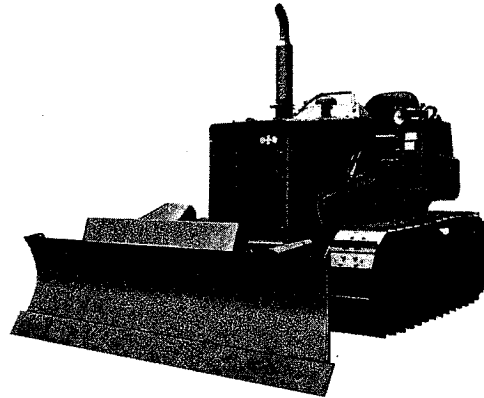


# Operation & Maintenance Manual

**KOMATSU**

# D20A,P,PL-5 BULLDOZER



SES

SERIAL NUMBERS

D20A -45001


D20P -45003 and up

D20PL-45001

# 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.

## 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 break in the various parts.

If a machine is subjected to unreasonably hard use at the initial operation stage, the potential of performance will prematurely deteriorate and the service life will be reduced. A new machine **must** be operated with care, particularly with regard to the following items.

- After starting, let the engine idle for 5 minutes to allow proper engine warm-up prior to actual operation.
- Avoid operation with heavy loads or at high speeds.
- Sudden starting or acceleration, unnecessarily abrupt braking and sharp turning should be avoided.
- At the first 250 hours of operation\*, the machine should be maintained in the following manner:

- 1) Changing of all oil and filter elements.
- 2) Checking and adjustment of engine valve clearance


(For maintenance procedure, refer to EVERY 250 HOURS SERVICE, EVERY 500 HOURS SERVICE, EVERY 1000 HOURS SERVICE and EVERY 2000 HOURS SERVICE).

- ★ When replacing oil filter elements (cartridges), check their interiors for dirt and dust. If heavily collected, check for possible cause before starting operation.

\* Hours of operation are indicated by the service meter.

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## OPERATION

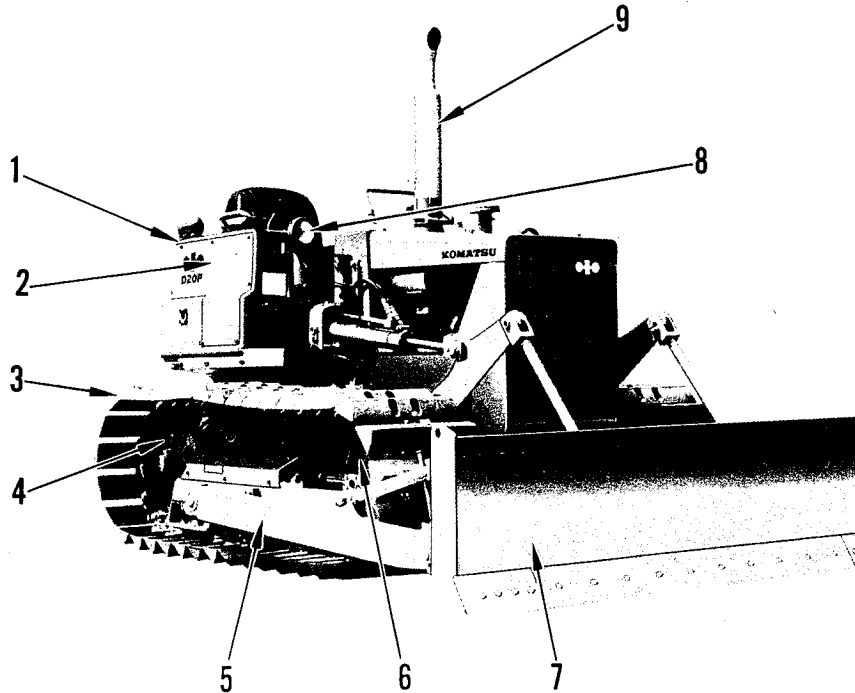
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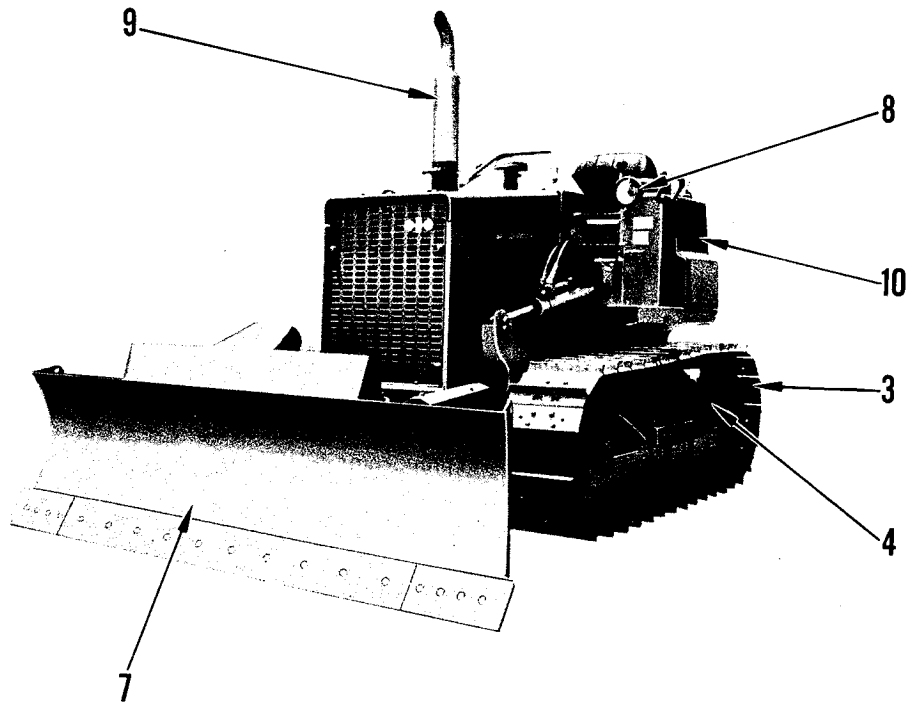
# GENERAL LOCATIONS

D20P



1. Hydraulic tank
2. Battery box
3. Track shoe
4. Sprocket
5. Frame

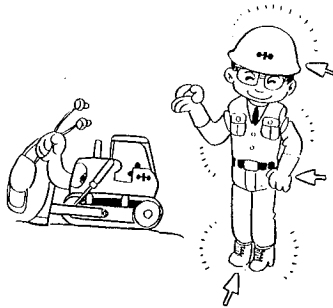
D20A



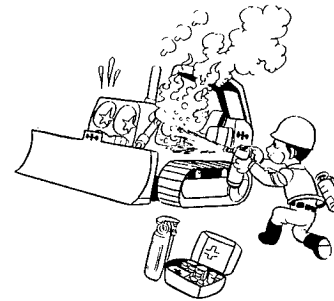
- 6. Idler
- 7. Blade
- 8. Head lamp
- 9. Exhaust pipe
- 10. Fuel tank

## SAFETY HINTS . . . ⚠

### OPERATION GENERAL

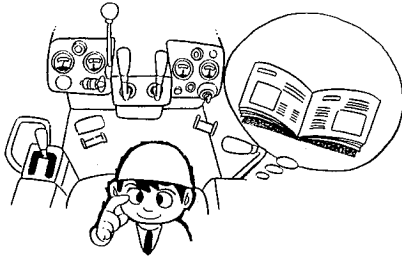


- Wear well-fitting helmet, safety shoes and working clothes. If the nature of the work requires safety, wear protective goggles or mask, thick gloves, ear plugs or other protection.
- Accidents or injuries are liable to occur when the operator is careless or slack. It is most important to bear safe operation in mind at all times.
- Take care of your health. Do not drive when tired, or after drinking.
- Learn the prohibitions, cautions and rules about work procedures in the work site.  
When there is a leader, fix standard signals and always follow these signals when operating.

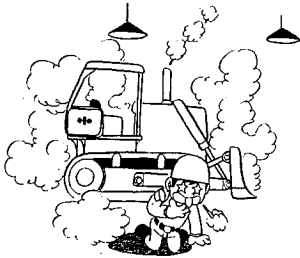


- If there should be an accident or fire or any other such unexpected mishap, deal with it quickly, using the nearest apparatus.  
Learn beforehand the locations of the first aid boxes and fire extinguishers and how to use them. It is also important to know the emergency contact system.
- Learn about the safety devices on your own machine and about how to use them. Confirm that they are correctly attached in the prescribed position.  
Such safety devices include:

- ★ Guards
- ★ Canopies
- ★ Protective Devices
- ★ Roller-Over Protective Structures
- ★ Seat Belts, etc.



- Read the Operation and Maintenance Manual carefully. Learn how to use the control devices, gauges and warning devices. Be sure you understand the meaning of the Caution plates. Remember the check points and checking method for engine oil, fuel, cooling water and hydraulic oil levels.



- Exhaust gas is dangerous. When running the engine for long periods in a poorly ventilated area, there is a danger of gas poisoning, so open the windows or doors to ensure a good supply of fresh air.



- When operating inside a building always be sure of the clearances of the ceiling, entrances, aisles, etc. and the load limit of the floor.
- Never allow other person than the operator to ride on the machine during operation.



## BEFORE STARTING OPERATION

- Examine the lay of the land and the kind of soil at the work site to determine the dangerous points and the best method of operation.  
Proceed with the work only after making safety arrangements about the dangerous points.
- Inspect leakages from the fuel, lubricating and hydraulic systems. Check that the shoe bolts are not loose, and that no other parts are damaged or missing. Machines having such failures should not be operated.

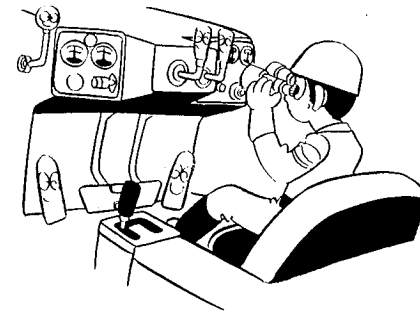


- When getting on or off the machine, use the handrail and step provided. Do not jump up or down from the machine.



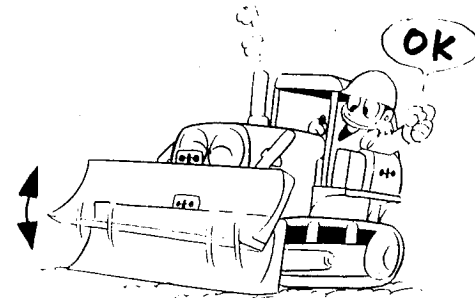
- Do not leave parts or tools lying around in the vicinity of or on the floor of the operator's compartment. Keep everything in its proper place.
- Wipe off thoroughly any grease, oil or mud on the step, handrail, floor or control levers. Failure to do this may cause you to slip.
- Check the level of the fuel, lubricants and cooling water. Extinguish cigarettes before checking or replenishing. Check that the radiator cap and each oil filler caps or plugs are firmly tightened.
- Adjust the operator's seat until it is in the most comfortable position for operating. Always sit in the seat while operating. Do not operate the machine from any other position.

