the blade to a suitable height and put a block underneath the blade rail to prevent its falling.

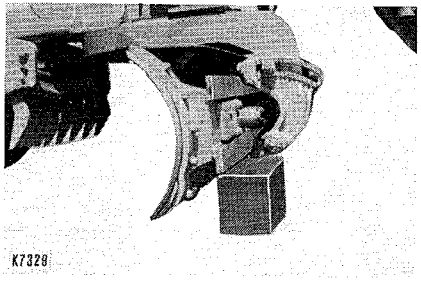
⚠ **Do not raise the blade unnecessarily high.**
Be sure not to put your body *underneath the blade when blocking it.*

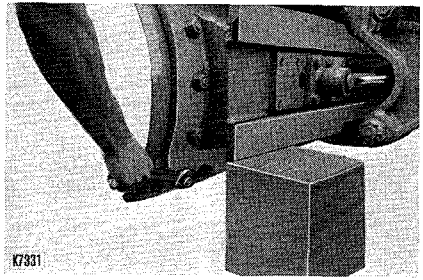
2. Clean the mounting face after detaching the cutting edge and the end bits.
3. Mount the cutting edges after *inverting it, or replacing it with a* new one.
4. Mount the end bits after inverting and switching right for left, or replacing with new ones.

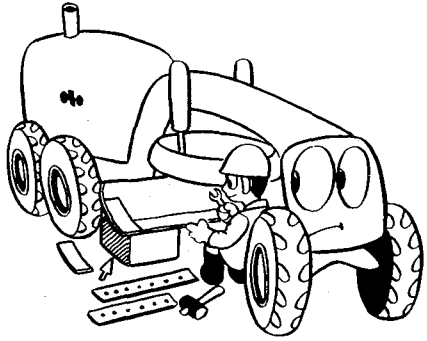
★ The tightening torque for the mounting nuts is 23 to 30kg.m.

★ Tighten the nuts again after several *hours' operation.*

★ If both ends of the cutting edge and side edges are worn out, replace them with new ones.







CHANGING TIRES

HOW TO CHANGE TIRES:

1. Front wheel

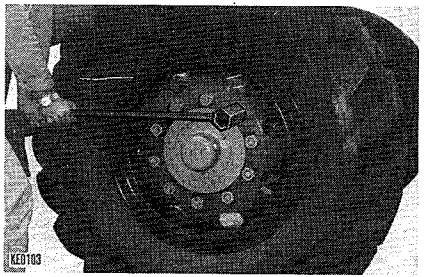
i) Place the work attachment on a ground and pull fully the parking brake lever.

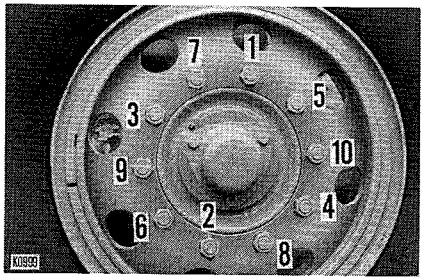
ii) Then, attach the socket wrench (accessory machine tool) to the hub nuts and loosen all the hub nuts by 3/4 – 1 turn.

iii) Depress the lift cylinder. If the front tires are lifted, lock the control lever, remove the hub nuts and change all the tires.

iv) In installing new tires, tighten lightly with the tires lifted and tighten the tires to the specified torque in the order shown in the photos, after placing the tires on the ground. The specified tightening torque is 45 ~ 55kgm.

⚠ Whenever the front tires are raised off the ground, support the front axle center frame on the stand to assure safety.





2. Rear wheel

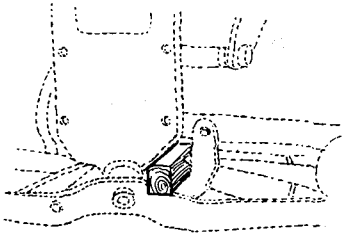
i) Repeat the front wheel change procedures i) and ii).

ii) Depress fully the right and left lift cylinders and retract the lift cylinder on the side where the tire is not removed, to lift the rear wheels.

iii) Install new tires according to the procedure iv) of the front wheel tire change.
The tightening torque is 45 ~ 55 kg.m

⚠ Whenever the rear wheels are raised off the ground, stably support the tandem on the block to assure safety.

⚠When a front tire punctures, do not attempt to travel the machine by temporarily applying a pad to the swing stopper. If it is necessary, travel the machine slowly only within the minimum necessary distance. In this case, be sure to securely keep the punctured tire off the ground with chains, etc.



Swing stopper

HOW TO USE LEANING STOPPER

When the leaning pipe is damaged, temporarily prevent the front wheels from leaning so that the machine can be successfully self-propelled to the nearest repair shop.

How to apply the leaning stopper

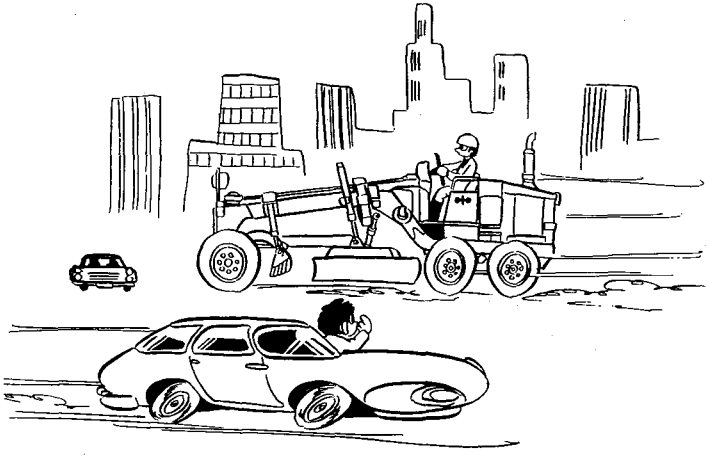
Fix the leaning rod to the front axle using the bolts provided in the tool box.

⚠If the machine is travelled with the leaning cylinder piston rod fluctuating or the front wheels leaning on one side, because of damaged leaning piping, dangerously unstable steering and excessively worn tires will result. Have the faulty leaning pipe repaired by mechanics quickly.

DRIVING ALONG ROAD

In addition to strict observance of traffic laws and rules concerned, keep the following in mind:

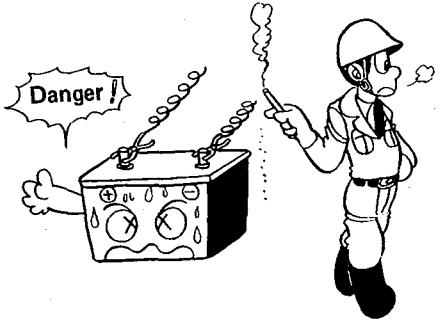
To relieve operator's fatigue, take a rest by 30 minutes – 1 hour – 30 minutes mode, every 80 kilometers or every 2 hours of travelling (whichever term expires earlier).

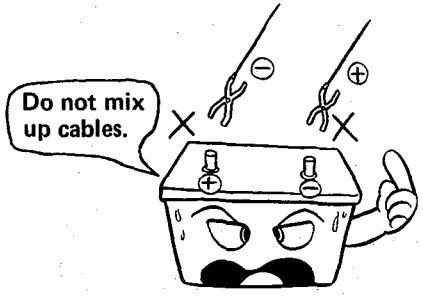


HANDLING OF BATTERY

PRECAUTIONS FOR CHARGING BATTERY

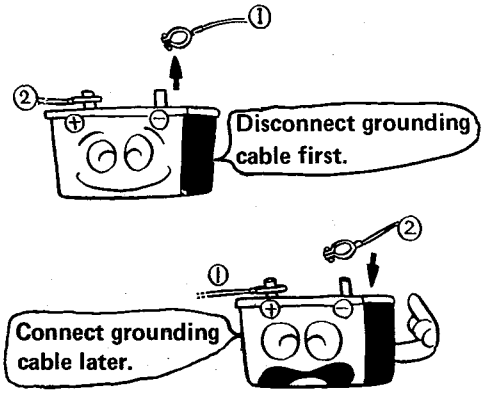
1. Before charging, disconnect the cable from the negative (–) terminal of the battery. Otherwise, an unusually high voltage will damage the alternator.
2. While charging the battery, remove all battery plugs for satisfactory ventilation.
   To avoid gas explosions, do not bring fire or sparks near the battery.
3. If the electrolyte temperature exceeds 45°C, stop charging for a while.
4. Turn off the charger as soon as the battery is charged.
   Overcharging the battery may cause followings:
   1) Overheating the battery
   2) Decreasing the quantity of electrolyte.
5. If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.
6. Do not mix up cables (positive (+) to negative (–) or negative (–) to positive (+)), as it will damage the alternator.
7. When inspecting or servicing a battery, be sure to stop the engine and turn the starting switch key to "OFF" position.
8. When performing any service to battery besides checking the electrolyte level or measuring the specific gravity, disconnect cables from the battery.





REMOVAL AND INSTALLATION OF BATTERY

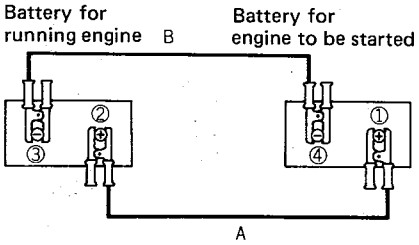
- When removing battery, first disconnect the cable from the ground (normally, from the negative (–) terminal). If a tool touches a cable connecting the positive terminal and the chassis, there is danger of sparks being emitted.
- When installing battery, the ground cable should be connected to the ground terminal as the last step.



STARTING ENGINE WITH A BOOSTER CABLE

When starting up the engine with a booster cable, do as follows:

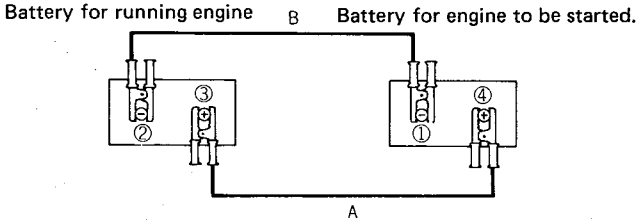
1. Before connecting the booster cable
   1) Size of booster cable and clip should be suitable for the battery size.
   2) Check cables and clips for breaks, corroded surfaces, etc.
   3) Make sure cables and clips are firmly secured.
   4) Keep the starting switch key in OFF position.
   5) The battery of the running engine must be the same capacity as that of engine to be started.
2. Connect the booster cables in the following manner.
   1) Connect one clip of booster cable A to the positive (+) terminal of the engine to be started. Connect the other clip to the positive (+) terminal to the engine which is running.
   2) Connect one clip of booster cable B to the negative (–) terminal of the engine which is running. Connect the other clip to the negative (–) terminal of the engine to be started.
   3) Make sure the clips are firmly connected to battery terminals. Then, start the engine.



3. Starting the engine
   1) Turn the starting switch key to START position and start up the engine.
   2) If the engine doesn't start at first, try again after 2 minutes or so.

After the engine has started, the booster cables should be disconnected in the reverse order in which they were connected.

1. Disconnecting the booster cables
   1) Disconnect the clip of booster cable B from the negative (–) terminal on the engine which was started and disconnect the other clip from the negative (–) terminal of the running engine.
   2) Disconnect the clip of booster cable A from the positive (+) terminal of the running engine and disconnect the other clip from the positive (+) terminal of the engine which was started.



TRANSPORTATION

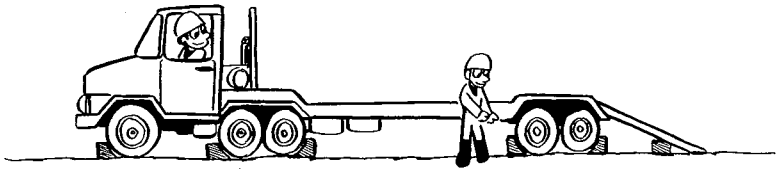
In addition to strict observance of traffic laws and rules concerned, it is desirable to provide a special platform for loading and unloading of the motor grader. If it is necessary to use a ramp when loading a motor grader on a trailer or unloading it from a trailer, observe the following instructions to assure safety:

1. Securely brake the trailer and chock trailer tires. Securely fix the ramp boards in place so that the center of motor grader being loaded coincides with the center line of the trailer.

★ Width, length and thickness of ramp boards must large enough to assure safe loading and unloading of the motor grader.

2. Slowly drive the motor grader on the ramp straight.

⚠ Never attemp to change the direction of travel on the ramp. If it is necessary to change the direction of travel, once return the machine to the original position.



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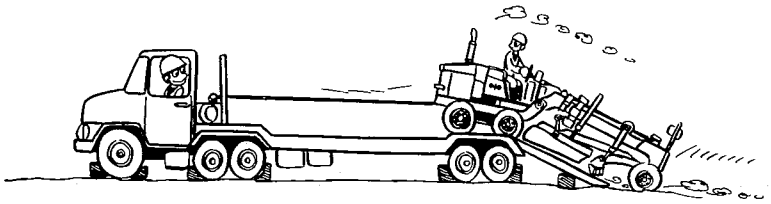
3. Properly load the motor grader on the trailer at the specified position. To prevent the grader on the trailer from moving back and forth during transportation, apply a chock to front and rear of each wheel and fix the motor grader with chains and wire ropes. Pay special care to prevent the motor grader from slipping sideward.

4. Rest the work equipment on the trailer deck and observe the following:
   - Pull the parking brake lever.
   - Place the gear shift lever in the neutral positon.
   - Pull the starting switch key out.

★ Determine the optimum transportation route, taking width of road and permissible overhead clearance and weight limitation into consideration.

⚠ Do not leave the front wheels raised off the trailer deck using the scarifier as a jack. The front wheels will fall gradually during transportation.



PERIODIC MAINTENANCE

Proper lubrication and maintenance assure trouble-free operation and long machine life. Time and money spent for scheduled periodic maintenance will be amply compensated by prolonged machine operation and reduced operating cost.

All hourly figures given in the following descriptions are based on service meter readings. In practice, however, it is recommended to rearrange all of them into units of days, weeks and months to make the maintenance schedule more convenient. Under rough job site or operating conditions, it is necessary to somewhat shorten the maintenance intervals stated in this manual.

GENERAL PRECAUTIONS FOR MAINTENANCE

General

- Wear a safety helmet, safety shoes and gloves. Wear goggles if the nature of the inspection work so requires.
- When working in a team of more than two persons, arrange a set of signals beforehand and coordinate joint work for safety.
- Keep unauthorized persons away during inspection or maintenance service.
- Use genuine Komatsu parts for replacement parts.
- Use genuine Komatsu grease and oil or products recommended by Komatsu. Depending on temperature, use grease and oil of recommended viscosity.
- Use only clean grease and oil. Also use clean containers for lubricants to prevent foreign matter from entering oil.
- Inspect or change oil in a place where it is not dusty so that dust will not enter oil.