## AFTER STARTING THE ENGINE



- To ensure the safety of workers near the machine, always sound the horn to warn them before starting the engine and moving the machine. Be particularly careful to check that the rear is clear before backing the machine.
- Inspect the inside of the engine room and remove any dead leaves or paper. Dead leaves or paper are highly inflammable and can cause fires.
- Before starting the engine, confirm that all control levers are in "NEUTRAL" or "HOLDING".

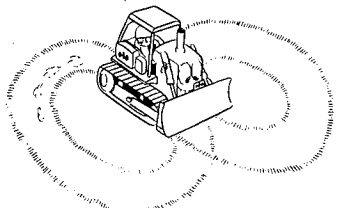
- Confirm that all gauges and warning devices are functioning correctly, and that the gauge readings are within the prescribed range.
- Check the play and travel of each lever and pedal.



- Operate the blade and ripper to confirm that they are functioning normally.

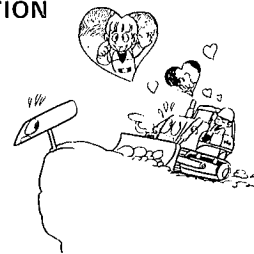


- Move the machine slowly and listen carefully to the engine or gears to confirm that they are not making any unusual noises.
- Operate the gear shift lever to confirm that the travel speeds for forward and reverse are functioning normally. Also carry out a brake test at each travel speed.



- Choosing a safe place, turn the machine to the left and right to confirm that the steering devices are functioning normally.
- If these tests reveal anything wrong, however slight it may be, contact the man in charge of the machine and operate the machine only after obtaining his permission.

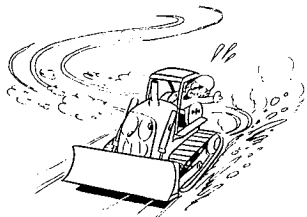
## DURING OPERATION



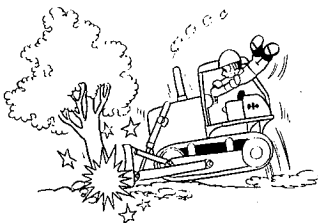
- Always concentrate. It is extremely dangerous to allow yourself to be distracted or to think of other things when operating a machine. In dangerous places, or where there is restricted visibility, it is important to get down from the machine and confirm whether it is safe before continuing work.



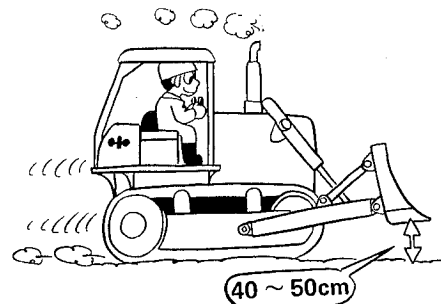
- The work area should be made as flat as possible. If the work area is flat, operation is made much easier and this reduces operator fatigue.



- The machine should always be operated at a speed where it can be correctly controlled. Never do the following:
  - ★ Speeding
  - ★ Sudden starting, sudden braking, sudden turning.
  - ★ Snaking
  - ★ Coasting



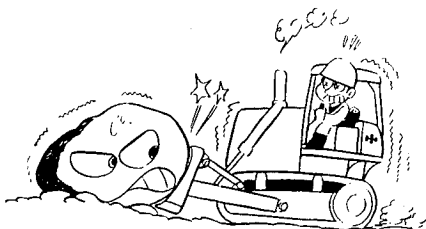
- Be careful of those around you, and always confirm that there is no person or obstacle in the way before driving or turning the machine.
- Always operate slowly in crowded places. On haul roads or in narrow places, give way to loaded vehicles.



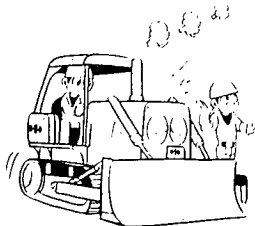
- When driving the machine, keep the blade 40 to 50cm above the ground.



- Do not allow unauthorized persons into the work area.



- Always be aware of the operating capacity of the machine. Using the machine to do work beyond its capacity will not only damage the machine, but may even cause unexpected accidents.



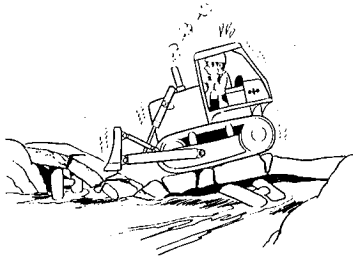
- The machine condition can be judged from many factors. Changes in the gauges, sound, vibration, exhaust gas color or response of the control levers can indicate the occurrence of some disorder. If any disorder occurs, park the machine immediately in a safe place and take appropriate action. Be especially careful in the case of a fuel leak as there is danger of fire.



- If the machine breaks down and needs to be towed, first confirm that the brakes are working properly, and then tow, using a wire rope or any other suitable towing equipment.
- When parking the machine after discontinuing work, put the gear shift lever into "NEUTRAL", apply the brake lock, lower the blade and ripper to the ground, and put all safety levers into the "LOCK" position. Never leave the operator's seat without switching the engine off.



- When continuing operations after rain, remember that conditions will have changed from those before the rain started, so proceed with caution. Be particularly careful when approaching the shoulder of the road or cliffs, as they may have been loosened by the rain.

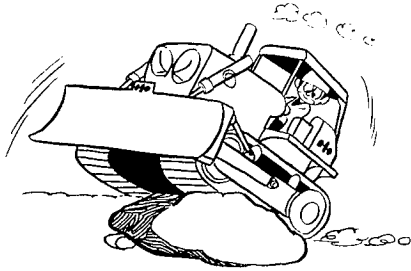


- Check the load limits of bridges before crossing.
- After earthquakes, confirm that the ground is still firm; after blasting, confirm that there are no unexploded charges remaining.

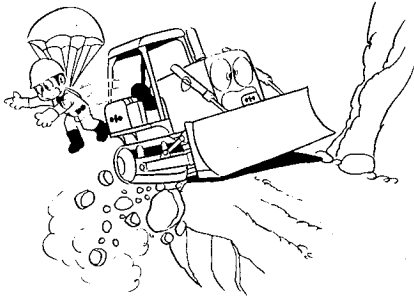
- When operating on uneven ground or in places where there are obstacles, remember the following points:
  - When operating on uneven ground, drive at as low a speed as possible and avoid sudden changes in direction.



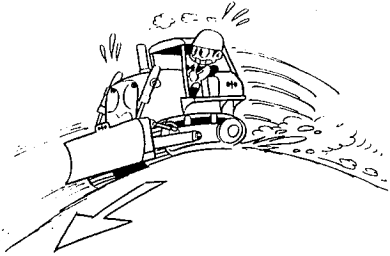
- Wherever possible, avoid travelling over large rocks, fallen trees, tree stumps and other such obstacles. Either use the working equipment to remove them, or travel round them. When it is impossible to avoid travelling over them, put the gear shift lever into a low speed, reduce speed and mount over the obstacle. Just before the front of the machine tips down, reduce speed even more to make the shock of hitting ground as small as possible.



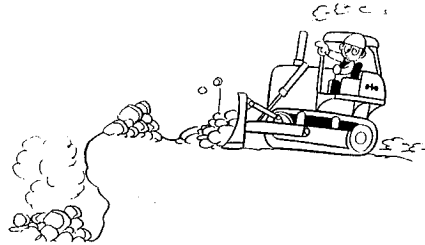
- Never mount over an obstacle at an angle; never disengage one steering clutch to travel over an obstacle.
- When operating at the edge of a cliff or on the shoulder of a road, remember the following points:



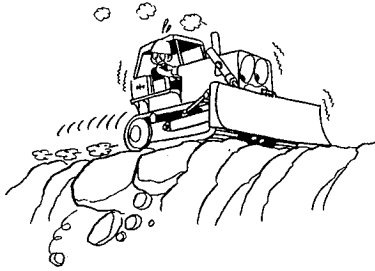
- When operating in a place where there is danger of the machine falling over the side, be doubly careful. Do not approach the edge of the cliff or road shoulder by mistake.



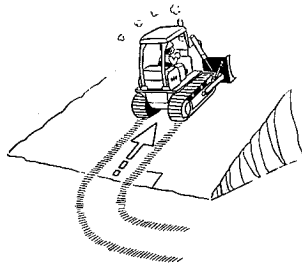
- At the instant when the soil is dumped over the cliff, or when the machine passes the summit of a slope, the machine speed suddenly increases. This is dangerous, so press the decelerator pedal (in the case of direct drive machines use the fuel control lever) to reduce the speed, and at the same time return the gear shift lever to "NEUTRAL".



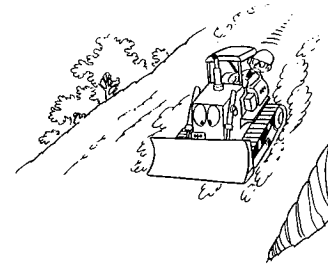
- When dumping soil over a cliff, dump the first excavated soil without dumping it over, and use each succeeding excavated soil to push the previous excavated soil over. Be sure not to approach the edge by mistake.



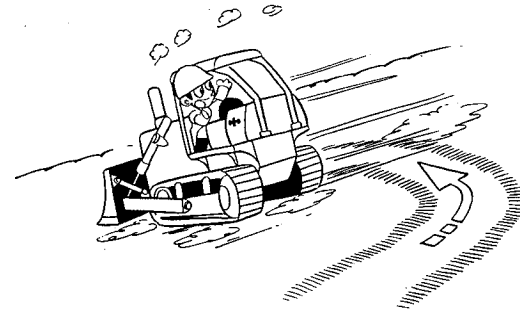
- When working on river embankments or other places made of piled soil, there is the danger that the weight or vibration of the machine may cause the machine to sink into the piled soil, so be extremely careful when operating in such places.
- When operating on slopes, remember the following points:



- When driving on a slope, always drive directly up or down it. Never drive horizontally or diagonally across the slope, as this may cause the machine to roll over or slip sideways.

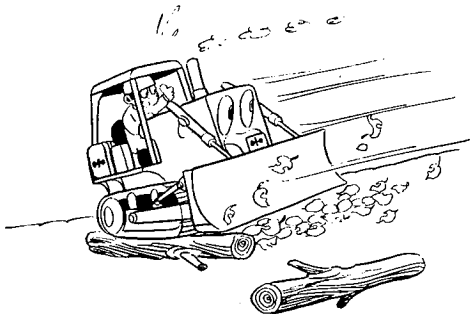


- When going down a slope, use the engine as a brake. If this is not enough to control the speed of the machine, use the steering brake as well. Never coast down a slope with the gear shift lever in "NEUTRAL".



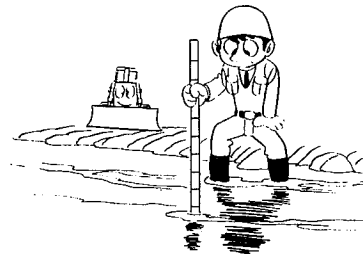
- As far as possible, avoid turning the machine on a slope. It may cause the machine to roll over or slip sideways.





- In forest areas, do not mount fallen trees or logs. Piles of leaves or branches are also very slippery, so proceed with caution.
- Before going up or down a slope, select a travel speed most suited to the slope. Do not change gear on the slope.
- If the engine stalls on a slope, first use the brake to stop the machine, then return the gear shift lever to “NEUTRAL” before starting the engine again.

- When operating in water or in muddy areas, remember the following points:

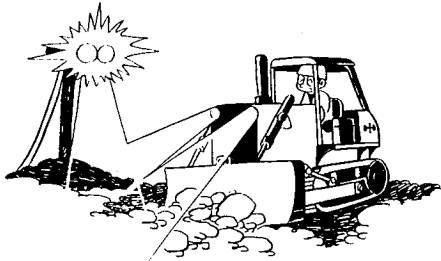


- When operating in water or when crossing shallows, first check the bed soil condition and the depth and flow speed of water, then proceed, taking care not to go beyond the permitted depth.

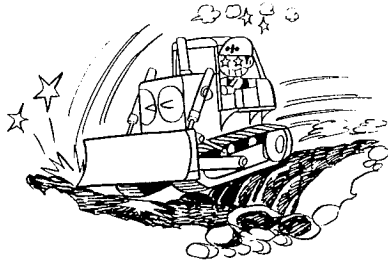


- If the machine gets stuck in mud, it is completely useless to increase the engine speed, causing the tracks to spin, or to rock the machine backwards and forwards. In such a case, raise the blade to reduce the load, and drive out slowly.

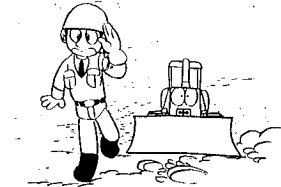
- When passing through a narrow space, be careful of the side and overhead clearances. Take special care not to touch any obstacles on either side or overhead. If necessary, have someone outside the machine call out instructions.
- When operating at night, remember the following points:



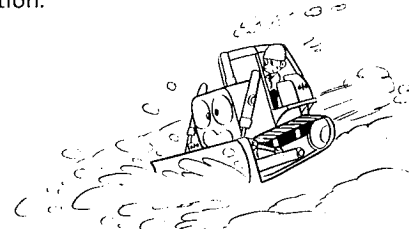
- Be sure to arrange an adequate lighting system.



- At night it is very easy to make mistakes in assuming the distance and height of objects and land.

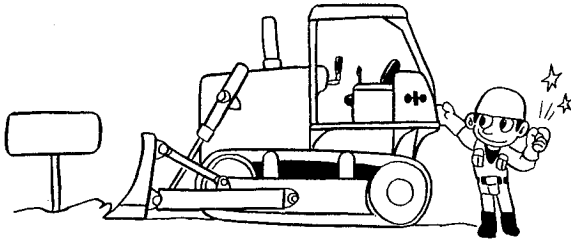


- When operating in fog, mist or smoke, where visibility is bad, be especially careful to confirm first whether operation is safe. When visibility drops below safety level, stop work and wait for the visibility to improve.
- When operating in snow, or cleaning snow, remember the following points:
  - Even slight slopes can cause unexpected side slipping, so in such places, operate with extreme caution.



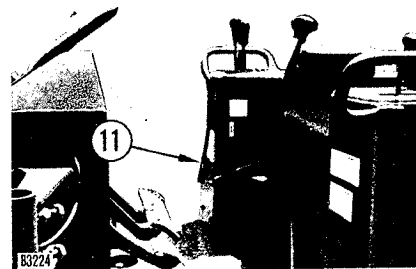
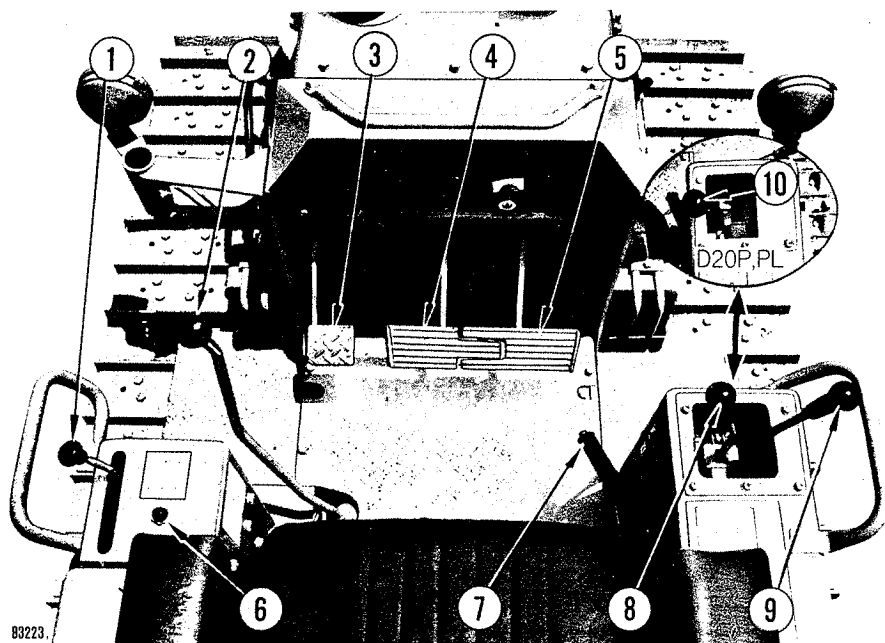
- Never use the steering brake to stop suddenly on slopes. Lowering the working equipment is a far more effective way of stopping.

## PARKING



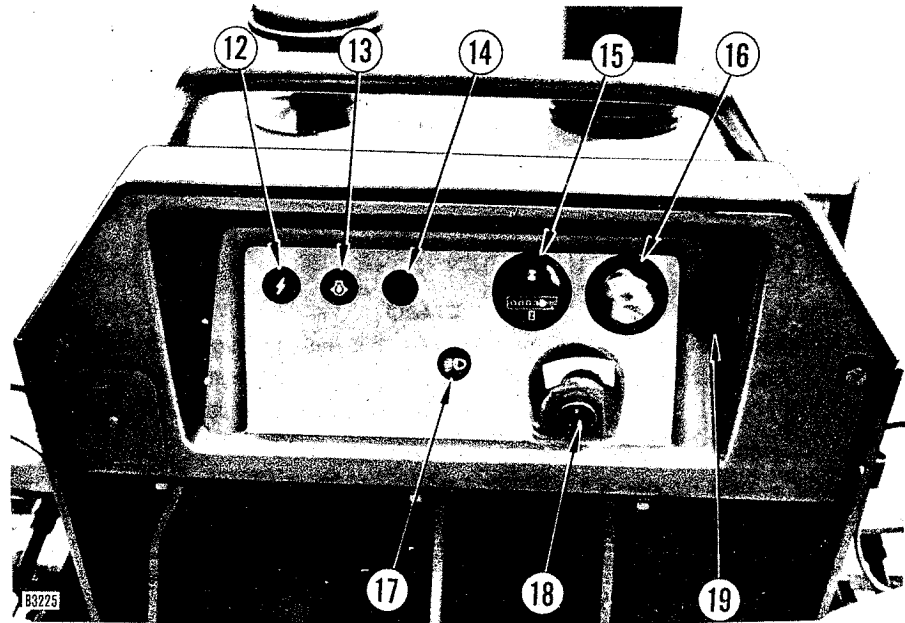
- When parking the machine, park it in a safe place outside the working area, or in the specified place. The following factors should be considered when choosing a parking place: it should be on flat, firm ground where there is no danger of rockfalls, landslides or floods. If the machine has to be parked on a slope, it should be parked facing directly up or down the slope, and chocks should be placed under the tracks. When the machine is facing downhill, lower the blade so that it cuts slightly into the ground to further increase the safety.
- When parking the machine, return the gear shift lever to "NEUTRAL", apply the brake lock, lower the blade and ripper to the ground, and put all safety levers in the "LOCK" position. Switch off the engine and remove the key.

# OPERATOR'S COMPARTMENT



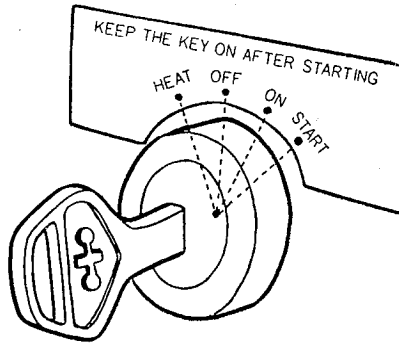
1. Fuel control lever
2. Gear shift lever
3. Main clutch pedal
4. Steering pedal (left)
5. Steering pedal (right)
6. Horn button
7. Parking brake lever
8. Blade control lever (D20A)  
(for lift and tilt control)
9. Blade control lever (D20A)  
(for angle control)
10. Blade control lever (D20P, PL)
11. Safety lever  
(for blade control lever)

- 12. Charge lamp
- 13. Engine oil pressure caution lamp
- 14. Heater signal
- 15. Service meter
- 16. Engine water temperature gauge
- 17. Lamp switch
- 18. Starting switch
- 19. Panel lamp



# INSTRUMENTS AND CONTROLS

## STARTING SWITCH



### ON

Charging and lamp circuits activate.  
Keep key at ON after starting.

### HEAT

At this position, the current will flow to the glow plug. Use to start the engine at low ambient temperatures. After heating, immediately turn the key two steps clockwise to START position.

- ★ Be sure to use the starting key to start the engine.

### OFF

Key insertion-withdrawal position. Power to all electrical systems remains shut off.

### START

As this key position, the starting motor will crank the engine. Release key immediately after starting.

## ENGINE WATER TEMPERATURE GAUGE



- When indicator is in the green range during operation, water temperature is normal.
- After engine start-up, warm up the engine until indicator moves into green range.
- If indicator moves from green into red range during operation, run the engine at low idling speed until indicator returns green range.

## ENGINE OIL CAUTION LAMP



- This lamp indicates pressure of engine lubricating oil.
- Oil pressure is normal when lamp is off during operation. If lamp is on, oil pressure is lower. Stop engine, determine the cause and take necessary corrective steps.

## CHARGE LAMP



- This lamp indicates the charge level of alternator.
- This lamp will come on when starting switch is turned ON. The charging is normal if lamp goes off as engine revolutions increase.

Occasionally check instruments for normal function during operation.

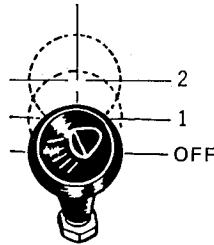
## HEATER SIGNAL



This signal is red-heated 15 to 20 seconds after the starting switch key turned to HEAT, thus indicating the glow plug is heated.

- ★ Preheating time will vary with ambient temperature. Stop preheating when heater signal has turned bright red hot.