Before Starting Maintenance Work

- Park machine on firm, level ground and lock it with parking brake lever.
- When working indoors, pay extra care to ventilation.
- Wash machine and particularly clean greasing and oiling holes to prevent dirt and dust from mixing with lubricants.

During Maintenance Work

- Unless specifically instructed, conduct maintenance work with engine stopped. When performing work with engine running, work should be performed by two people. One operator should sit on operator's seat; the other performs service work. They should closely cooperate to assure maximum safety.

- Hang a warning sign (e.g., "Do not Start" or "Under Maintenance Work") on operator's seat to prevent some other person from inadvertently starting or operating machine.

- Drain oil after heating it to proper temperature (about **30°** to **40°C**).

- Before removing the radiator cap, raise the lever to discharge in pressure.

- Do not attempt to remove the hydraulic tank cap and the drain plug while oil is still hot.

- After replacement of oil, filter element, strainer, etc. as well as cleaning, purge air from circuits.

- For oiling parts with strainers, do not remove strainer from port to fill with oil.

- Lubricating oil should never be more or less than amount required. At time of inspection or refilling, check that oil is at proper level.

- After greasing, wipe clean any old grease forced out.

- When changing oil and replacing filter, check used oil and filter for any abnormal amounts of iron chips or other foreign objects.

- When removing assemblies containing O-rings, gaskets, or seals, clean their mounting surfaces and replace with new seals.

- Do not smoke while refueling or when handling fuel containers.

- When changing the mounting tips tire never stand over or stand directly beside, a tire and rim.

PERIODICAL REPLACEMENT OF SAFETY PARTS

The users of our machine should carry out periodical maintenance in order to ensure the working and operation safety. Those parts, as listed on the right, which are closely convected with safety, must be replaced periodically so that the highest safety standard can be maintained.

These parts with the passage of time have a great tendency to deteriorate in quality, and to wear ratter soar. Furthermore, their defective condition is difficult to detect during periodical maintenance. These parts must, therefore,be replaced with new ones after a predetermined service period even though there is no apparent abnormality.

It goes without saying that if any abnormality should be found, there parts must be replaced or repaired even before the predetermined period expires.

The periodical replacement is completely different from the replacement due to the claim against the guarantee by the manufacturer. So they must be treated separately.

No.	Item	Period
1	Brake hose, vacuum hose	Every 2 years
2	Rubber parts of brake master cylinder	Every 2 years
3	Rubber parts, etc. of brake wheel cylinder	Every 2 years
4	Brake oil	Every 2 years
5	Packing seal, O-ring of the steering cylinder	Every 4 years
6	Rubber hose for steering and leaning cylinder	Every 4 years
7	O-rings for steering valves	Every 4 years
8	Hose for fuel	Every 2 years
9	Tube of brake oil supply tank	Every 2 years
10	Hydromaster rubber parts	Every 2 years
11	Safety cylinder rubber parts (Option)	Every 2 years

MAINTENANCE TABLE

★ **For new machine, change all oil, replace oil filter elements and adjust engine valve clearance at the first 250 hours service.**

No.	ITEM	SERVICE	PAGE
	CHECK BEFORE STARTING		
a	Oil and water leak	Check	23
b	Nuts and bolts	Check and retighten	23
c	Electric wiring	Check and retighten	23
d	Engine oil pan	Check and add oil	24
e	Transmission	Check and add oil	24
f	Fuel tank	Drain water and sediment	25
g	Cooling water	Check and add water	25
h	Fuel	Check and add	26
i	Brake fluid	Check and add	26
j	Steering wheel	Check and adjust clearance	27
k	Brake pedal travel	Check and adjust	27
l	Braking ability	Check and adjust	27
m	Parking brake	Check and adjust	28
n	Vacuum pressure	Check	28

No.	ITEM	SERVICE	PAGE
	(CHECK BEFORE STARTING)		
o	Tire	Check	28
p	Dust indicator	Check	29
q	Lamps	Check	29
r	Rear view mirror (Option)	Check	29
s	Number plate	Check	29
t	Horn and turn signal switch	Check	29
u	Exhaust gas color	Check	29
v	Instruments	Check	29
w	Previous day's defects	Check	29
x	Seat belt (Option)	Check	29
y	Door lock	Check	29
z	Wiper, window washer and defroster	Check	29
a'	Water separator (Option)	Check	29

No.	ITEM	SERVICE	PAGE
	EVERY 50 HOURS SERVICE		
a	Greasing		83
-1	Circle pinion gear	Greasing 2 points	83
-2	Blade guide rail	Greasing	83
b	Oil bath type air cleaner (Option)	Change oil and clean element	83–1
	EVERY 250 HOURS SERVICE		
a	Check oil level		84
-1	Final drive case	Check and add	84
-2	Tandem case	Check and add	84
-3	Blade rotating	Check and add	84
-4	Hydraulic tank	Check and add	85
b	Greasing		86
-1	Front axle center pin	Greasing 1 point	86
-2	Leaning cylinder pin	Greasing 2 points	86

No.	ITEM	SERVICE	PAGE
	(EVERY 250 HOURS SERVICE)		
-3	Leaning rod end pin	Greasing 2 points	86
-4	Tie-rod	Greasing 3 points	86
-5	Scarifier cylinder pin	Greasing 2 points	86
-6	Scarifier ball joint	Greasing 4 points	86
-7	Steering linkage	Greasing 11 points	87
-8	Drawbar ball joint	Greasing 1 point	87
-9	Blade lift cylinder yoke	Greasing 6 points	87
-10	Blade lift cylinder ball joint	Greasing 2 points	87
-11	Drawbar side shift cylinder ball joint	Greasing 2 points	88
-12	Bank control guide	Greasing 3 points	88
-13	Bank control lock pin	Apply grease around the pin	88
c	Engine oil pan and filter	Change oil and replace element	89
d	Fan belt tension	Check and adjust	90
e	Ball joint	Check clearance	90

No.	ITEM	SERVICE	PAGE
f	Battery electrolyte level	Check	91
g	Pitman arm ball joint	Check clearance	91
h	Parking brake lever	Check travel	91
i	Service brake	Check and adjust	93
j	Wheel hub nut	Check and retighten	97
	EVERY 500 HOURS SERVICE		
a	Fuel filter	Replace cartridge	98
b	Circle guide	Check clearance	99
c	Hydromaster	Supply vacuum cylinder oil	100
d	Radiator fin	Check and clean	101

No.	ITEM	SERVICE	PAGE
	EVERY 1000 HOURS SERVICE		
a	Change oil		102
-1	Transmission case	Change oil	102
-2	Final drive case	Change oil	102
-3	Blade rotating system gear case	Change oil	103
-4	Hydraulic oil tank	Change oil	104
b	Hydraulic filter	Replace element	104
c	Drawbar front ball joint	Check looseness	105
d	Corrosion resistor	Replace cartridge	105
e	Toe-in	Check and adjust	106
f	Transmission case	Clean oil strainer	107
g	Front wheel bearing	Check clearance	108
h	Propeller shaft	Greasing 4 points	108
i	Turbocharger rotor	Check play	109

No.	ITEM	SERVICE	PAGE
	EVERY 2000 HOURS SERVICE		
a	Front wheel bearing	Change grease	110
b	Tandem case	Change oil	112
c	Engine breather	Clean element	112
d	Turbocharger rotor impeller	Check rotating condition	113
e	Turbocharger	Check clamping joint	113
f	Alternator and starting motor	Check	113
g	Engine valve clearance	Check	114
	EVERY 4000 HOURS SERVICE		
a	Water pump	Check	115
b	Engine vibration damper	Check	115

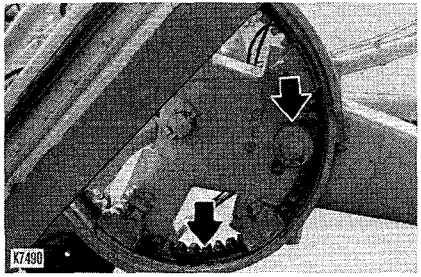
No.	ITEM	SERVICE	PAGE
	WHEN REQUIRED		
a	Air cleaner element	Check, clean or replace when required	116
b	Cooling water	Change water and clean twice a year	119
c	Ribbon heater and coil heater	Check	121
d	Engine breather hose	Clean	121
e	Drain pipe and hose	Clean	121
f	Water separator (Option)	Drain water and sediment when required	121

EVERY 50 HOURS SERVICE

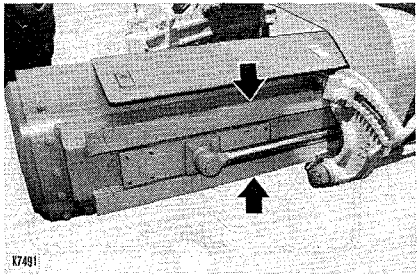
a. GREASING

Grease the arrow-marked grease fittings.

1. Circle pinion gear (2 points)
   Apply grease all around the circle part.



2. Blade guide rail
   Apply grease all over the guide rail.



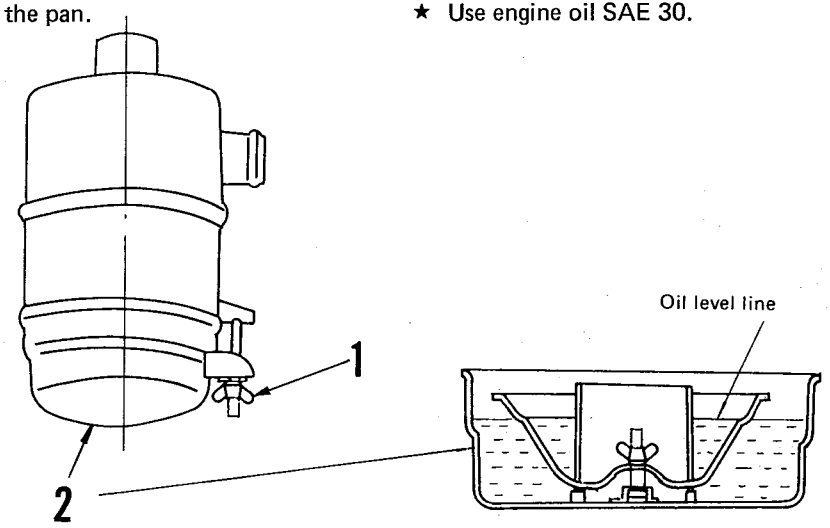
b. OIL BATH TYPE AIR CLEANER (OPTION)

1. Change oil

Drain and refill an oil pan with new oil.

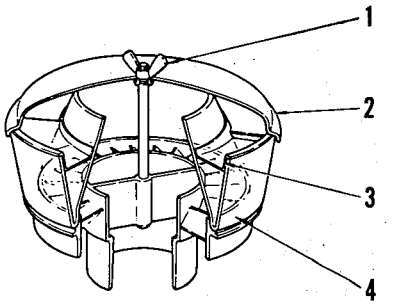
Loosen wing nut (1) (four pcs.), remove oil pan (2). Drain and clean the oil pan inside. Refill the oil pan with new oil up to the oil level line. After cleaning the element, install it in the pan.

★ Oil capacity: 3.5ℓ
★ Use engine oil SAE 30.



2. Check and clean precleaner

Loosen wing nut (1), remove cover (2) and dust lap (3). Remove dust case (4) and empty it of its dust before dust collects up to dust level line.

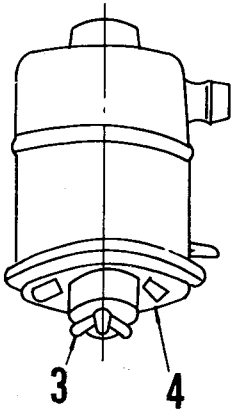


K-13701

3. Clean element

Remove the oil pan as described above, loosen wing nut (3) with the element (4) held by one hand.

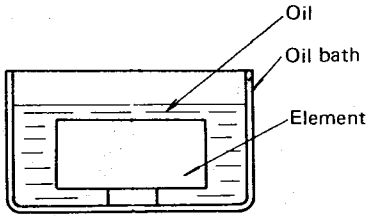
Then, take the element out of the case and clean the case interior thoroughly with cloth clean the element thoroughly and install it in the case.



- **Cleaning procedure**

a) Put an element in an oil bath so large as to contain an element (Reference: O.D. 400 mm, height 300 mm) and fill the bath with diesel fuel so that the element is immersed in the oil.

Leave the element in the oil for about 5 minutes and shake it vertically and horizontally. This shaking action should be repeated two or three cycles.



b) Take the element out of the bath, drain and refill the bath with new oil. Then, immerse the element in the oil again and check the oil for its fouled condition. If, the oil si fouled, repeat the action described in a).

c) When no foulness is seen in the oil, take the element out of the bath and shake the element quickly to remove the oil. Then, install the element in the cleaner case.

⚠ **Gasoline is better in the cleaning effect than the diesel fuel but must not be used because of its higher inflammability.**

⚠ **Do not inspect or service the air cleaner element while engine is in operation.**

EVERY 250 HOURS SERVICE

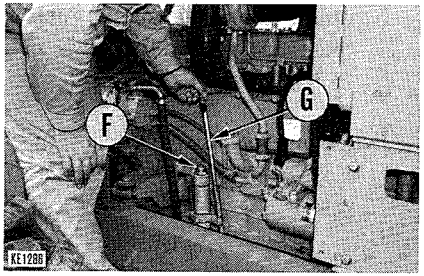
★ **Maintenance for every 50 hours should be carried out at the same time.**

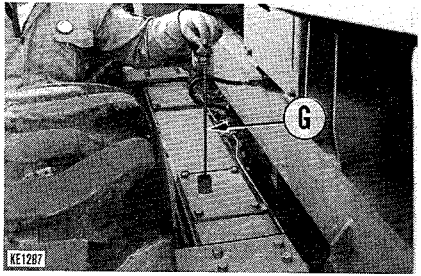
a. CHECK AND CORRECT OIL LEVEL

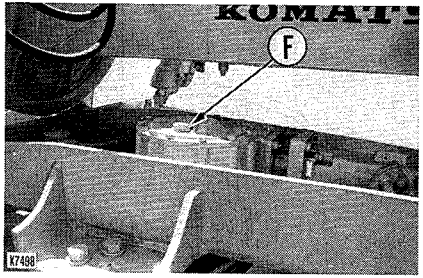
1. Final drive case
   Use the dipstick (G) to check the oil level. If the oil level is too low, add gear oil from oil filler (F).
★ When checking the oil level, stop the engine and pull out the dipstick. Wait for about three minutes and put the dipstick back in, then check the oil level.