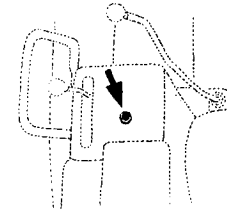
## LAMP SWITCH



With lamp switch in position 1, head lamp and panel lamp will light.

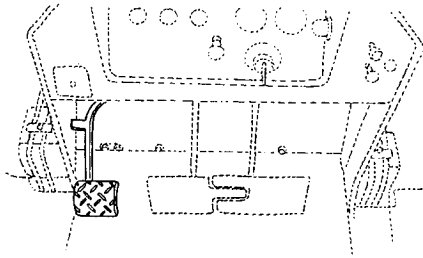
With lamp switch in position 2, rear lamp will also light.

## HORN BUTTON



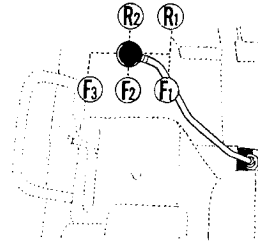
To sound the horn, push the button located in front of the LH arm rest.



**MAIN CLUTCH PEDAL**

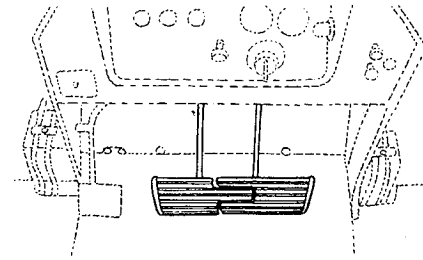
When the left pedal is depressed the main clutch is disengaged, enabling the machine to shift, start and stop.

**!** Do not place your foot on this pedal unnecessarily.

**GEAR SHIFT LEVER**

After stepping on the main clutch pedal, shift the gear shift lever to the desired speed position. If engagement of the gear is not smooth, return the lever, at once, to N position and repeat shifting by depressing the pedal again, with the clutch contracted slightly. Do not engage the gear forcedly.

When shifting is desired while machine is operating, stop machine first, then shift.

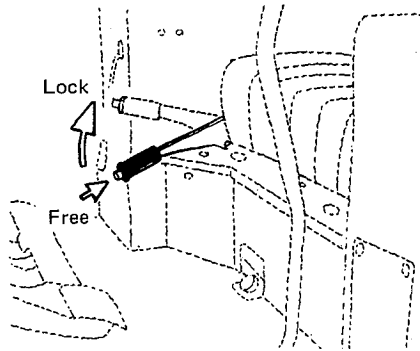
**STEERING PEDAL**

When pedal on side of desired direction of turning is depressed half way, machine will make a slow turn. When pedal is depressed fully, machine will make a pivot turn.

When central part of both pedals is depressed, the brakes will be activated.


**!** Do not place your foot on pedals unnecessarily.

## PARKING BRAKE LEVER

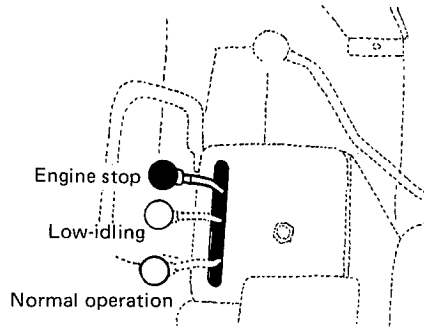


This steering brake locking device is used when parking machine. When central part of both steering pedals is depressed and the lock lever is placed in **LOCK**, both brakes are locked.

To release the brakes, depress the both pedals and place the lever in **FREE**.

 **Whenever machine is parked, lock steering pedals without fail.**

## FUEL CONTROL LEVER

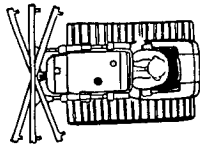
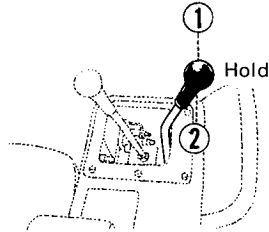


The lever operating force will become light when pulled from engine stop position. This position is the low idling position.

When stopping engine, place lever in engine stop position by pushing lever beyond the low idling position.

## BLADE CONTROL LEVER (D20A)

- For angle control



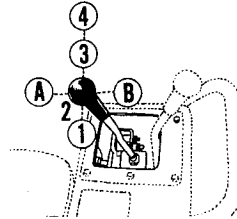
Left angle Right angle

Lever position

1. LEFT ANGLE
2. RIGHT ANGLE

Blade can be angled at 25° on both right and left sides.

- For lift and tilt control



Lever position

1. RAISE
2. HOLD
3. LOWER
4. FLOAT

Blade is stopped and held in this position.

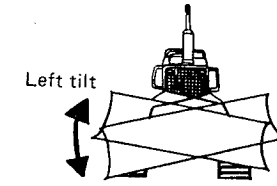
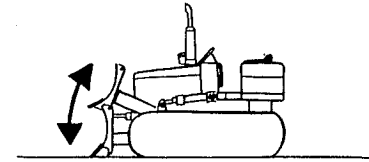
Blade can be freely raised and lowered. When releasing the lever, it will not return to HOLD position, so it must be returned by hand.

### A. LEFT TILT

The left end of the blade falls.

### B. RIGHT TILT

The right end of the blade falls.

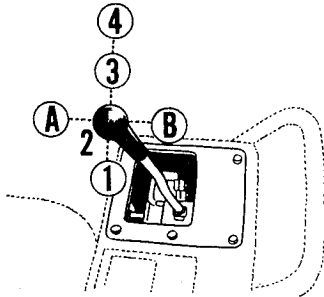


Right tilt

- In case of no angling, tilting of up to 240mm is possible, both left and right.
- In case of maximum angling of the blade, the extent of tilt is as follows.

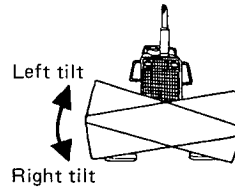
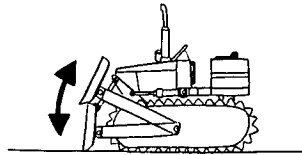
Blade condition	Tilt (mm)
Right angle, right tilt	225
Right angle, left tilt	255
Left angle, right tilt	265
Left angle, left tilt	215

## BLADE CONTROL LEVER (D20P, PL)



### Lever position

1. RAISE
2. HOLD  
Blade is stopped and held in this position.
3. LOWER
4. FLOAT  
Blade can be freely raised and lowered. When releasing the lever, it will not return to HOLD position, so it must be returned by hand.

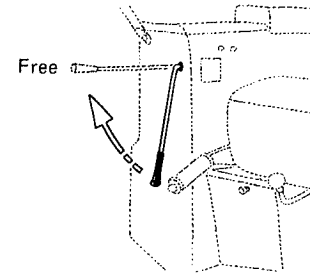


- A. LEFT TILT  
The left end of the blade falls.
- B. RIGHT TILT  
The right end of the blade falls.

Maximum tilt is as follows, both left and right.

- D20P: 300mm
- D20PL: 320mm

## SAFETY LEVER (for blade control lever)



This is the locking device of blade control lever.

**!** When leaving the machine parked, be sure to lower the blade and set the safety lever in a lock position.

## OPERATOR'S SEAT

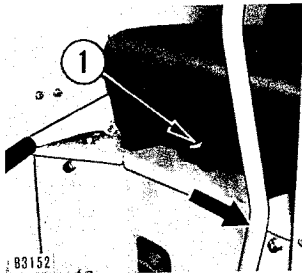
Set operator's seat as follows for maximum comfort.

### FORWARD AND BACKWARD ADJUSTMENT OF THE SEAT

Pull lever (1) in direction of arrow.

Set seat in desired position and release lever.

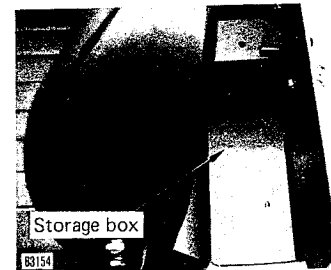
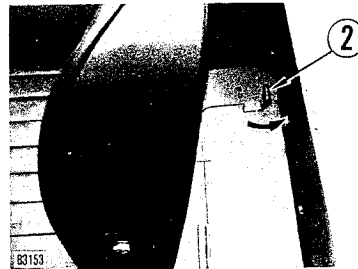
For adjustment, seat can be moved forward or backward **140 mm** (in **8** steps).



## STOWING THE TOOL BOX

The toolbox can be stowed under the operator's seat.

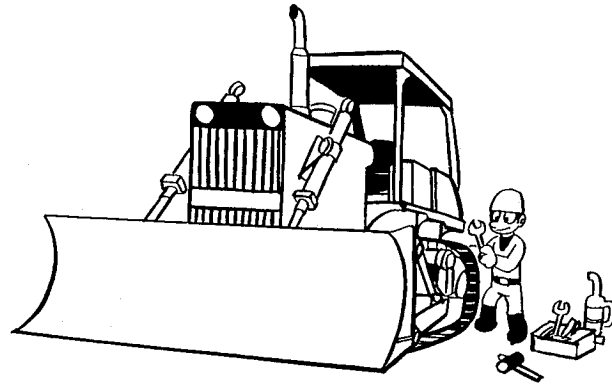
Pull the lever (1) in the arrow direction, move the operator's seat fully forward. Pull the lock (2), turn it in the direction of the arrow, and the lid of the storage box can be taken off.



## CHECK BEFORE STARTING


Pre-operation checks forestall machine trouble. Never neglect them.

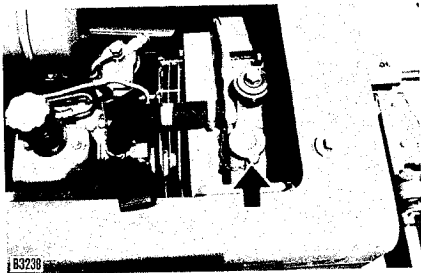
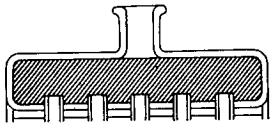
- a. Walk around the machine and check for any trace of oil or water leakage. Examine connections of high pressure hoses, hydraulic cylinders, final drive, radiator and floating seals with special attention.  
If any leakage is evident, check for the cause and repair. If difficulty is encountered, consult your Komatsu distributor.
- b. Check tightness of bolts and nuts, and retighten if required. Particular checks are required for mounting of air cleaner, muffler and track roller supports.
- c. Check for broken electric wirings, short circuits and loose terminals.



**d. CHECK AND REFILL COOLANT**

Remove radiator cap and check that coolant level is in the shaded area. If level is low, add water. If more water than normal is required to fill to the specified level, coolant is leaking somewhere. Immediately locate the leak and plug it.

 When removing the cap, release radiator pressure little by little by loosening cap slowly; then remove cap.

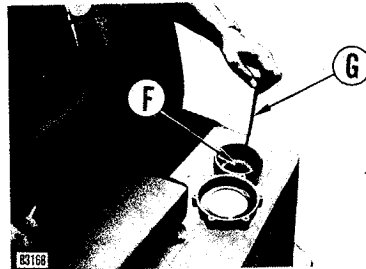
**e. CHECK FUEL LEVEL**

After removing cap, pull out fuel dipstick (G) and check fuel level.