2. Tandem case
   Use the dipstick (G) to check the oil level. If necessary, add oil from oil filler.
★ Above 0°C: Use engine oil CLASS-CD SAE30.
   Below 10°C: Use engine oil CLASS-CD SAE10W.

3. Gear case of the blade rotating system
   Remove the plug (F). Check if the oil level is at the gear upper face. Add the engine oil through the filler (F), if necessary.
★ Above 0°C: Use engine oil CLASS-CD SAE30.
   Below 10°C: Use engine oil CLASS-CD SAE10W.





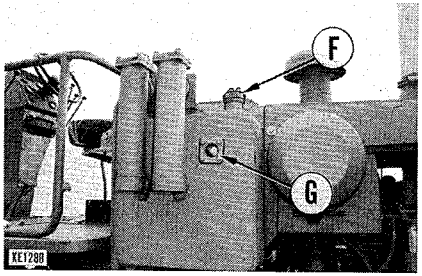


4. Hydraulic oil tank
   Check the oil level with the level gauge (G). Add engine oil through the filler (F), if necessary.

★ Check the oil level after bringing work equipments in the travelling posture.

★ Use CLASS-CD SAE10W engine oil for all seasons.

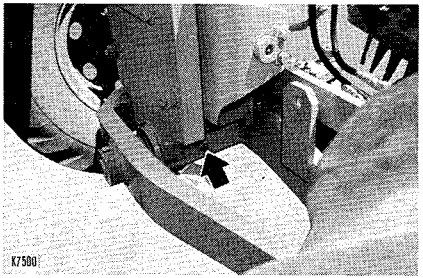
⚠ **When oil temperature is high, do not remove cap. Hot oil sometimes spouts out.**
When removing the cap, turn it slowly to relieve inner pressure.



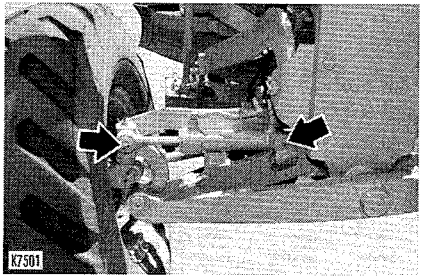
b. LUBRICATE THE FOLLOWING PARTS

Grease to points indicated by arrows.

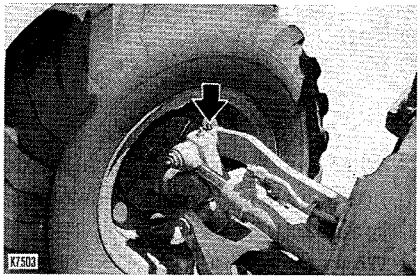
1. Front axle center pin (1point)



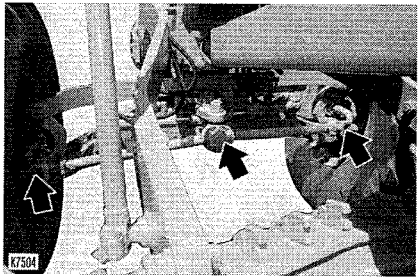
2. Leaning cylinder pin (2 points)



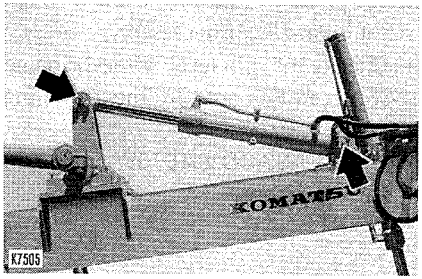
3. Leaning rod end (2 points)



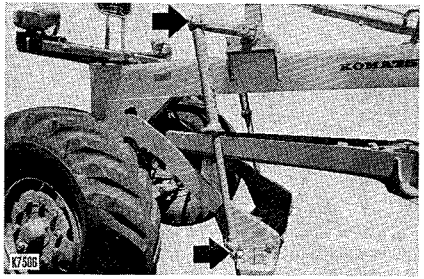
4. Tie-rod (3 points)



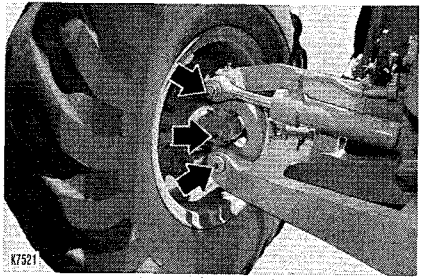
5. Scarifier cylinder pin(OP) (2 points)



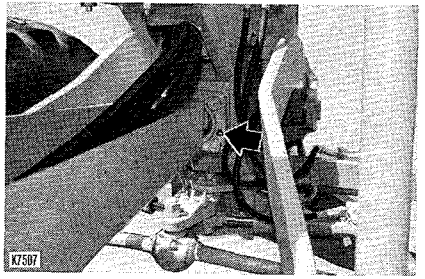
6. Scarifier ball joint(OP) (4 points)



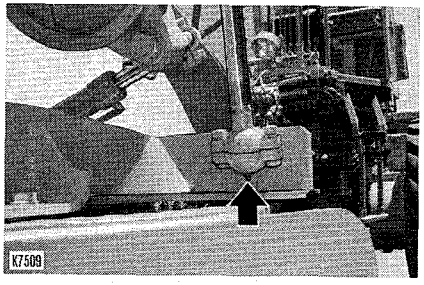
7. Steering linkage (11 points)



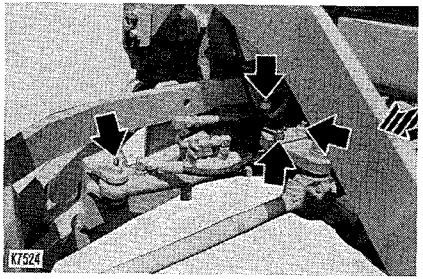
8. Drawbar ball joint (1 point)

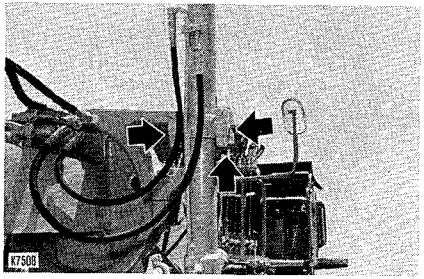


10. Blade lift cylinder ball joint (2 points)

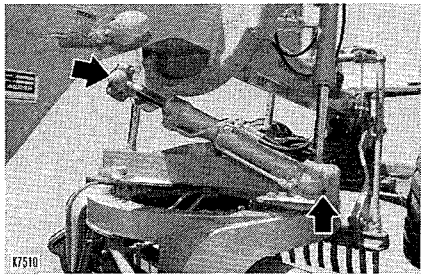


9. Blade lift cylinder yoke (6 points)

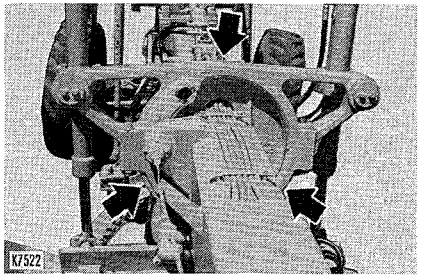




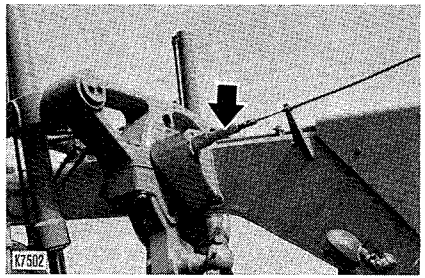
11. Drawbar side shift cylinder ball joint (2 points)



12. Bank control guide (3 points)



13. Bank control lock pin
Apply grease around the pin.

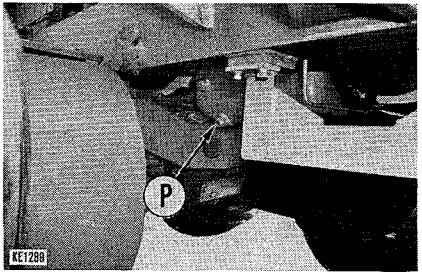


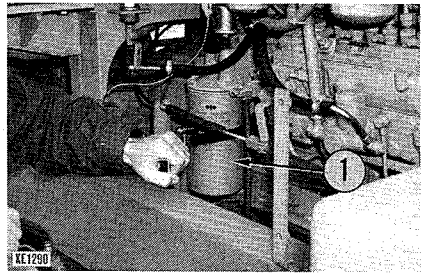
c. ENGINE OIL PAN AND OIL FILTER

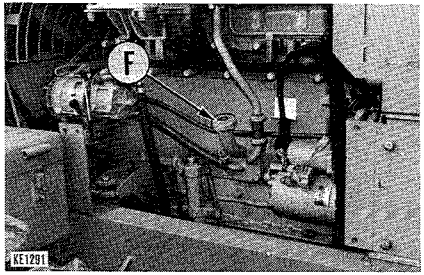
1. Remove drain plug (P) and drain oil. Tighten drain plug (P) after draining oil.
2. Remove cartridge element (1) by turning it counterclockwise with a filter wrench. Clean dust and unfiltered oil collected on filter base. Install new element after applying engine oil (or a thin coat of grease) on packing surface of element.

   To install element, bring its packing surface into contact with sealing surface of filter base and then tighten element 2/3 turn by hand (Be careful not to over-tighten.)
3. After replacing element, fill with engine oil through oil filler (F). After refilling with oil, start the engine and idle it for a while. Then, stop the engine and check the oil level.

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.
★ Refill capacity: 20ℓ
★ Use a genuine Komatsu cartridge element.
★ Be careful not to tighten it excessively.







d. FAN BELT TENSION

Push the belt at the middle between the fan pulley and the alternator (approximately 6 kg). If the belt slack is about 10 mm, the belt is considered to have the correct tension.

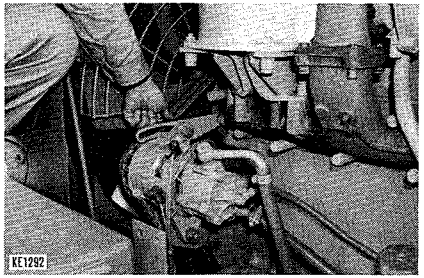
To adjust, loosen the bolt (1) and nut (2) to shift the alternator.

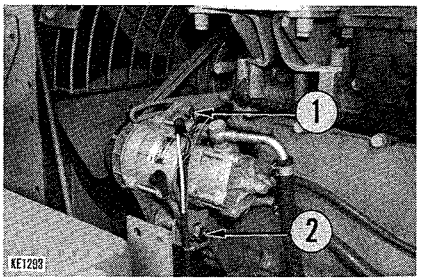
★ Check for the damage to each pulley, wear of the V Groove, and wear of V belt. In particular, check if the V belt contact with the bottom of the V groove.

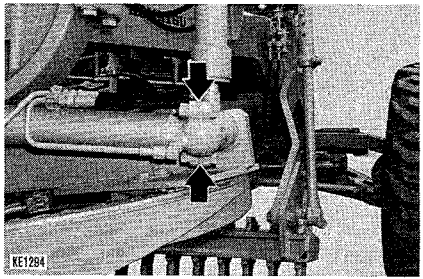
★ If the belt is so over-extended that no adjustment allowance exists, or if cuttings or cracks are found, replace both belts.

e. BALL JOINT CLEARANCE

Remove all shims. Tighten the cap in such a manner that the clearances (shown in the picture) on both sides are the same. Measure the clearance with a thickness gauge, and place the shims which are thicker than the measured clearance by one shim. Then, retighten the cap. One shim is equal to 0.2 mm thickness.



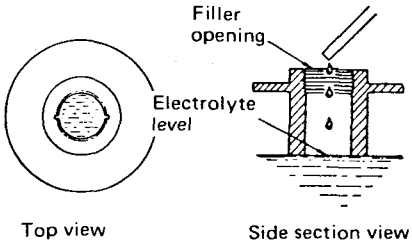




f. BATTERY ELECTROLYTE LEVEL

If the electrolyte level is below the prescribed level of 10 to 12 mm above the plate, add distilled water. Should any of the acid be split, have it replenished by the nearest battery shop with acid of the correct specific gravity. Clean the air hole of the battery cap along with the level check.

★ Never use metal funnel for electrolyte supply.

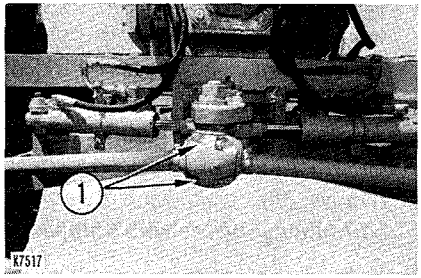


g. PITMAN ARM BALL JOINT CLEARANCE

Remove the bolt (1). Adjust by reducing the shim thickness so that the tie rod can move smoothly without clearance axially.

★ Thickness per shim is equal to 0.1 mm and 0.2 mm.

★ After this adjustment, adjust the toe-in. (See the item EVERY 1000 HOURS SERVICE)

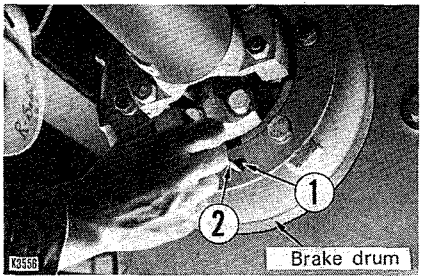


h. PARKING BRAKE LEVER TRAVEL

Check

If the normal braking grip is effective by pulling the brake lever 2 to 3 ratchets from the brake release position, the brake lever travel is considered normal.

If six or more ratchets are counted before the parking brake comes into effect, perform the following adjustment.



Adjustment

Move the machine as necessary until the adjustment hole (1) is located to approx. 15 mm right side from the center bottom of the brake drum. The brake drum rotates one complete turn with every 29 cm of movement of the machine.

Insert the screwdriver (2) into the adjustment hole. Using the driver blade, rotate the adjusting screw in the "shoe expanding" direction (lower the screwdriver grip) to bring the shoe into close contact with the drum. Then, back the adjustment screw eight clicks. (0.23 mm of shoe clearance will result.)

Then, adjust the yoke nut on each end of the cable until proper lever travel (135 mm) can be obtained.

★ After adjustment, try travelling the machine for about 500 meters and confirm that the brake drum is free from trailing. (If some trailing exists, the brake drum will become hotter than the propeller shaft next to the drum.)

★ As the parking brake is independent of the service brakes and used only when the machine is at a stop, usually brake lining will not be subjected to any wear.

★ Wear of parking brake, if any, is caused by failure of releasing of the parking brake lever. Most of wear will be accompanied with burning of the lining and discoloration of the drum.

As burnt brake lining causes deterioration of braking effect, remove the drum and clean the burnt lining surface with sandpaper.

★ Keep the lining surface free from oil and grease. If soiled with oil or grease, wipe off it and polish the surface with sandpaper.

★ To check the parking brake for normal function, pull the parking brake and start the engine. Depress the inching pedal, place the gear shift lever in the forward 3rd position, and run the engine at full speed.

The effect of the parking brake can be considered normal if the engine is stopped when the pedal is gradually released. In this case, it should not be regarded as abnormal if the machine is moved slightly.

★ Do not attempt to repeat the above-mentioned parking brake test unnecessarily, as this test gives undue stress to the various parts in the power train.

i. SERVICE BRAKE

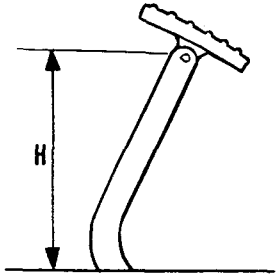
Check

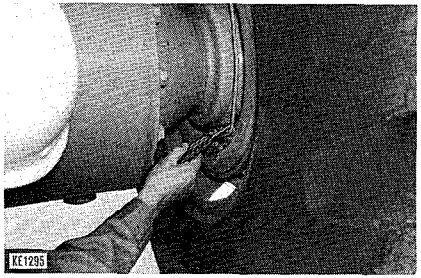
When the pedal is depressed if the height (H) of the mounting bolt center of brake pedal above the floor is 70 mm or less, perform the following adjustment.

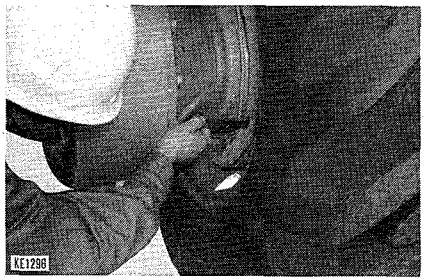
Adjustment

1. Turn the adjusting gear, with the screwdriver inserted into the hole on the lower side of back plate, until the brake lining comes into close contact with the brake drum.
2. Back the adjusting gear 2 to 3 clicks.
3. Insert the 0.6mm feeler gauge into one of two inspection windows on the lower side of the drum and confirm that the lining clearance checked at the other inspection hole is less than 0.4mm.

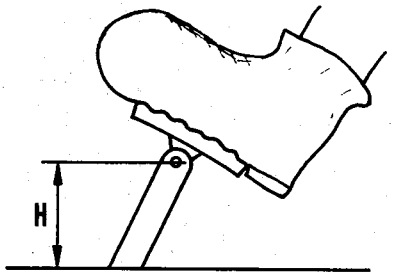
★ *Adjustment of brake lining* clearance for the machine in operation should be performed only about the steps 1 and 2, and the step 3 may be omitted.







4. After adjustment, confirm that brake pedal height (H) is 76 to 116 mm.



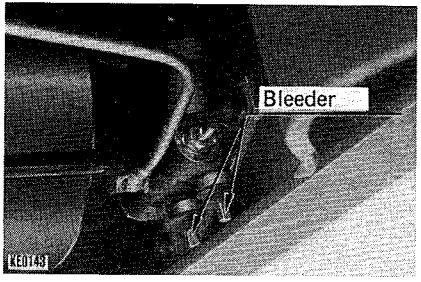
★ If deterioration of braking efficiency is suspected, check it as follows:
1) While the machine travels at about 20km/h of travelling speed, try lightly braking the machine (so as not to cause wheel locking) three times.
2) Touch each brake drum by hand to see whether heating of drums is felt or not.
3) Cold drums, if any, may be assumed ineffective.

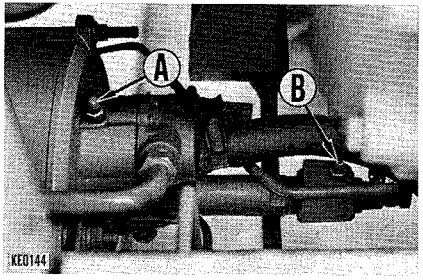
★ Brake lining with black surface due to burning or lining soiled with oil causes insufficient braking effect. Polish such a lining with sandpaper.
★ After adjustment, travel the machine about 500 meters and confirm that four brake drums are free from overheating caused by trailing.

Air bleeding

When bleeding air from the brake fluid piping, use the following procedure: This operation is carried out by two persons in cooperation with each other: The person on the machine depresses the brake pedal repeatedly, while pouring brake fluid into the brake fluid supply tank, to send fluid to the wheel cylinders. The other person on the ground bleeds air from the Hydromaster and wheel cylinders. Perform the following.

1. Turn down the safety cylinder air vent valve (1) until the valve comes into a slight contact with the stopper. (The safety cylinder is optional)
2. Attach vinyl tube to the breather plug. Immerse the other end of tube into the vessel filled with brake fluid.
3. Depress the brake pedal several times and keep the pedal depressed. Loosen the breather plug to discharge pressure and tighten the plug before fluid pressure in the wheel cylinder lowers completely. Repeat feeding brake fluid and spurting pressurized fluid until brake fluid free from air bubbles comes out of the breather plug.
4. Apply these steps to the Hydromaster breathers (A) and (B) and every wheel cylinder breather one after another.

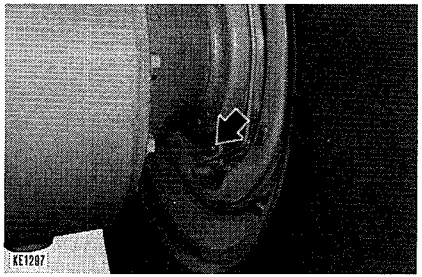




5. After completion of air bleeding operation, turn up the safety cylinder air vent valve until its seat comes into close contact with the cylinder valve seat. (Tightening torque: 1.4 to 2.0 kg.m)

★ Do not attempt to pump the brake pedal quickly, but carry it out at the rate of about 1 cycle/3 seconds.

★ Also, be careful not to cause lack of brake fluid during air bleeding operation.



⚠ **If turning up the air vent valve seat is neglected, the safety cylinder loses its function. Although the brake is normally actuated.**

⚠ **Do not attempt to use any oil instead of brake fluid. If any oil is used, rubber parts in the brake piping will swell to cause serious failure of braking function.**

★ Be careful not to splash brake fluid about on the painted surfaces.
Brake fluid, if splashed, will not only affect the painted surface, but also deteriorate rubber parts used for the various devices other than brake system.

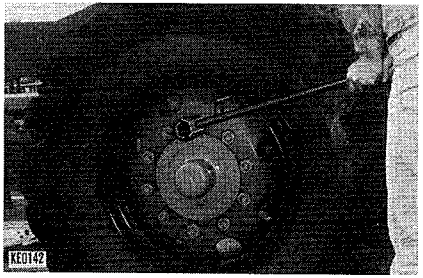
j. WHEEL HUB NUT

Loose wheel hub nuts will result in shortened life of tires or troubles. Carefully check loosening of the nuts.

CHECK

i) Place the work attachment on a ground and pull the parking brake lever to its limit.

ii) Place the accessory machine tools (socket wrench and bar) as indicated in the photo below and turn the bar in a tightening direction. The tightening torque is 45 to 55kgm. Depress the bar end with full force.



★ Check all the nuts for loosening. Also, check the rim for damage. If a hub bolt is broken, replace the total unit of the wheel stud.

EVERY 500 HOURS SERVICE

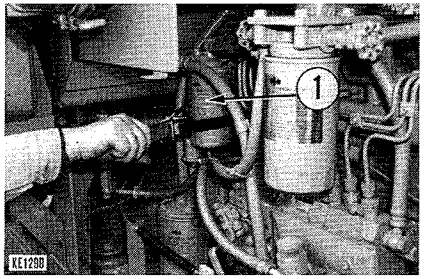
★ **Maintenance for every 50 and 250 hours should be carried out at the same time.**

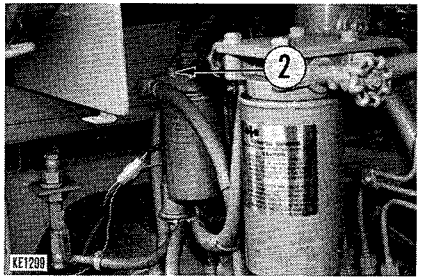
a. FUEL FILTER CARTRIDGE

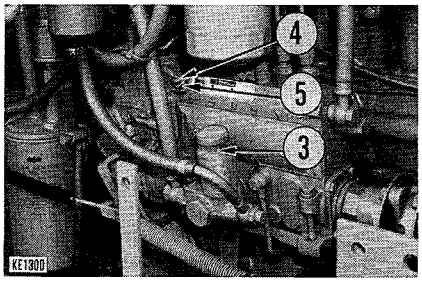
1. Using the tools provided, rotate cartridge element (1) counterclockwise, then fit the new cartridge after filling it with oil and applying oil to the packing face.
   To mount the new cartridge, place the packing face in contact with the seal face of the filter stand, then tighten up the cartridge by rotating it by hand 2/3 of a turn. (Be careful not to tighten it excessively.)
2. After replacing cartridge (1), loosen air bleed plug (2). Next, loosen the knob of feed pump (3) and move it up and down to bleed air from air bleed plug (2). When fuel starts to come out of air bleed plug (2), tighten it up again.
3. Loosen locknut (5) of the injection pump, then loosen air bleed plug (4) and expel air in the same manner as for the fuel filter (see 2 above). After bleeding the air, tighten up plug (4) and locknut (5), then push in the knob of feed pump (3) and fit it in position.

★ After replacing the element, start up the engine and inspect the filter seal face for possible oil leakage.

★ Use a genuine Komatsu cartridge element.







b. CIRCLE GUIDE

Checking

With the blade raised from the ground, check the circle guide clearances at the portions (P) and (Q), using the feeler gauge.

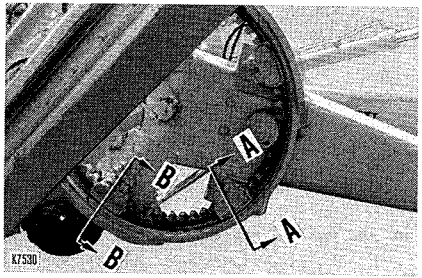
Standard clearance at portion (P) is 1.5 ± 0.5mm.

Standard clearance at portion (Q):

$(Q)_F$ = 0 and $(Q)_R$ = 1.5 mm or $(Q)_F = (Q)_R$ = 1mm

F: Front

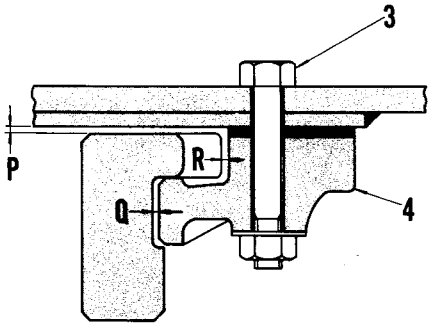
R: Rear



Adjustment

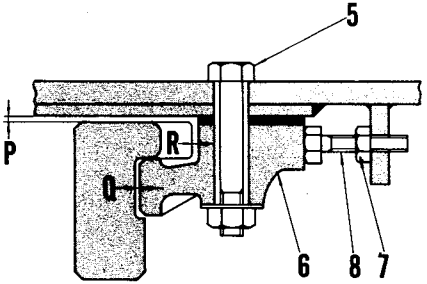
Rest the blade on the ground. To adjust the clearance at portion (P), loosen bolt (3) and (5) and adjust thickness of shims for the circle guide (4) and (6). Two kinds of shims different in thickness (1 mm and 0.5 mm) are provided.

Section A–A (Two places on the front side)



To adjust the clearance at portion (Q), first loosen the bolt (3), push the circle guide (4) rearward to make the clearance $(Q)_F$ zero, and temporarily tighten the bolt (3). (Slightly move the machine forward, with the blade rested on the ground, to make the clearance $(Q)_F$ zero.)

Section B–B (Two places on the rear side)



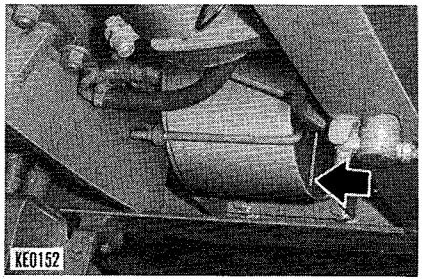
Then, loosen the bolt (5). Loosen locknut (7) fastening the bolt (8) and turn in the bolt to push the circle guide (6) until the clearance $(Q)_R$ becomes zero. Be sure to equally tighten the right and left bolts (8). With the clearance $(Q)_R$ kept in zero, back the bolt (8) half rotation, and tighten the locknut (7). Back the circle guide (6) until it comes into contact with the bolt (8) and tighten the bolt (5).

When either of the following conditions arises, replace the circle guide:

1. Clearance at portion (R) has decreased to zero.
2. Clearance between the circle tooth top and circle reverse pin gear tooth bottom land has decreased to zero or clearance between the circle tooth bottom land and the circle reverse pin gear tooth top has decreased to zero.

c. HYDROMASTER

Remove the rubber cap from the Hydromaster and refill with 60 cc of vacuum cylinder oil. Apply the oil every 500 hours of operation or every 6 months.



d. RAFIATOR FIN

Dust, mud, or leaves sticking to, and blocking, the radiator are to be blown off by compressed air. Steam or water may be used instead of the compressed air.

★ Be careful not to bend the fin.

★ Check the rubber hose also. If any broken, or defective fixtures, or deteriorated parts are found, replace with new one. Check that the hose clamp is tight.

EVERY 1000 HOURS SERVICE

★ **Maintenance for every 50, 250 and 500 hours should be carried out at the same time.**

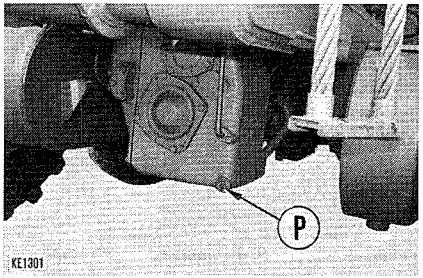
a. CHANGE OIL

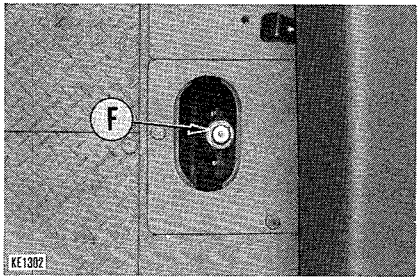
1. Transmission case
   After draining the oil through the drain plug hole (P), refill the oil up the predetermined level from oil filler (F). Then, confirm the level with the level gauge.