After each operation, fill the fuel tank from oil filler (F). A clogged breather hole in cap may stop the fuel flow to the engine.

Check it from time to time and clean.

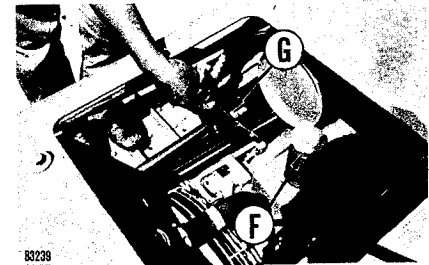
★ Breather hole is bored in cap.

**f. CHECK OIL LEVEL IN ENGINE OIL PAN.**

Use the dipstick (G) to check the oil level. If necessary, add oil at the oil filler (F).

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

Below 10°C: Use engine oil  
CLASS-CD SAE10W.

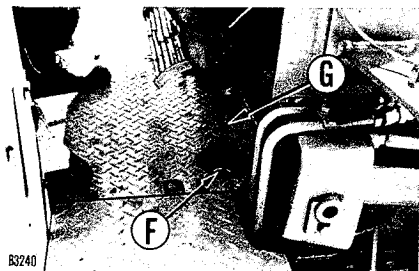


## CHECK BEFORE STARTING

### g. CHECK OIL LEVEL IN MAIN CLUTCH CASE

Use the dipstick (G) to check the oil level. If necessary, add oil at the oil filler (F).

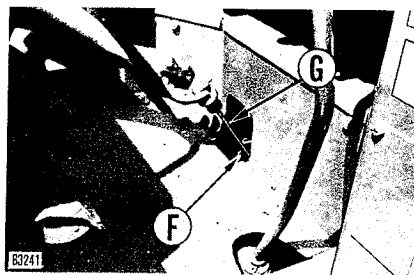
- ★ Use CLASS-CD SAE10W engine oil for all seasons.



### h. CHECK OIL LEVEL IN TRANSMISSION CASE (INCLUDING BEVEL GEAR CASE)

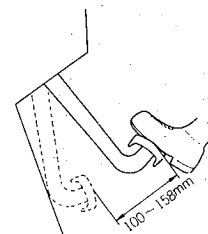
Use the dipstick (G) to check the oil level. If necessary, add oil at the oil filler (F).

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



### i. IS THE TRAVEL OF STEERING PEDALS ADEQUATE?

The standard travel is 100 to 158mm at the tip of pedal. If pedal travel exceeds 158mm or if pedal responds poorly, adjust pedal travel by referring to the ADJUSTMENT section.





**j. CHECK MAIN CLUTCH PEDAL FOR PROPER PLAY**

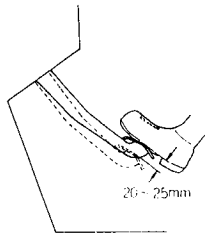
The standard play is 20 to 25mm at the tip of pedal. If the play is not standard, adjust it by referring to the ADJUSTMENT section.

- ★ Pedal play tends to increase as the main clutch case oil temperature rises.

**k. CHECK MAIN CLUTCH INERTIA BRAKE FOR PROPER EFFECT**

When depressing main clutch pedal fully with engine at full speed, clutch shaft must stop within 1.5 to 2.2 seconds. This is the standard.

If the time is other than standard, adjust it by referring to the ADJUSTMENT section.

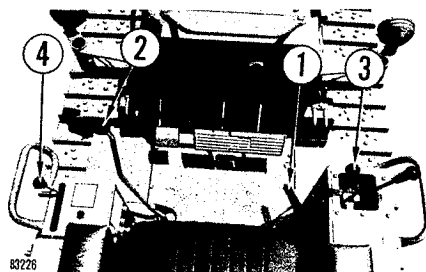


## OPERATING YOUR MACHINE

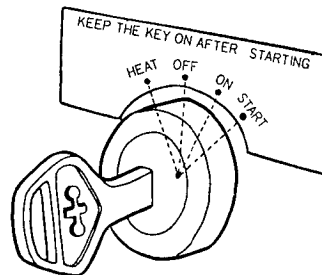
### ENGINE HANDLING

#### Before Starting

- Perform pre-operation checks referring to the section CHECK BEFORE STARTING.
- Is parking brake lever (1) in LOCK position?
- Is gear shift lever (2) in NEUTRAL position?
- Is blade control lever (3) locked?
- Move fuel control lever (4) to between LOW IDLING and NORMAL OPERATION.



#### Engine Starting



1. Turn starting key to START and start engine.
    - ★ Confirm that engine caution lamp goes out after starting engine.
- Release key, and key will return automatically to ON.

- ★ Do not leave key in START for more than 20 seconds.
- ★ If engine will not start, repeat the starting procedure after about 2 minutes.
- ★ Never place starting switch key in OFF position while engine is running. This will damage the alternator.
- ★ Even in warm weather, starting is easier after 20 seconds of preheating operation.
- ★ When engine is warm, starting is also possible while fuel control lever in low-idling position.
- ★ To start engine in cold weather, refer to COLD WEATHER OPERATION.

### Checks after Start-up

After starting the engine, carry out the followings.

1. Run engine at low idling speeds and make sure the caution lamp is off.
  2. Keep the engine idling with the fuel control lever placed in between **LOW IDLING** and **NORMAL OPERATION** for about 5 minutes.
  3. Run engine with light load until engine water temperature gauge indicates into green range.
    - ★ The procedure in 1, 2 and 3 is called "warm-up run".
  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.
- ★ If engine oil pressure caution lamp is on, the warm-up run should be continued until caution lamp is off.
  - ★ Avoid abrupt acceleration until warm-up run is completed.

### Stopping the Engine

1. Cool the engine by running it at low idling for about 5 minutes.
2. Place the fuel control lever in the engine stop position to stop engine.
3. Return starting switch key to OFF and remove key.
  - ★ If engine is stopped abruptly before it cools down, engine life may be greatly shortened.  
Never stop engine abruptly except in case of emergency.

## OPERATION OF MACHINE

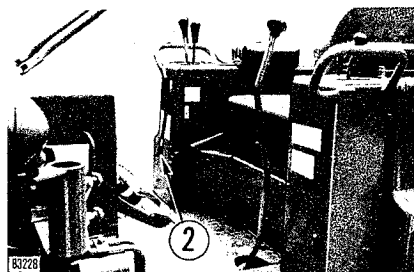
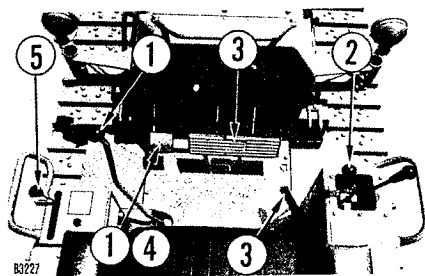
### Starting Machine Travel

1. Depress the main clutch pedal.  
Place the gear shift lever in a desired speed position.
2. Raise the blade at a height of 400 to 500mm off the ground.
3. Depress central part of both steering pedals, place parking brake lever FREE and release the left foot.

4. Gradually release your right foot from the main clutch pedal, and the machine will start.
5. By pulling the fuel control lever, increase the engine speed.

- ★ When starting machine on a steep uphill grade, depress the central part of both steering pedals and main clutch pedal, place gear shift lever in 1st speed with engine full speed.

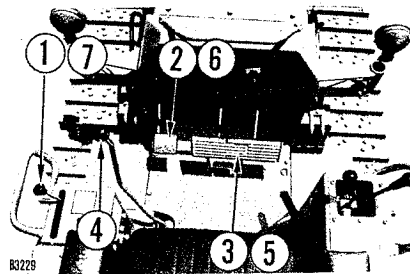
Release main clutch pedal gradually, and machine will start slowly or shoe-slip. Then release steering pedals and main clutch pedal completely.



### Speed Change or Forward-Reverse Change

Depress main clutch pedal and central part of steering pedals to stop the machine, and place gear shift lever in a desired speed position.

1. Decrease engine speed by fuel control lever.
2. First, step on the main clutch pedal to disengage the clutch.
3. Depress central part of both steering pedals.
4. Place the gear shift lever in a desired speed position.
5. Release the steering pedals.
6. Release main clutch pedal to start machine.
7. By pulling the fuel control lever, increase the engine speed.



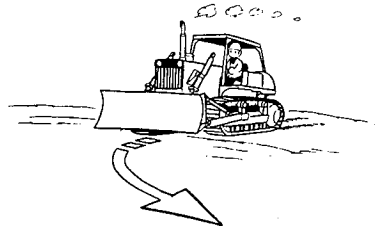
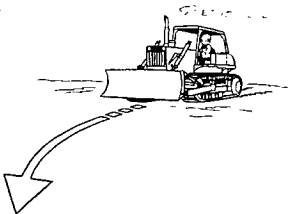
## OPERATING YOUR MACHINE

### Turning

To turn while traveling, depress the steering pedal on the side to which you intend to turn.

In addition

- When the steering pedal is depressed halfway, the steering clutch is disengaged and the machine will turn gently.
- When the steering pedal is depressed fully, steering brake works as well as steering clutch is disengaged.

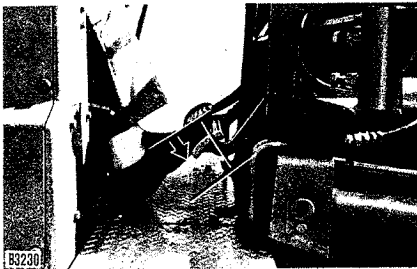
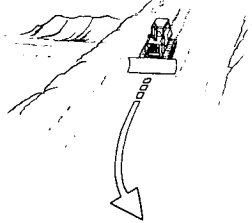


### Turning While Descending a Slope

- ★ When descending a slope steep enough to let the machine to coast by its own weight, or when towing a vehicle, the machine will sometimes turn in the opposite direction to the steering pedal.

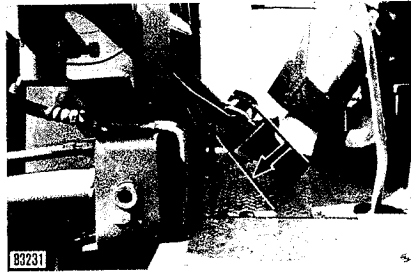
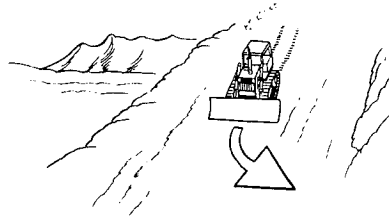
If you want to turn gradually on such a steep slope, depress the opposite side steering pedal "half-way".

e.g. If you want to turn to the left gradually, depress R.H. steering pedal "half-way".



If you need to make pivot turn on such a steep slope, "fully" depress the steering pedal on the side which you want to turn.

e.g. If you want to make pivot turn to the left, depress L.H. steering pedal "fully".