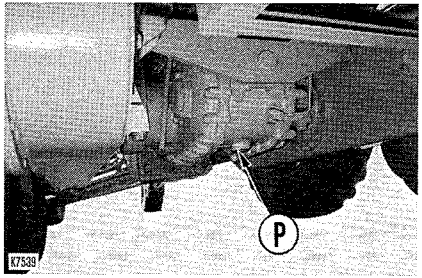
★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

★ Oil capacity: 31ℓ

2. Final drive case
   After draining oil through the drain plug holes (P), refill the gear oil through the filler (F) up to the prescribed level.
   For the refilling procedure, see the item "EVERY 250 HOURS SERVICE".



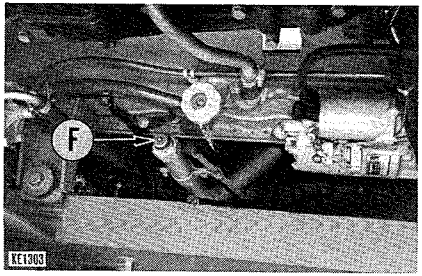


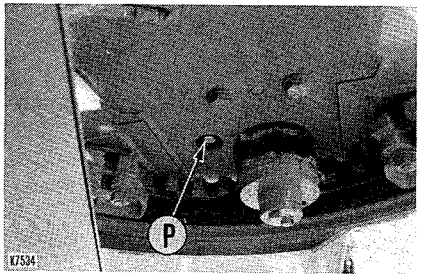


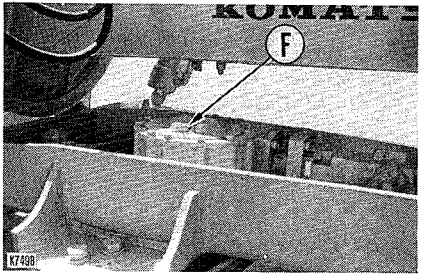
★ Use SAE90 gear oil for all seasons.
★ Oil capacity: 15ℓ (each side)

3. Blade rotating system gear case
After draining oil through the drain plug hole (P), refill the engine oil through the filler (F) up to the predetermined level. Then, confirm that the oil level is at the gear upper face.

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.
★ Oil capacity: 4ℓ







4. Hydraulic oil tank

After relieving the work equipment from travelling posture, stop the engine.

Drain oil from the drain plug (P) and refill engine oil in the specified amount from the filler (F).

Then, check the oil level with the oil gauge (G).

★ Use CLASS-CD SAE10W engine oil for all seasons.

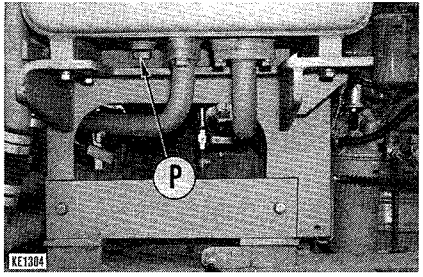
★ Refill capacity: 30ℓ

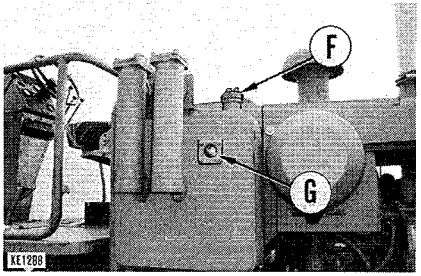
b. HYDRAULIC FILTER ELEMENT

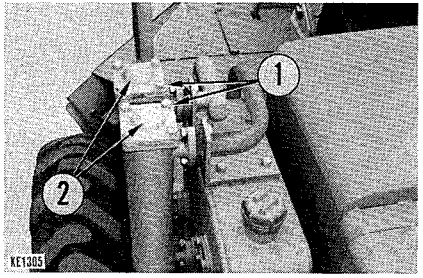
This cleaning is to be carried out along with the oil change.

Remove the filter cover mounting bolts (1) (4 each) and the cover (2) and take out the element.

Then, clean the inside of the filter housing together with the other removed parts and replace with a new element.

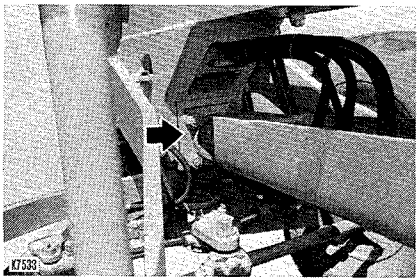






c. DRAWBAR FRONT BALL JOINT

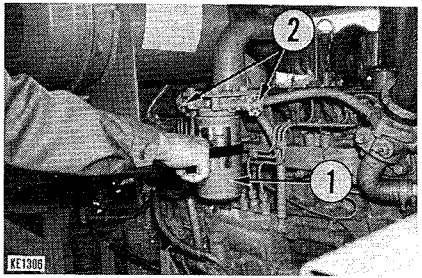
Check the ball joint connecting portions at the front of the drawbar for loosening. If the connecting portions are loose, re-tighten them.



d. CORROSION RESISTOR CARTRIDGE

1. Screw-in the valves (2) on the upper parts of corrosion resistor.
2. Remove cartridge (1) by turning counterclockwise with a tool, and replace the cartridge by new one. To install the cartridge, coat engine oil to the sealing surface and turn the cartridge until the sealing surface touches the head. Then screw it further by 2/3 turn. (Be careful not to overtighten.)
3. After replacement, open the valves (2).

★ Use a genuine Komatsu cartridge.

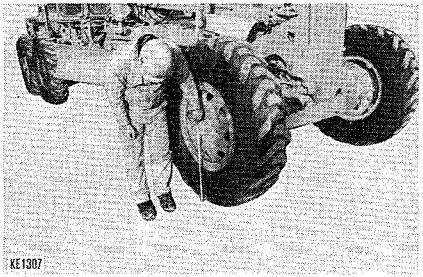


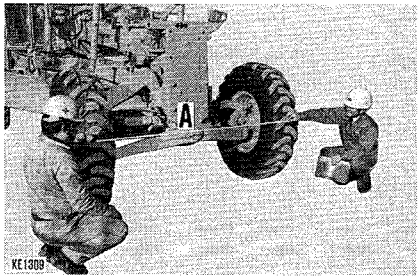
e. CHECK AND ADJUST TOE-IN.

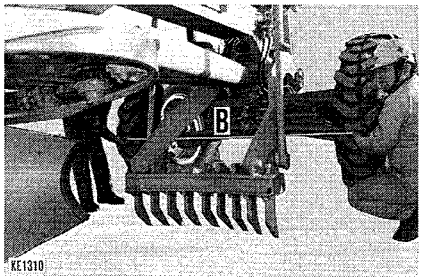
Check toe-in and adjust it so that no side slip is caused. When no side slip tester is available, use the following procedure.

How to measure toe-in:

1. Park the grader on a level ground without steering and leaning the wheels. Be sure to drive straight at least a few meters before parking.
2. Measure the height from the ground to the center of the front wheel axle.
3. Mark on the front tire surfaces with the same measure taken by the above procedure.
4. Measure the distance between the two marks on the right and left tires. This distance is named "A".
5. Drive the grader at a low speed and shift backward the mark on the tire. Stop the grader when the mark's height from the ground surface has become equal to the same value measured in the procedure 2.
6. Measure the distance between the two marks.
   This distance is named "B".



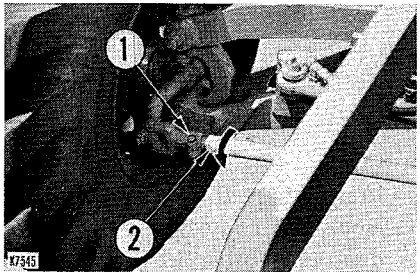




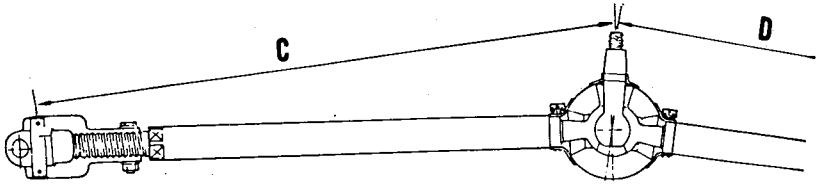
How to Adjust Toe-in:

When toe-in (B – A) is adjusted to 6.5 to 9.5 mm of standard range, side slip is decreased to zero. If any value other than the standard range is measured, adjust toe-in using the following procedure:

Loosen the nut (1). Turn the right and left tie rods with a wrench put on the square portion (2). Then, tighten the locknuts. Toe-in increases when the wrench is turned in the direction shown by the arrow, and vice versa. The value of toe-in varies by approx. 11 mm when the right and left tie rods are turned 1/3 rotation in the opposite direction to each other.



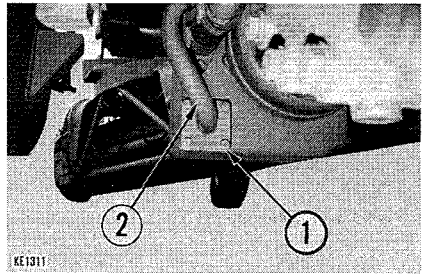
★ To keep the right and left tie rods in balanced condition, set the length C and D equal. When performing this adjustment, keep the front axle horizontally without any leaning.



f. TRANSMISSION CASE OIL STRAINER

This cleaning is to be carried out along with the oil change. Remove the bolt (1) and tube (2) to take the element out and clean it.
clean it.

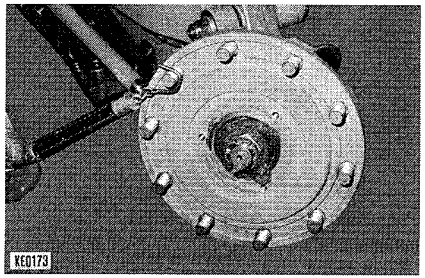
Refit the strainer after washing in the fuel.



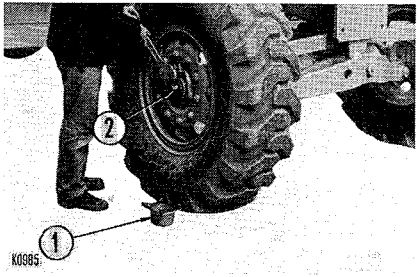
g. FRONT WHEEL BEARING PLAY

Raise the front wheels off the ground, using the blade or scarifier as a jack. Check hub turning torque with a spring balance hooked to a hub bolt. The bearing play is normal if the front wheel is rotated smoothly with 8 to 12kg of pulling force.

★ If the front wheel is loosely fitted or is rotated by a pulling force less than 8kg, remove the cap (1). Pry the cotter pins and tighten the nuts (2) so that the wheel is rotated by a pulling force within the specified range.



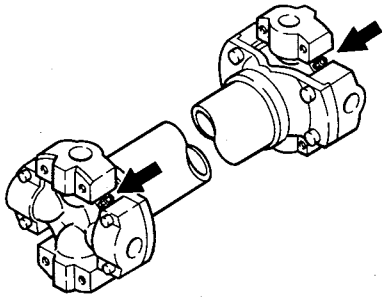
★ Check for greasing condition, irrespective of bearing play. If emulsified grease is found, disassemble the bearing to renew grease. Also, check the various parts for emulsification of grease. (See EVERY 2000 HOURS SERVICE section.)

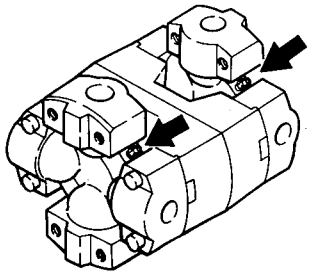


h. GREASING

Propeller shaft (4 points)

Apply grease to the grease fittings shown by arrows.





K-06763

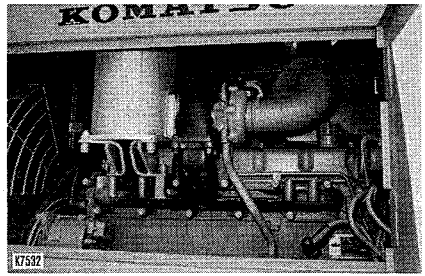
i. TURBOCHARGER ROTOR PLAY

Have the turbocharger inspected by Komatsu or check it by yourself using the follwing procedure:

Remove the intake and exhaust pipes and hoses from the turbocharger.

1) Play in the axial direction
   Move the rotor and check for rotor play in the axial direction.
   Standard axial play:
   0.025 ~ 0.076 mm.

2) Play in the radial direction
   Move the rotor in the radial direction by holding it with your hands on both ends.
   Standard radial play:
   0.076 ~ 0.152 mm.



★ If necessary play cannot be obtained, have the turbocharger repaired by Komatsu distributor.
★ If the rotor is excessively soiled with dust or carbon or if any oil leakage caused by torubocharger trouble is noted, have the turbocharger repaired by Komatsu distributor.

EVERY 2000 HOURS SERVICE

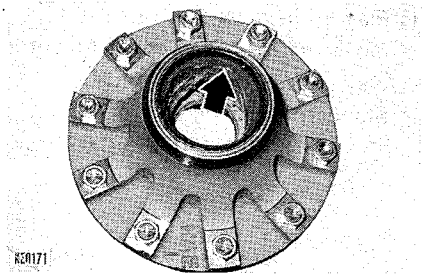
★ Maintenance for every 50, 250, 500 and 1000 hours should be carried out at the same time.

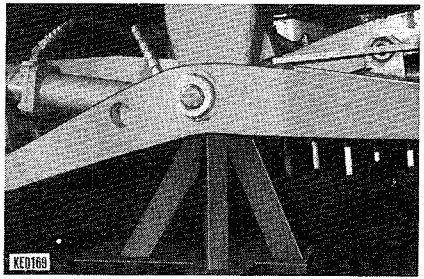
a. FRONT WHEEL BEARING GREASE (ON BOTH RIGHT AND LEFT SIDES)

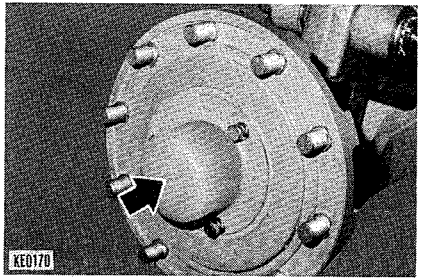
1. Support the front axle on a block to raise the front wheel off the ground. Remove the wheels.

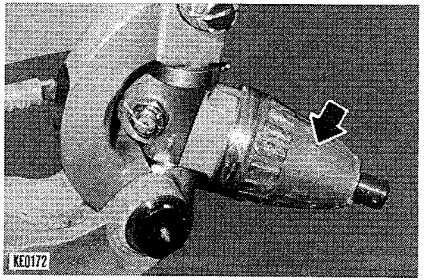
★ When raising the front wheels, securely apply the parking brake and rest the blade and scarifier on the ground.

2. Remove the cap. Pry the cotter pins, loosen the nuts, and remove the hub.
3. Clean the axle and bearing. Thoroughly wash out waste grease from the hub interior. Fill the half space of the cavity with fresh grease.
4. Replace the hub seal.



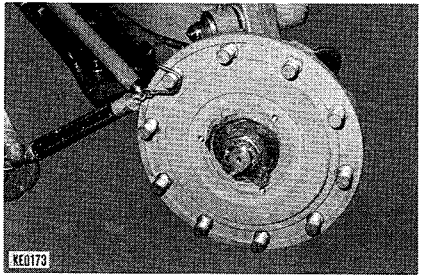




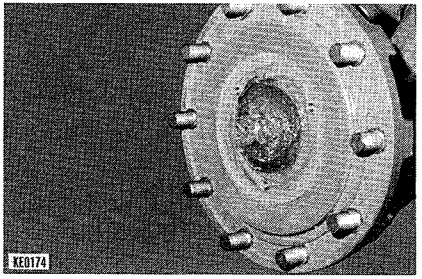


★ Before installing the hub seal, coat the lip surfaces and sliding surfaces with grease and fill the space between lips with grease.
★ Press ample quantity of grease into the axle and bearing. Heap up grease around the bearing. Install the hub.

5. Hook a spring balance to a hub bolt. Tighten the nuts to give a pre-load to the bearing so that the hub can be rotated by about 20kg of pulling force given to the hub bolt through the spring balance. Loosen the nuts. Then, tighten the nuts again to give the 8 to 12kg of specified pre-load to the bearing. Install cotter pins to prevent nuts from loosening.
6. Always replace the cap gaskets with new parts.
   Fit one on the hub and one on the cover, and coat both with liquid adhesive.



★ Smear gasket sealant on both the gasket and mating surface. Mate them together after discoloration of partially dried gasket sealant is noticed.
7. Install the cap. Tighten cap mounting bolts to a torque of 10 to 12.5 kg.m. Check the bolts for tightness after spending some lapse of time and retighten, if necessary, to compensate loosening of bolts due to fatigue of the gaskets.
   It is recommended to have the above-mentioned service operation performed by your Komatsu distributor.



b. TANDEM CASE

After draining oil through the drain plug hole (P), refill the engine oil up to the prescribed level through the gauge hole (G). Then confirm the oil level with gauge (G).

★ Above 0°C: Use engine oil CLASS-CD SAE30.
Below 10°C: Use engine oil CLASS-CD SAE10W.

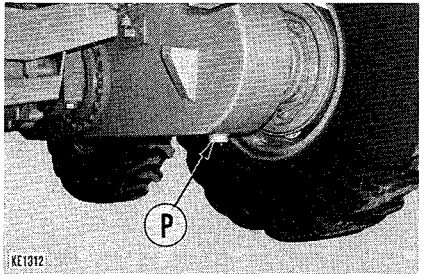
★ Oil capacity: 30ℓ (each side)

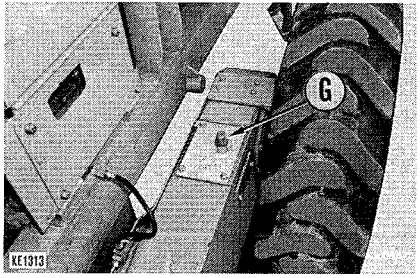
★ Check the oil reservoir for each axle to see if it is filled with oil.

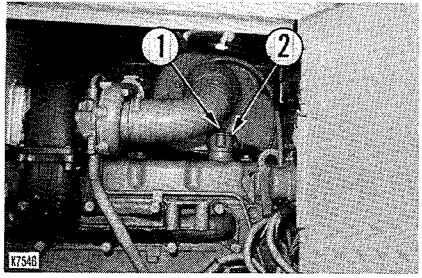
c. ENGINE BREATHER

The breather is located on the engine cylinder-head cover. Loosen the bolts (1) and remove the cover (2) then extract the element.

Refit the strainer after washing in the fuel.







d. TURBOCHARGER ROTOR IMPELLER

Remove the intake air rubber hose, rotate the impeller forcefully by your finger. When it does not rotate for one rotation, you shall request repair to Komatsu distributor.

★ When the rotation of the impeller is heavy, remove the turbocharger drain pipe from the flange, and while pouring light oil through the oil filler of the turbocharger, rotate the impeller for **2** or **3** rotations. Then, fixed sludge will be exhausted and normal rotation will be obtained. In such case, the normal operation is restored.

In case the rotation is heavy in spite of above treatment, you must require repair to Komatsu distributor.

e. TURBOCHARGER MOUNTING PARTS

Bolt tightening torque on the turbine housing side: 1.6 ~ 2.15 kg.m.

Bolt tightening torque on the blower housing and back plate mounting bolt: 0.86 ~ 1.04kg.m.

Clamping bolt tightening torque on the blower housing side: 1.15 ~ 1.50kg.m.

Turbocharger mounting bolt tightening torque: 5.5 ~ 7.5kg.m.

f. ALTERNATOR AND STARTING MOTOR

Brushes should be worn by this time. Request a Komatsu distributor to repair. An attempt to disassemble starting motor by unskilled hands may impair its drip-proof function. Leave its repairs to a service shop specialist.

★ Have a service shop inspect alternator and starting motor every 1000 hours if work operations require frequent use of light.

d. ENGINE VALVE CLEARANCE

Ask Komatsu distributor to check engine valve clearance because special tools should be used.

EVERY 4000 HOURS SERVICE

★ **The maintenance for every 50, 250, 500, 1000 and 2000 hours should be carried out at the same time.**

a. WATER PUMP

Check for loose pulley, grease leakage or water leakage. If any, contact your Komatsu distributor for repair or replacement of the water pump.

b. ENGINE VIBRATION DAMPER

The vibration damper has match marks on the hub and inertia member. It is constructed so that any misalignment of these marks can be detected. Accordingly, inspect the damper to see if the match marks are misaligned or if the rubber is projecting out.

If a fault is found, consult Komatsu distributor.

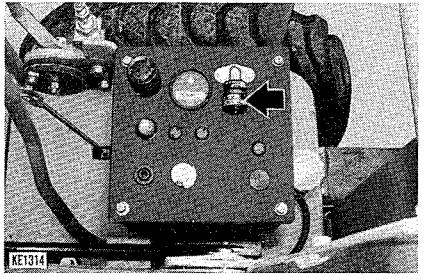
WHEN REQUIRED

a. CHECKING, CLEANING AND REPLACING AIR CLEANER ELEMENT

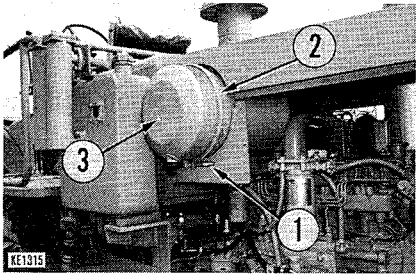
(In case of oil bath type air cleaner attached, refer to EVERY 50 HOURS SERVICE.)

Check

When the dust indicator shows red the air cleaner element needs cleaning.



Cleaning and replacing the outer element



1. Loosen wing nut (1) and remove the clamp (2) and the cover (3). Then remove outer element.
2. Clean the inner body and the cover.
3. Clean and check the outer element (c.f. following pages) and reattach.
4. Press the dust indicator button and return the red piston to its place.

★ Replace an outer element cleaned as many as 6 times. In this case, replace together with an inner element.

★ Even when an outer element has been cleaned less than 6 times, a dust indicator shows a red signal soon after a cleaned outer element is installed, replace both the outer and inner elements at the same time.

★ When both outer and inner elements have been used for more than one year, replace the both elements, even though the outer element has not cleaned as many as 6 times.

Replacing the inner element

1. After removing the cover and outer element, remove the inner element.
2. Cover the intake opening.
3. After cleaning inside the body remove the intake opening cover.
4. Fix a inner new element to the connector and tighten the nut.
5. Fix on the outer element and cover and return the dust indicator red piston to its place.
   ★ The inner element should not be cleaned and re-used.

⚠ **Do not clean the air cleaner while the engine is running.**

Cleaning the element

- With compressed air
  Dry compressed air (below 7kg/cm^2) is blown from inside the element following the folds. Repeat the process and check the element.

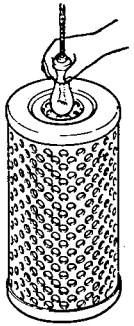
⚠ **When using compressed air use safety goggles and equipment.**

When using the following method a spare should be on hand.

- With water
  Tap water (below 3kg/cm^2) is squirted into the element from inside following the folds, then from outside following the folds, then again from inside, after the element dries check it.
  When the element is very dirty the following process is followed.

1. Place the element in tepid solution of a cleanser for home use for about 15 minutes.
2. After rinsing wash in running water.
3. Check after drying.
   Dry with a fan or in the shade.

★ Even when in a hurry never use heat to dry the element.
★ Using hot water (40°) will be more effective than cold water.
★ When the element can be re-used wrap it and store in a dry place.
★ When cleaning do not tap the element or knock it against other objects.
★ Do not use elements with damaged folds, gaskets or seals.
★ Check the element after cleaning or drying by putting a lighted electric bulb inside it. Change the element if there are small holes or thin parts.



b. CHANGE OF COOLING WATER

FLUSHING COOLING SYSTEM AND CHANGING COOLING WATER should by performed when draining antifreeze (in spring) and when refilling with antifreeze (in autumn), or every 1000 hours if no antifreeze is used.

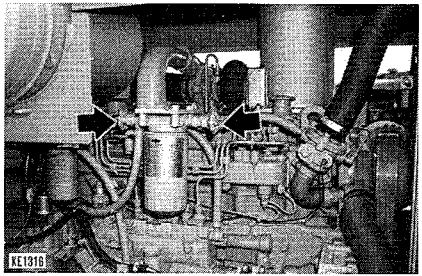
CHANGE

1. Stop the engine, tighten the valve of the corrosion resistor and remove the water filler of the radiator.
2. Open the drain cock and drain water throughly from the radiator.
3. After draining, wash the radiator by using detergent sold on the market. When using detergent, follow the maker's instruction.
4. After cleaning, once drain water and close the drain cock and supply clean water (for example, city water) through the water filler.
5. When water overflows the water filler, start and run the engine at low idling speed. Open the drain cock and supply water through the water filler until clean water comes out through the drain cock.
6. When water becomes clear, close the drain cock and supply water up to the overflow pipe position.
7. Replace the corrosion resistor element and open the valves (2 places).
8. Then, to bleed air trapped in water after the valves are opened, run the engine at low idling speed for 5 minutes and at high idling speed for another 5 minutes. (With the water filler cap removed)
9. Stop the engine and 3 minutes later supply water again up to the overflow pipe position and tighten the water filler cap.

★ Replace the corrosion resistor element (cartridge type) without fail.

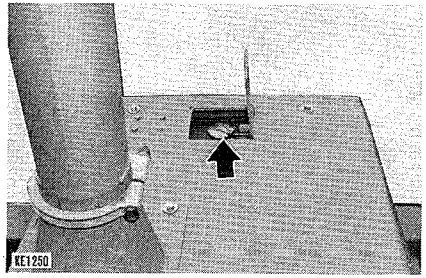
★ Park the machine on the level ground before changing water.

Corrosion resistor

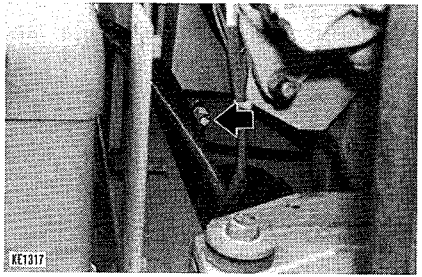


⚠ **When water is still hot, do not remove the cap. Hot water spouts out. And when removing the cap, loosen the cap gradually and raise the lever to relieve inner pressure.**

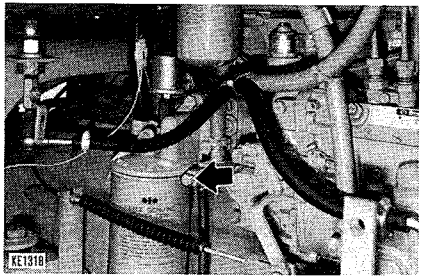
Water filler



Drain cock (bottom of radiator)



Drain cock (cylinder block)



c. CHECK RIBBON HEATER AND COIL HEATER

Check the ribbon heater and coil heater once a year before commencing work in the cold season.

Remove the ribbon heater and coil heater from the engine intake connection, and check them for possible open-circuits and dirt.

When inspecting and replacing the coil heater and ribbon heater, replace the gaskets with new ones.

d. CLEAN ENGINE BREATHER HOSE

In dusty, sandy, rough or steeping working area, the hose is sometimes clogged by the emitted oil, sand and dust. It is thus necessary to inspect the hose and clean it.

e. CLEAN MUFFLER DRAIN PIPE AND HOSE

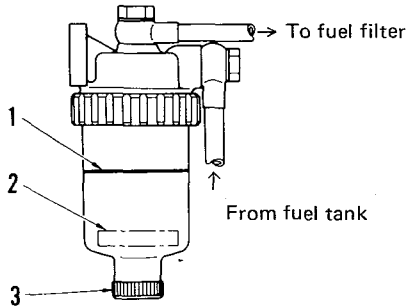
The drain pipe and hose at the muffler are sometimes clogged by particle at the exhaust gas and water after long-term storage or rain.

Clean the pipe and hose to prevent the water entering into the engine.

f. WATER SEPARATOR (OPTION)

When the float (2) is at or above the red line (1), drain the water according to the following procedure;

1. Loosen the drain plug (3) and drain the accumulated water until the float reaches the bottom.
2. Tighten the drain plug (3).
3. If the air is sucked into fuel line when drain the water, be sure to bleed air in the same manner as for the fuel filter.
   (See Fuel Filter Cartridge in EVERY 500 HOURS SERVICE section.)



1. Allowable water level (red line)
2. Float
   (Floats on water to indicate the water level)
3. Drain plug

ADJUSTMENT

CHECKING VACUUM SYSTEM

1. Leakage inspection

   Attach a vacuum gauge to the circuit. Start the engine and idle it until vacuum pressure rises to 500 mm Hg. Stop the engine.

   Check for vacuum pressure dropping speed with the vacuum gauge. The following standard condition must be satisfied:

   (1) When brake is applied:
   less than 20mm Hg/min.

   (2) When brake is not applied:
   less than 15mm Hg/min.

   For convenience sake, either of the following simple methods may be used:

   After adjusting the brake shoe clearance, idle the engine at full speed for about 5 minutes, and stop the engine. With the parking brake released, depress the brake pedal fully, and release the brake pedal. Depress the brake pedal again and maintain it at that position. If the warning buzzer does not sound within 10 minutes after depressing the brake pedal, the vacuum system may be considered normal. (Do not continue depressing the pedal over 10 minutes.)