**!** Avoid as much as possible turning the machine on a slope. The machine will tend to slip sideways. Particular care should be taken on soft or clay land.

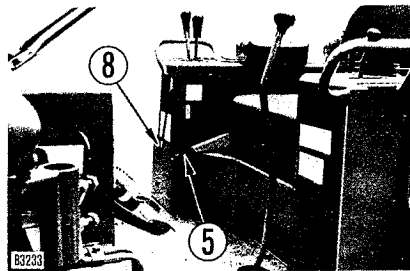
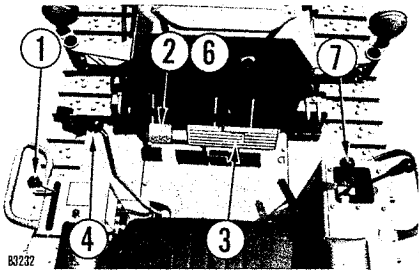
## OPERATING YOUR MACHINE

### Stopping the Machine

1. Lower engine speed by operating fuel control lever.
2. Depress main clutch pedal.
3. Apply brakes by depressing central part of both steering pedals.
4. Then, shift the gear shift lever to N position.
5. Using the parking brake lever, lock the steering brake pedal.
6. Release the main clutch pedal.
7. Lower blade to ground while keeping it horizontal.
8. Lock blade control lever with safety lever.

- ★ For stopping engine, refer to section "Stopping the Engine".

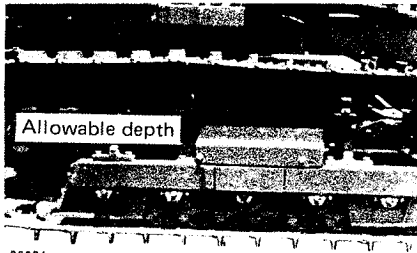
 **Stop machine on flat, stable ground. Do not stop in a dangerous place.**





**When working in water or in muddy areas, observe the following instructions:**

- Before beginning work, securely tighten each drain plug.
- Do not operate machine in such a depth that carrier rollers are submerged. Further, be careful so that the cooling fan will not come in contact with the water.
- During suspension of work or after completion of work, remove mud from machine exteriors and check engine oil pan, main clutch case, final drive case, hydraulic system, etc. for:
  - Oil leakage
  - Rise in oil levelAlso check for any water mixed into oil. If necessary, remove drain plugs and check. Pay particular attention to the final drive case.



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# 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  $-10^{\circ}\text{C}$ .  
Coolant capacity: 13ℓ


- Add antifreeze in the cooling water  
When the atmospheric temperature drops lower than  $0^{\circ}\text{C}$  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.

### ★ Cautions for using antifreeze

- 1) Permanent type antifreeze shall be used.
- 2) Soft water (ex: city water) shall be used as mixing water.
- 3) Cooling systems must be thoroughly flushed before filling with antifreeze mixture.
- 4) When the climate becomes warmer and antifreeze is not needed, replace with soft water (ex: city water; after thoroughly cleaning the cooling system).

Mixing rate of water and antifreeze

Min. atmospheric temperature ( $^{\circ}\text{C}$ )	-5	-10	-15	-20	-25
Amount of antifreeze (ℓ)	3.0	3.9	4.7	5.3	6.0
Amount of water (ℓ)	10.0	9.1	8.3	7.7	7.0

 Do not expose antifreeze to ignition sources. It 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 over 75% 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

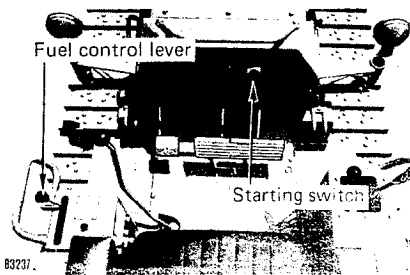
★ When electrolyte level is low, add distilled water in the morning before work instead of after the day's work. This is to prevent fluid from freezing at night.

★ 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 WITH AID OF AIR INTAKE PREHEATER

For inspection before and after starting engine, refer to the section **ENGINE HANDLING** in this Manual.



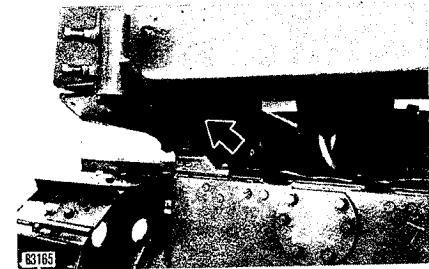
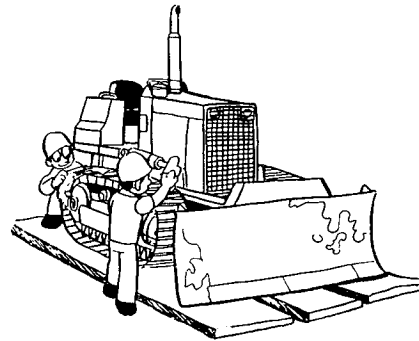
### Starting

1. Pull out fuel control lever about 1/2 of its travel.
  2. Place key in HEAT (Preheating) position to heat heater signal red hot for approx. 1 minute at atmospheric temperature of 15 to 0° C, or 2 minutes at 0 to -20° C.
  3. Place key in START position to start engine.
  4. When engine is started, promptly turn key to HEAT (Preheating) position.
  5. When engine begins normal operation, promptly return key to ON position and set fuel control lever in low-idling position.
- ★ If engine fails to start, repeat steps 2 and 3 after about 2 minutes.
  - ★ Operate engine at low speed under no load until it runs smoothly. When engine has started smooth operation, warm up engine under no or light load for 5 minutes. Run engine in low speeds at first and gradually increase load.

## CAUTION AFTER COMPLETION OF WORK

1) Mud and water on the machine body should be completely removed.  
Park the machine on concrete or hard ground. If this is impossible, park the machine on wooden boards. This will prevent the accessories from freezing or the track and undercarriage from freezing to the ground thereby preventing vehicle movement the next morning. Particular attention should be given to water drops collected on the surface of the hydraulic cylinder piston rods. Such droplets must be fully wiped off because if water is frozen to the rod when the cylinder is utilized, the cylinder oil seals may be damaged.

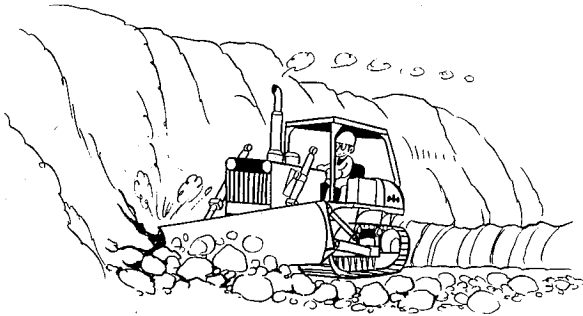
2) Drain water collected in fuel filters and fuel tank to prevent its freezing during the night and restricting the flow of fuel the following day.



## BULLDOZER'S WORK

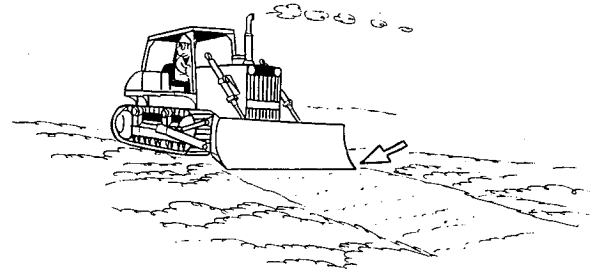
### CUTTING INTO HARD OR FROZEN GROUND OR DITCHING

For digging and ditch excavation of hard or frozen ground, tilt the blade. Even hard ground can be dug effectively by a tilted or angled blade. If the ground is harder, use a ripper attachment for better efficiency.



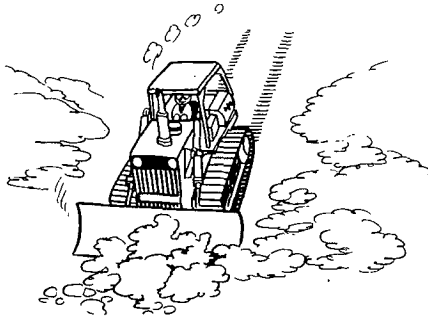
### SMOOTHING

Uneven ground surfaces remaining after digging can be levelled off by fine operation of blade. The basic method is to operate the machine at low speeds with the blade fully loaded with soil and sand. A flat finished surface is also possible by slowly backing the machine with the blade "floating" so it is dragged across the surface. However, avoid this on rocky or stony ground, as it may damage the blade.

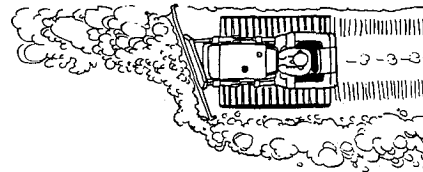


## DOZING

A bulldozer digs and transports dirt in a forward direction. Distance per trip should preferably be 70 meters at maximum. If longer, use of a scraper is economical. Slope excavation can always be most effectively carried out by proceeding from the top downward.



When dozing toward one side only, operate with angled blade (angledozer only).



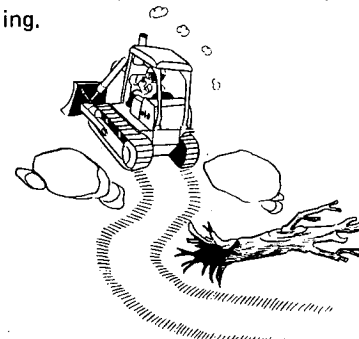
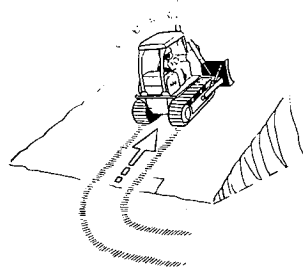
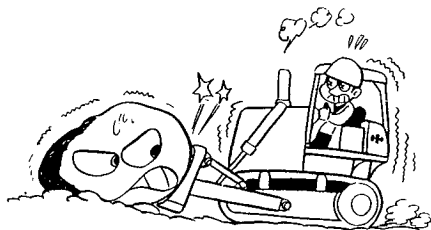
## TIPS FOR LONGER UNDERCARRIAGE LIFE

Undercarriage life greatly varies depending on operation method, inspection and maintenance. For most efficient operation, keep the following point in mind.

(For inspection and adjustment procedures, refer to the section ADJUSTMENT)

### OPERATION METHOD

- Select the track shoe that best suits the type of soil to be encountered in service.
- Do not slip shoe during operation. If shoe slips, reduce load until slipping stops.
- Avoid sudden starts, acceleration or stops, unnecessarily high speeds and sharp turns.
- On a slope, operate the machine parallel to the inclination of the slope. Do not operate across the slope. Also when on a slope, the machine should face toward the top of the slope.
- Always operate machine in a straight line whenever possible. When making turns, be careful not to allow the machine to stay to one side, so operation in both turning directions can be done properly. Make turns with the largest possible radius.
- Prior to operation, clear boulders and obstacles to prevent machine from riding over them while operating.





## REVERSING AND REPLACEMENT OF CUTTING EDGE AND END BIT

Reverse the cutting edge before it is worn out to the blade end. If, due to neglect to reverse or replace, it has been worn out up to the fitting surface, repair the fitting surface and then reverse or replace.

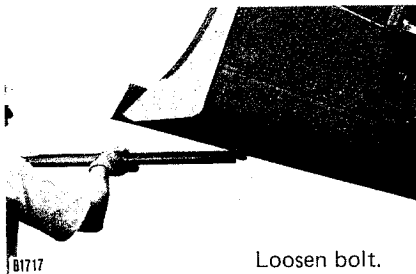
### METHOD OF REVERSING AND REPLACEMENT

1. Raise the blade to a proper height and apply blocks to the frame so as to prevent fall of the blade.
  2. Remove the cutting edge and the end bit and clean the fitting surface.
  3. Reverse the cutting edge and the end bit when worn out.
- ★ If the cutting edges and end bits on both sides are worn out, replace with new one.

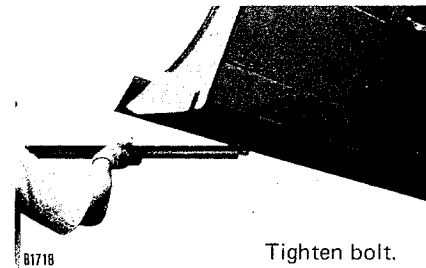
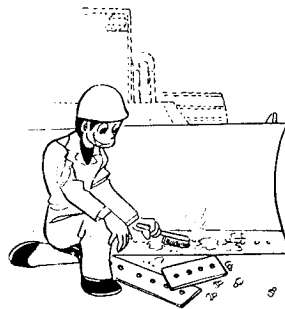
 Nut tightening torque:

**11 ~ 15 kg.m**

- ★ After several hours of running, retighten the fitting bolts.



Loosen bolt.




Tighten bolt.

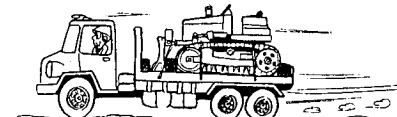
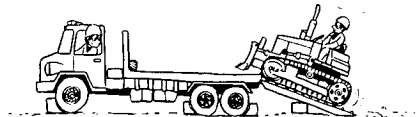
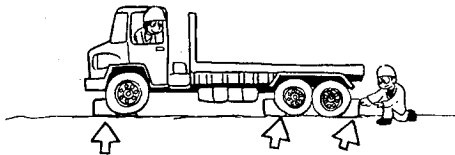
# TRANSPORTATION

When transporting machine, observe traffic laws and regulations. When loading and unloading, follow procedures given below and use care for maximum safety.

1. Positively apply brakes to trailer and secure tires with wooden blocks. Hold boards in place in such a manner that trailer and machine are aligned.
  - ★ Use boards which have enough width, length and thickness to safely load and unload machine.
2. Steer machine to boards and slowly drive on boards for loading and unloading.

 Never change travel direction on boards. When changing directions, back up off boards and change directions on ground or trailer.

3. Load machine at a suitable place on trailer. To prevent machine from moving during transportation, hold it securely in place by applying square timber to front and rear of track shoe and by fastening machine with chain or wire rope. Secure machine with special care to prevent shifting sideways.



4. Upon unloading, keep various control levers in the following places:

- Fuel control lever  
    in low-idling position
- Gear shift lever       neutral
- Blade control lever    hold

Take off the starting key.



If the blade end protrudes from the trailer, angle the blade.

- ★ Determine the transportation route, taking into consideration width of road, clearance and weight.

# Maintenance

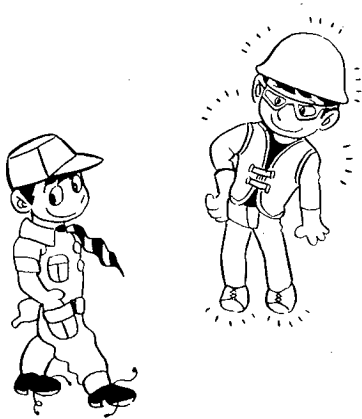
## PERIODIC MAINTENANCE

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

All figures by the hour shown 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.

## PRECAUTIONS FOR MAINTENANCE

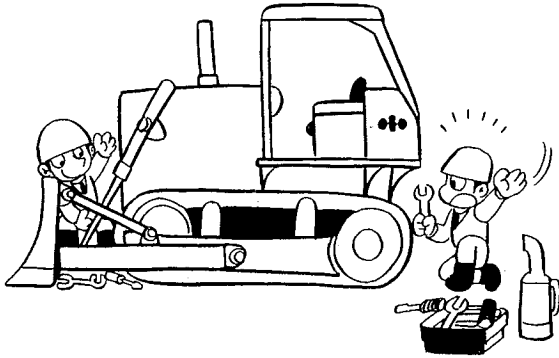
### GENERAL



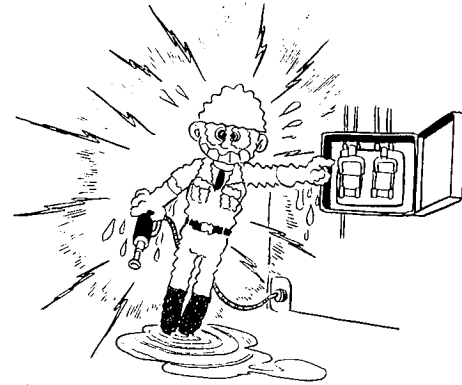
- Wear well-fitting helmet, safety shoes and working clothes. When drilling, grinding or hammering, always wear protective goggles.



- Fuel or oil are dangerous substances. Never handle fuel, oil, grease or oily clothes in places where there is any fire or flame. As preparation in case of fire, always know the location and directions for use of fire extinguishers and other fire-fighting equipment.



- When working with others, choose a group leader and work according to his instructions. Do not perform any maintenance beyond the agreed work.



- Do not handle electrical equipment while wearing wet gloves, or in wet places, as this can cause electric shock.
- During maintenance do not allow any unauthorized person to stand near the machine.

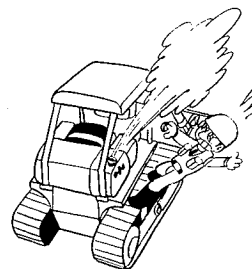
## PRECAUTIONS FOR MAINTENANCE



- Exhaust gas is dangerous. When working inside, be particularly careful to have good ventilation.



- Unless you have special instructions to the contrary, maintenance should always be carried out with the engine stopped. If maintenance is carried out with the engine running, there must be two men present: one sitting in the operator's seat and the other one performing the maintenance. In such a case, never touch any moving part.



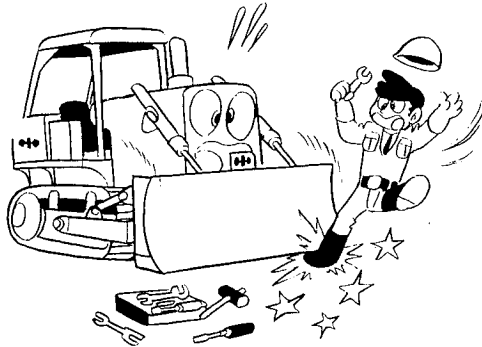
- Always remember that the hydraulic oil circuit is under pressure. When feeding or draining the oil or carrying out inspection and maintenance, release the pressure first.

The procedure for releasing the hydraulic pressure is as follows: lower the blade and ripper to the ground, and stop the engine; move the control levers to each position two or three times and then slowly loosen the oil filler cap.

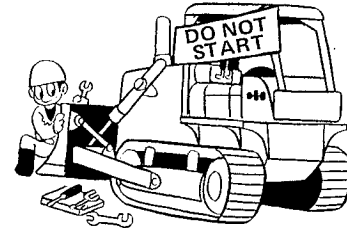
- Always use Komatsu genuine parts for replacement.
- Always use the grades of grease and oil recommended by Komatsu. Choose the viscosity specified for the ambient temperature.
- Always use pure oil or grease, and be sure to use clean containers.
- When checking or changing the oil, do it in a place free of dust, and prevent any dirt from getting into the oil.



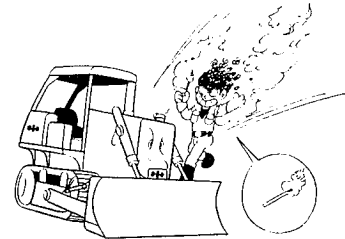
DURING MAINTENANCE



- Park the machine on firm, flat ground. Lower the blade and ripper to the ground and stop the engine. Return the gear shift lever to "NEUTRAL", apply the brake lock and set each control lever to "LOCK". When maintenance has to be carried out with the blade and ripper raised, they must be securely supported by blocks.
- Thoroughly wash the machine. In particular, be careful to clean the filler caps, grease fittings and the area around the dipsticks. Be careful not to let any dirt or dust into the system.



- Hang a caution sign in the operator's compartment (for example "Do not start" or "Maintenance in progress"). This will prevent anyone from starting or moving the machine by mistake.

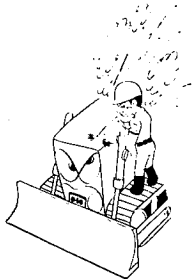


- Flames should never be used instead of lamps. Never use a naked flame to check leaks or the level of oil, fuel, anti-freeze or electrolyte.
- Immediately remove any oil or grease on the floor of the operator's compartment, or on the handrail. It is very dangerous if someone slips while on the machine.

## PRECAUTIONS FOR MAINTENANCE

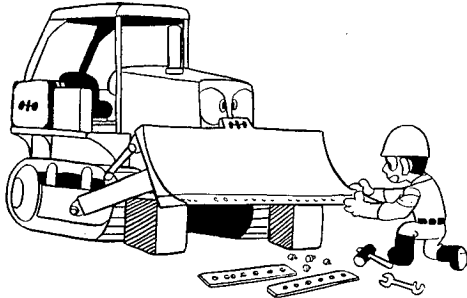


- When check an open gear case there is a risk of dropping things in. Before removing the covers to inspect such cases, empty everything from your pockets. Be particularly careful to remove wrenches and nuts.
- Before draining the oil, warm up it to a temperature of 30 to 40° C.



- Be particularly careful when removing the radiator cap or the hydraulic oil tank filler cap. If this is done immediately after using the machine, there is a danger that boiling water or oil may spurt out.

- After replacing oil, filter element or strainer, bleed the air from the circuit.
- When the strainer is located in the oil filler, the strainer must not be removed while adding oil.
- When adding oil or checking the oil level, check that the oil is at the correct level.
- After greasing up, always wipe off the old grease that was forced out.
- When changing the oil or filter, check the drained oil and filter for any signs of excessive metal particles or other foreign materials.
- When removing parts containing O-rings, gaskets or seals, clean the mounting surface and replace with new sealing parts.
- When the tracks are removed, never put your fingers between the shoes.



- When handling the cutting edges, always wear gloves.