2. Charging performance

   Try depressing the brake pedal about 10 times, repeatedly, to expel vacuum pressure. Release the parking brake, and the warning buzzer will sound. Idle the engine at full speed.

   If the warning buzzer stops sounding within 10 seconds after starting full-speed idling of the engine, the vacuum charging performance may be considered normal.

CHECKING HYDROMASTER

1. Idle the engine at full speed for about 5 minutes, then stop the engine and depress the brake pedal fully.

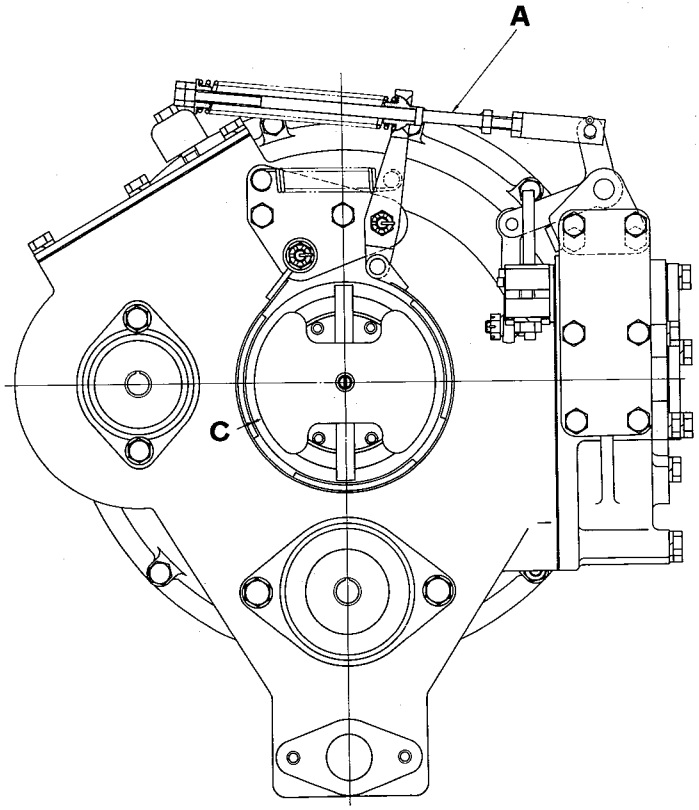
   If it is evident that the Hydromaster air cleaner sucks air when the brake pedal is released, function of the Hydromaster may be considered normal.

2. Try depressing the brake pedal repeatedly to expel vacuum pressure. With the brake pedal partially depressed, start the engine. If some sinking of the pedal is felt, function of the Hydromaster may be considered normal.

ADJUSTING INERTIA BRAKE

When faulty function of inertia brake is noticed during step-up gear shifting, adjust the clearance between the inertia brake drum and the band. (An excessively large clearance causes increased clutch pedal travel when both the brake pedal and clutch pedal are depressed.)

To adjust, turn in the rod (A) to decrease the clearance "C" to zero. From that position, back the rod (A) about 12.5 turns to make the clearance "C" to 1mm.

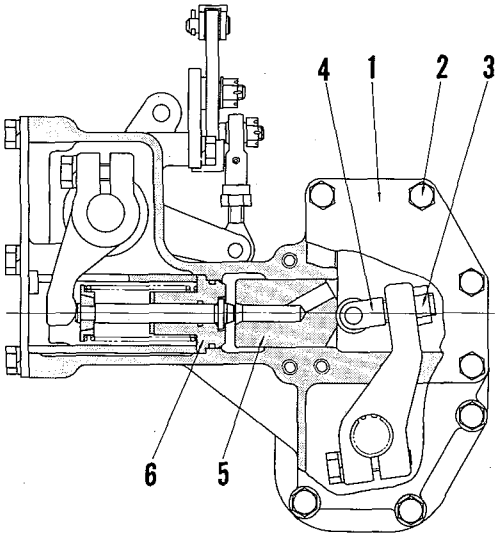


ADJUSTING CLUTCH

When insufficient clutch pedal play (standard play is 45 to 55mm when measured at the center of pedal mounting bolt) or slippery clutch is noticed, perform the following adjustment:

1. Remove the bolts (2) fastening the side cover (1) to the clutch booster; remove the cover. Loosen the lock-nut (3) and turn the yoke (4) until the piston (5) and valve (6) come into contact with each other.

From this position, back the yoke 4 turns, and tighten the lock nut (3).
However, roller at yoke (4) should face in the direction shown.



K-06777

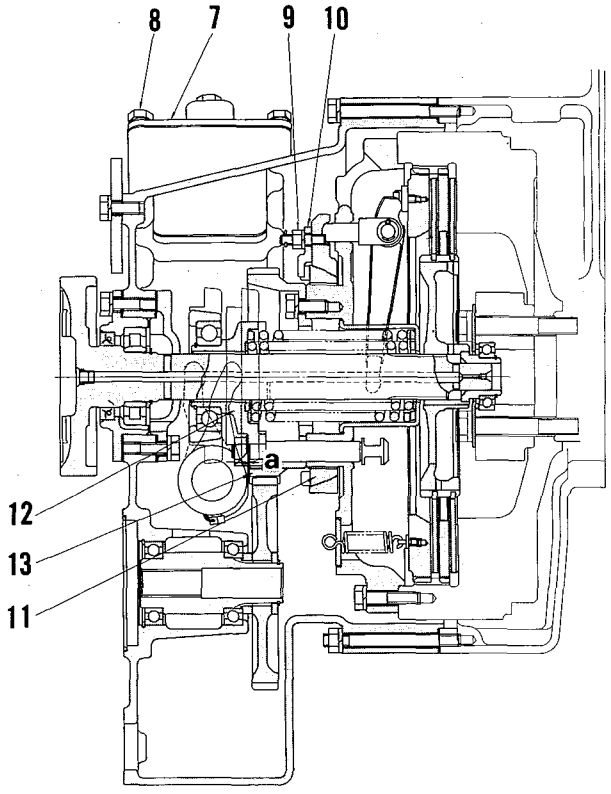
2. If the clutch still slips even after the above-mentioned adjustment is made, proceed as follows:
   Remove bolts (8) fastening the inspection cover (7); remove the cover. Loosen the nut (9), remove the lock (10), and turn the adjustment ring (11) until 0 ~ 1.0 mm of clearance "a" can be obtained between the flange (12) and gear (13). Then, adjust the clutch pedal play using the procedure described in step 1.

★ If ring (11) is turned by one step (22.5°), dimension (a) will be changed by 0.76 mm.

★ Ring (11) can be turned smoothly with the clutch pedal down to keep the clutch disengaged.

★ Do not attempt to overtighten ring (11) in order to prevent the clutch control linkage and oil system from being damaged.

★ The clearance varies 0.76 mm when ring (11) is turned by 1 notch (22.5°).



TROUBLE SHOOTING GUIDE

ENGINE

The pointer of engine oil pressure gauge is in red range on left hand side of the gauge when engine speed is raised after completion of warm-up.
- Add the oil to the specified level.
- Replace the oil element.
- Check oil leakage from the pipe or the joint.
- Replace the pressure gauge.

Steam is emitted from the top part of the radiator (the pressure valve).
The pointer of the water temperature gauge is in red range on right hand side of the gauge.
- Supply the cooling water and check leakage.
- Adjust fan belt tension.
- Wash out inside of cooling system.
- Clean or repair the radiator fin.
- Replace the thermostat.
- Tighten the radiator cap firmly or replace the gasket of it.
- Replace the water temperature gauge.

The pointer of the water temperature gauge is in white range on left hand side of the gauge.
- Replace the thermostat
- Replace the water temperature gauge.

The engine does not start when the starting motor is turned over.
- Add fuel.
- Repair where air is leaking into fuel system.
- Replace the injection pump and the nozzle.
- Check the valve clearance.
- Check engine compression pressure.
- Refer to the section of electrical system.

Exhaust gas is white or blue.
- Adjust to specified oil quantity.
- Replace with specified fuel.

Exhaust gas occasionaly turns black.
- Clean or replace the air cleaner element.
- Replace the nozzle.
- Check engine compression pressure.

Combustion noise occasionally changes to breathing sound.
- Replace the nozzle.

Unusual combustion noise or mechanical noise.
- Replace with specified fuel
- Check over-heating.
- Replace the muffler.
- Adjust valve clearance.

ELECTRICAL SYSTEM

Ammeter pointer swings abnormally even with the constant engine rpm.
Lamps dim as engine runs at high speed
Lamps flicker
- Inspect and repair wiring
- Adjust belt tension

Ammeter pointer does not swing when the engine starts
- Inspect and repair wiring
- Replace alternator
- Replace ammeter

Unusual noise is emitted from the alternator.
- Replace the alternator.

Starting motor does not turn when starting switch is turned on.
- Inspect and repair the wiring.
- Charge the battery.

The pinion of the starting motor keeps going in and out.
- Charge the battery.

Starting motor turns the engine sluggishly.
- Charge the battery.
- Replace the starting motor.

The starting motor disengages before the engine starts up.
- Check and repair the wiring.
- Charge the battery.

The heater signal does not glow red.
- Check and repair wiring.
- Replace the heater relay.
- Replace the heater signal.

Outside the ribbon heater and the coil heater is not warm when touched with the hand.
- Check and repair wiring.
- Replace the ribbon heater and the coil heater.
- Check and repair the heater switch.

CHASSIS

Tractive force is lacking. (Insufficient travel speed)
- Refer to item "Engine".
- Inspect and adjust transmission valve.
- Release parking brake lever.

Machine fails to start at any gear shift lever position.
- Add oil to the specified level.
- Inspect and adjust transmission valve.

Loud noise in the power transmitting system.
- Add oil to the specified level.

Excessive wear of front wheels
- Adjust toe-in.

Heat generation at front wheel hub
- Adjust front wheel bearing nut.
- Apply grease.

Front wheels sway while travelling
- Adjust toe-in and tie rod.
- Equalize tire pressure on each side.
- Check wheel installation.
- Tighten front wheel bearing nut.

Steering wheel feels heavy.
- Add air to front tire to the specified pressure.
- Apply grease to steering linkage.
- Check engagement of ball nut.
- Correct piping.

Parking brake does not operate satisfactorily
- Adjust brake shoes.
- Polish the lining with sand paper.
- Clean the interior of brake drum.

Excessive blade swing during work
- Adjust shims of ball joint and circle guide.
- Replace side bushing.
- Correct blade rail.

Excessive vibration of the blade when rotating during work
- Adjust position of circle guide.

Excessive scarifier swing during work.
- Adjust shims of lift cylinder ball joint.

Work equipment is slow to move by operating the control lever
- Add oil to the specified level.

Wear of parking brake lining
- Adjust clearance between lining and drum

WEAR PARTS

Consumable items like filter element must be replaced at the periodical maintenance or before the wear limit is reached.

These items must be replaced without fail in order to maintain the economic operation of the machine.

For replacement, we recommend the superb genuine Komatsu parts.

Item	Part name	Q'ty	Replacement
Engine oil filter	Cartridge	1	Every 250 hours
Fuel filter	Filter	1	Every 500 hours
Hydraulic filter	Element O-ring	2 2	Every 1000 hours
Corrosion resistor	Cartridge	1	Every 1000 hours
Air cleaner	Element	1	When required
Blade	Edge	2	—
	End bit	2	
	Bolt	30	
	Bolt	4	
	Nut	34	
	Washer	34	
Scarifier teeth (OP)	Teeth	11	—
Ribbon heater	Gasket	2	When required
Coil heater	Gasket	2	When required

COLD WEATHER OPERATION

PREPARATION FOR LOW TEMPERATURE

- Change lubrication oil by that with prescribed viscosity.
- Fuel of low pour point shall be used. ASTM D975 No. 1 diesel fuel should be used at atmospheric temperature lower than **−10°C**.

- Add antifreeze in the cooling water When the atmospheric temperature drops lower than **0°C** while the machine is stopped, prevent freezing by adding antifreeze to the cooling water. The mixing rate of antifreeze is determined according to the expected minimum temperature. The following table shall be used.

Mixing rate of water and antifreeze

Min.atmospheric temperature (°C)	−5	−10	−15	−20
Amount of antifreeze (ℓ)	8	10	12.5	14
Amount of water (ℓ)	27	25	22.5	21

★ **Cautions for using antifreeze**

1) Permanent type antifreeze shall be used.
2) Soft water (ex: city water) shall be used as mixing water.
3) Liquid made of water and antifreeze shall be poured after perfectly extracting the cooling water and cleaning the slime.
4) When the climate becomes warmer so that antifreeze is not needed, replace by clean water (ex. city water) after perfectly cleaning the cooling system.

⚠ **Take care for fire as antifreeze is inflammable.**

- Battery
  As ambient temperature drops, battery capacity will drop, and electrolyte may sometimes freeze if battery charge is low. Maintain battery at a charge level of approx. 100% and insulate it against cold temperature so that machine can be readily started the next morning.

★ Measure specific gravity of fluid and obtain rate of charge from the following conversion table:

Temp. of fluid / Rate of charge	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

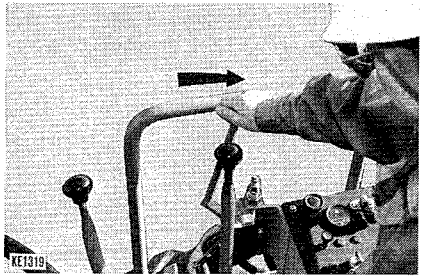
★ When electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.

★ When temperature rises, change lubricating oil in each unit to that of recommended viscosity.
Completely drain antifreeze from cooling system and fill with soft water (for example, city water) after thorough flushing.

STARTING IN COLD WEATHER

For attention of engine starting, refer to section "Operating your machine."

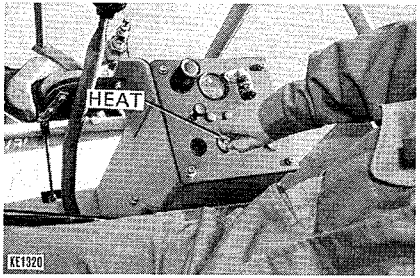
1. Put the fuel control lever in half open position.



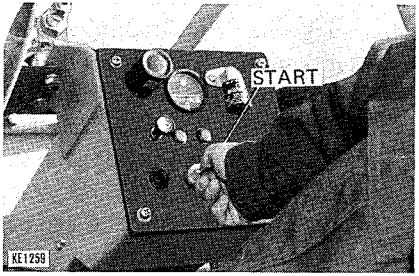
2. Put the starting switch in the HEAT position to red-hot heater signal.

   The preheating times are as shown below:

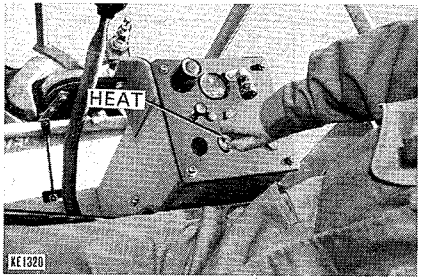
Ambiente temperature	Preheat time
Above 5°C	—
5°C to –20°C	40 seconds



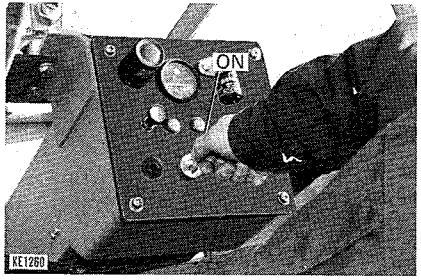
3. When the heater signal glows red, turn the key to the START position to start the engine.



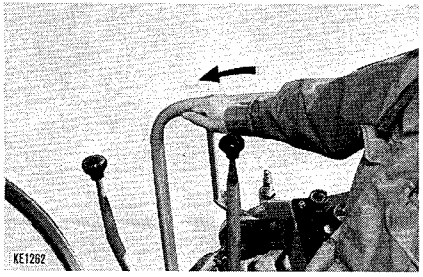
4. As soon as the engine starts, turn the key to the HEAT position to expedite the attainment of smooth running conditions.



5. Once the engine is running normally, return the key to the ON position.



6. Put the fuel control lever in LOW IDLING position.



★ If the engine runs smoothly as soon as it starts up, it is possible to except step 4 and go on to the next step.

★ If the engine does not start up despite carrying out the above operations, leave it for about 2 minutes and then repeat the above procedure 2 and 3.

★ Once the engine starts up, thoroughly warm up the engine before putting the machine into operation. Initially, put the gear shift lever in the lowest position, and then gradually apply the load.

⚠ **When starting the engine using an auxiliary starting fluid, do not on any account turn the key of the starting switch in the HEAT position.**

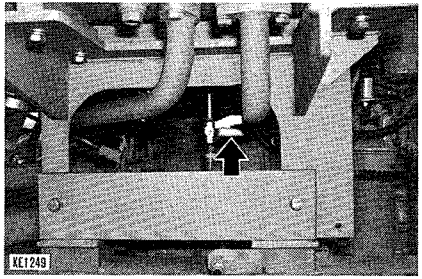
This is because of the danger of explosion. It is possible to prevent inadvertent operation of the switch by disconnecting the wiring between the heater relay and the starting switch. After disconnecting the wires, wrap the terminals in insulating tape and anchor them to the wiring in the vicinity.

CAUTIONS AFTER COMPLETION OF WORK

1) Mud and water attached on the machine.
   Mud can easily be removed soon after it has adhered to the machine. Dried or frozen mud will not only become difficult to remove, but also cause various defects.
   In particular, water drops collected on the surface of the piston rod of the hydraulic cylinder shall be fully wiped out. When water drops is frozen on the surface of the piston rod, the seal may be broken.

- When washing the machine, be careful not to throw water on the alternator and breathers.

2) Drain water collected in fuel system so that such water may be frozen at night.

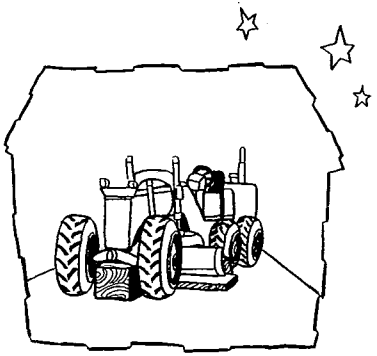


STORAGE

BEFORE STORAGE

To place the machine in storage for an extended period of time, the following measures must be taken to insure that it can be returned to duty operation with minimum of service.

- After washing, cleaning and drying every part, store the machine in a dry building. Do not leave the machine outside.
  If the machine has to be stored outside, park it on level ground and cover it with canvas, etc. Place wooden blocks under the front wheels and tandem gear case to raise the tires from the ground. Also place blocks under the blade and scarifier.
- Lower the air pressure in the tires to about 80% of the standard operating pressure.
- Completely fill fuel tank, lubricate and change oil before storage.
- Apply sufficient quantity of grease and oil replacement.
- Give a thin coat of grease to metal surface (hydraulic piston rods and oil seal)
- As to batteries, remove the terminals and place cover on them, or remove them from the machine and store separately.
- In case the atmospheric temperature may drop below 0°C, add antifreeze in the cooling water.
- ★ Set the gear shift lever to neutral position, set the fuel control lever to stop position.



DURING STORAGE

- Operate the engine and move the machine for a short distance once a month so that new oil film will be generated and exhaustion of oil film in a long period will be prevented.

★ Before using work equipment, wipe off the grease from the pressure cylinder rod.

⚠ **When it is unavoidably necessary to carry out rust-preventive operation indoors, open all windows and doors to circulate the air and prevent the accumulation of poisonous gases.**

AFTER STORAGE

In case the machine is operated after a suspension for a long period (when the machine is stored without applying cover or when rust-preventing operation was not executed once a month), the following treatment should be applied before starting the engine.

- Remove the drain plugs of oil pan and various cases for the purpose of draining mixed water.
- Remove the cylinder head cover and amply supply oil in the valve and the locker arm. And check the activation of the valve.
- When the engine is started, operate the warm up operation without fail so that every part of the engine will be well warmed up.
- Remove the oil pipe flange on the turbocharger oil inlet, fill with 0.5 to 1ℓ engine oil, and leave the flange as lightly loosened. Then, rotate the engine by starting motor at the state of no fuel injection so that the discharge of oil is confirmed. Then, tighten the flange and start the engine.

SERVICE METER

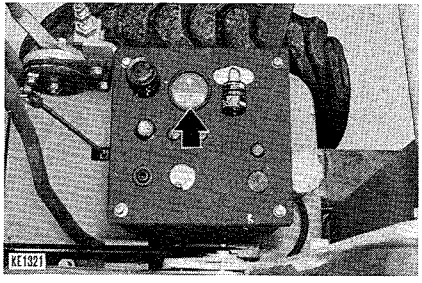
This meter indicates the integrated work hours. So, use it according to the following instructions.

- Record the readings at the start and the end of a work, which will be a work record of the machine.
- The time for periodical maintenance is informed.
- It indicates the integrated working hours which must be informed at trouble information.

★ **How the meter progresses**

The service meter progresses by 1 when the engine is operated for one hours.

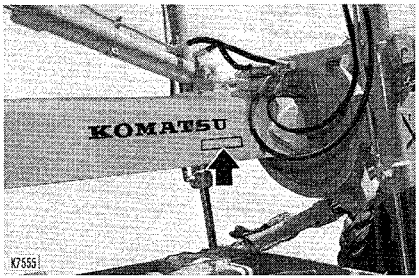
Therefore, the service meter progresses when the engine is rotated even the machine does not travel.



MACHINE AND ENGINE SERIAL NUMBERS

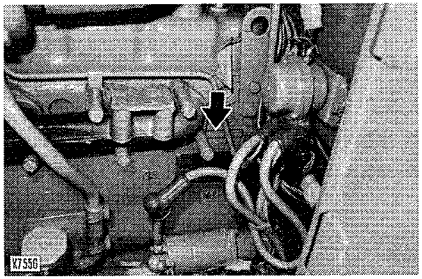
When calling for a service of mechanic or when making replacement parts order, be sure to give your Komatsu distributor the machine and engine serial numbers as well as the service meter reading beforementioned. These numbers are found on the plates shown in the photos below.

- Machine serial number mark



Impressed on the left side of the frame.

- Engine serial number mark



Impressed on the upper right side of the cylinder block.

SPECIFICATIONS

GD500R-2

PERFORMANCE

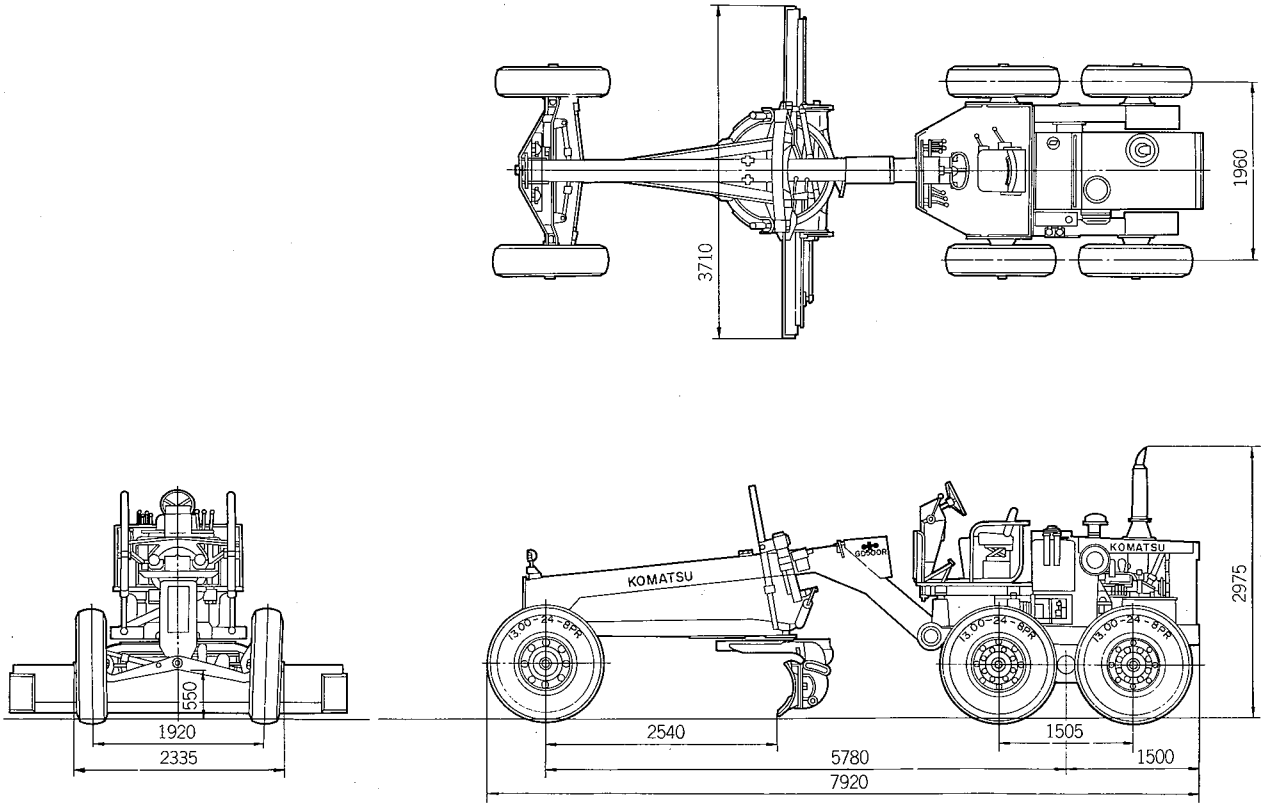
• Travel speed	Forward	L	1st	3.7 km/h
		L	2nd	6.7 km/h
		L	3rd	12.0 km/h
		L	4th	18.6 km/h
		H	1st	8.2 km/h
		H	2nd	14.8 km/h
		H	3rd	26.3 km/h
		H	4th	41.2 km/h
	Reverse		1st	5.1 km/h
			2nd	9.2 km/h
			3rd	16.4 km/h
			4th	25.5 km/h
• Maximum tractive force				6060 kg
• Minimum turning radius				10.4 m

WEIGHT

• Operating weight	10500 kg

ENGINE

• Model	Komatsu S6D105-1 diesel engine
• Rated horsepower	130 HP/2400 rpm
• Starting method	Starting motor 24V, 5.5 kW
• Alternator	24V 25A
• Battery	12V 120 Ah x 2


3710
1960
2975
550
1920
2335
2540
5780
7920
1505
1500
KOMATSU
KOMATSU
13.00-24-8PR
13.00-24-8PR
13.00-24-8PR

FUEL AND LUBRICANTS

PROPER SELECTION OF FUEL AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE 14 32 50 68 86°F / −10 0 10 20 30°C	CAPACITY (ℓ) Specified	CAPACITY (ℓ) Refilled
Engine oil pan Transmission case Tandem case (each) Blade rotating gear case	Engine oil	SAE 30 SAE 10W	28 31 30 4	20 31 30 4
Final drive case	Gear oil	SAE 90	15	15
Hydraulic system	Engine oil	SAE 10W	60	30
Fuel tank	Diesel fuel	ASTM D975 No. 2 ※	227	
Cooling system	Water	Add antifreeze	35	35

※ *ASTM D975 No. 1*

NOTE:

(1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.
Change oil according to the following table if fuel sulphur content is above 0.5%.

Fuel sulphur content	Change interval of oil in engine oil pan
0.5 to 1.0%	1/2 of regular interval
Above 1.0%	1/4 of regular interval

(2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, even though an atmospheric temperature goes up to 10°C more or less in the day time.

(3) Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.

SPEC. & GRADE / NAME OF SUPPLIER	ENGINE OIL	GEAR OIL	GREASE
	Class CD	Class GL-4, GL-5	
	SAE 30 SAE 10W	SAE 90 SAE 140	NLGI 2
CALTEX	RPM DELO 300 RPM DELO 400	Universal Thuban 90	Marfak All Purpose Marfak Multi-Purpose 2
CHEVRON	RPM DELO Super 3	RPM Multi-Service Gear Lubricant 90	RPM Multi-Motive Grease 2 RPM Automotive Grease Medium
TEXACO	Ursa Oil S-3 Ursa Oil LA-3	Universal Gear Lubricant EP 90	Marfak All Purpose Marfak Multi-Purpose 2
ESSO WORLD-WIDE ESSO AFFILIATES	Essolube D-3	Esso Gear Oil GP	Esso Multi-Purpose Grease Nebula EP
SHELL	Shell Rimula CT	Shell Spirax BP 90	Shell Alvania Grease EP 2
MOBIL	Mobil Mobil Delvac 1330 Delvac 1310	Mobilube H.D. 80-90	Mobilplex 47 (Mobilplex 48)
PENNZOIL	Zoildeez S-3	Penzoil M.P.P. Gear Lube 4090	Pennz Lube 310 Cha-Z-Lube 315 M.P. Lube 705
CASTROL	CRD 10, 30	Hypoy 90	
BP	BP Vanellus C-3	BP Hypo gear oil 80EP, 90EP, 140 EP	BP Energrease L2 BP Energrease LS-EP2
GULF (for sever cold districts)	Gulf Dieselube Super S-3 Motor Oil 10W	Gulf Gearlube HT75	