When carrying out other difficult maintenance works, carrying them out carelessly can cause unexpected accidents. If you consider the maintenance is too difficult, always request the Komatsu distributor to carry out it.



- Special measuring apparatus is needed for testing hydraulic pressure.

# MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
<b>CHECK BEFORE STARTING</b>			
a	Oil and water leak	Check	30
b	Nuts and bolts	Check and retighten	30
c	Electric wiring	Check and retighten	30
d	Coolant	Check and supply	31
e	Fuel	Check and supply	31
f	Engine oil pan	Check and supply oil	31
g	Main clutch case	Check and supply oil	32
h	Transmission case (incl. bevel gear case)	Check and supply oil	32
i	Steering pedals	Check travel	32
j	Main clutch pedal	Check play	33
k	Main clutch inertia brake	Check effect	33
<b>EVERY 50 HOURS SERVICE</b>			
a	Fuel tank	Drain water and sediment	64

★ At the first 250 hours, change all oil, replace engine oil and hydraulic filter elements, and adjust engine valve clearance.

No.	ITEM	SERVICE	PAGE
<b>EVERY 250 HOURS SERVICE</b>			
a	Check oil level		65
-1	Final drive case	Check oil level	65
-2	Hydraulic tank	Check oil level	65
b	Greasing		66
-1	Lift cylinder bottom shaft	Greasing 2 points	66
-2	Lift cylinder head shaft	Greasing 2 points	66
-3	Angle cylinder bottom shaft (D20A)	Greasing 2 points	66
-4	Angle cylinder head shaft (D20A)	Greasing 2 points	66
-5	Brace shaft (D20A)	Greasing 2 points	66
-6	Tilt cylinder head shaft	Greasing 1 point	66
-7	Lift lever pin (D20P, PL)	Greasing 2 points	67
-8	Lift rod pin (D20P, PL)	Greasing 4 points	67
-9	Tilt brace shaft (D20P, PL)	Greasing 2 points	67
-10	Center brace shaft (D20P, PL)	Greasing 2 points	67

MAINTENANCE TABLE

No..	ITEM	SERVICE	PAGE
<b>(EVERY 250 HOURS SERVICE)</b>			
-11	Main clutch control (D20P, PL)	Greasing 3 points	67
c	Track shoe bolts	Check and retighten	67
d	Crankcase breather	Clean element	68
e	Battery electrolyte level	Check	68
f	Fan belt tension	Adjust	69
g	Air cleaner element	Check, clean and if necessary, replace element.	70
<b>EVERY 500 HOURS SERVICE</b>			
a	Engine oil pan	Change oil and replace element	72
b	Fuel filter	Replace element	73
c	Radiator fins	Check and clean	74
d	Main clutch case and transmission case	Clean breathers	74

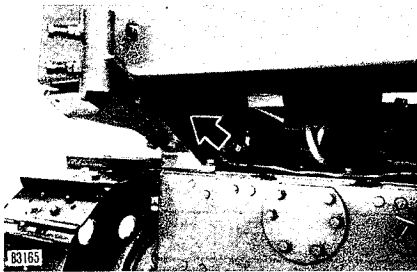
No.	ITEM	SERVICE	PAGE
<b>EVERY 1000 HOURS SERVICE</b>			
a	Main clutch case	Change oil and clean strainer	75
b	Transmission case (incl. bevel gear case)	Change oil	76
c	Hydraulic tank	Change oil and replace filter element	76
d	Final drive case	Change oil	78
e	Undercarriage components	Check lubricating condition	78
<b>EVERY 2000 HOURS SERVICE</b>			
a	Engine valve clearance	Check	79
b	Alternator and starting motor	Check	79
<b>WHEN REQUIRED</b>			
a	Coolant	Change twice a year	80
b	Track	Check tension	81

EVERY 50 HOURS SERVICE

## EVERY 50 HOURS SERVICE

### a. FUEL TANK

Loosen the cock on the bottom of the tank so that the precipitation and mixed water will be drained in accompaniment with fuel.





## EVERY 250 HOURS SERVICE

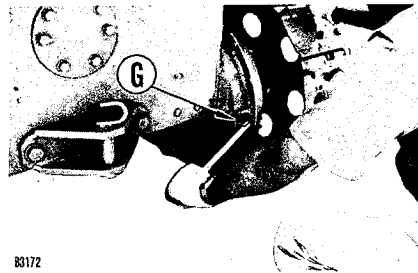
### a. CHECK AND CORRECT OIL LEVEL

#### 1. Final drive case

Remove plug (G) and check whether final drive case is filled with oil to lower edge of plug hole. If oil level is below this point, refill with engine oil through plug hole.

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

Below 10°C: Use engine oil CLASS-CD SAE10W.

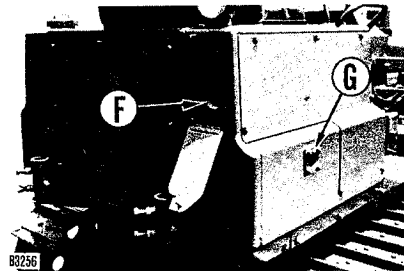


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#### 2. Hydraulic tank

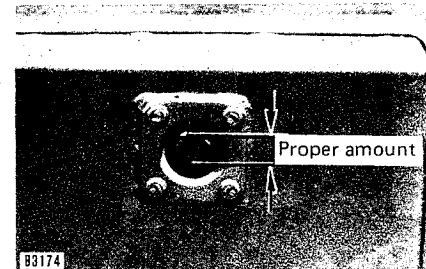
Lower blade to ground in horizontal position, stop engine and wait for about 5 minutes before checking oil level. If oil level is not between top and bottom of red circle in sight gauge (G), refill tank with engine oil through oil filler (F). The oil filler (F) is behind the battery box rear cover.

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



83256

#### Sight gauge



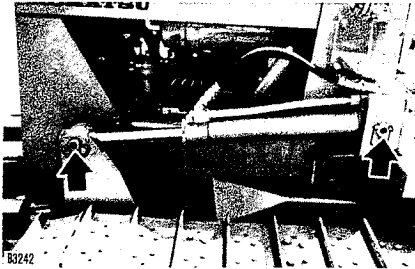
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EVERY 250 HOURS SERVICE

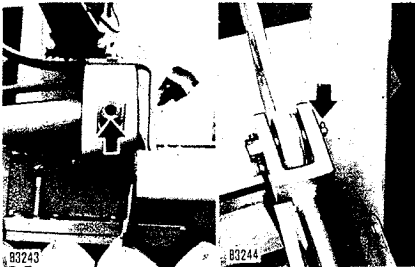
**b. LUBRICATE THE  
FOLLOWING PARTS**

Grease each point indicated by  
arrows.

- 1. Lift cylinder bottom shaft (2 points)
- 2. Lift cylinder head shaft (2 points)  
(D20A)

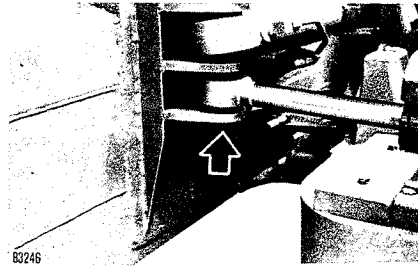
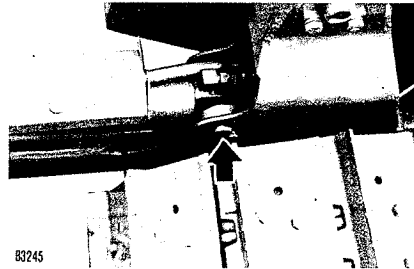


(D20P, PL)

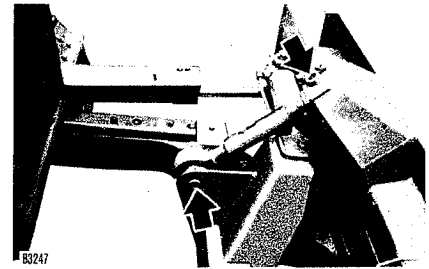


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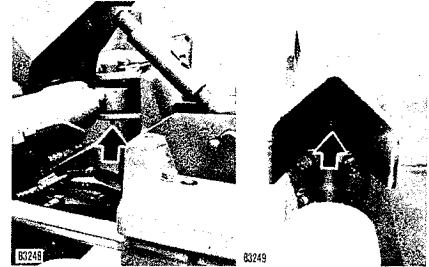
- 3. Angle cylinder bottom shaft(D20A)  
(2 points)
- 4. Angle cylinder head shaft (D20A)  
(2 points)



- 5. Brace shaft (D20A) (2 points)

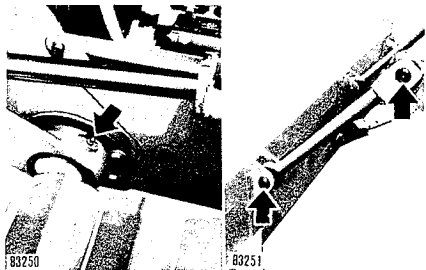


- 6. Tilt cylinder head shaft (1 point)  
(D20A) (D20P,PL)

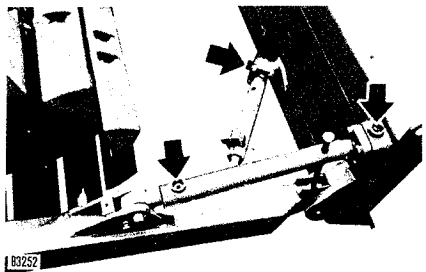


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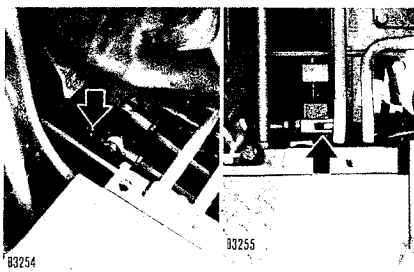
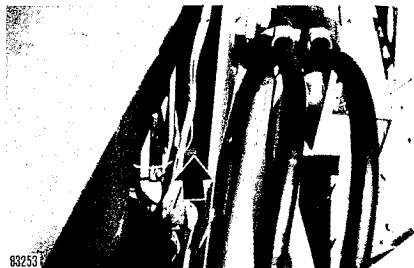
- 7. Lift lever pin (D20P,PL) (2 points)
- 8. Lift rod pin (D20P,PL) (4 points)



- 9. Tilt brace shaft (D20P, PL) (2 points)
- 10. Center brace shaft (D20P, PL) (2 points)




- 11. Main clutch control (3 points)



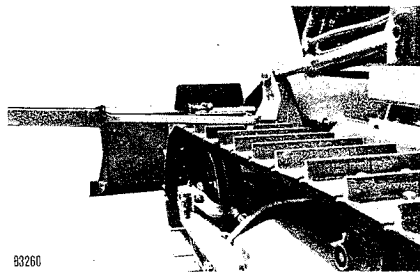
**c. TRACK SHOE BOLTS**

Shoe bolts which secure track shoes to links will break if used in a loosened state. Tighten all loosened bolts.

 kgm Tightening torque

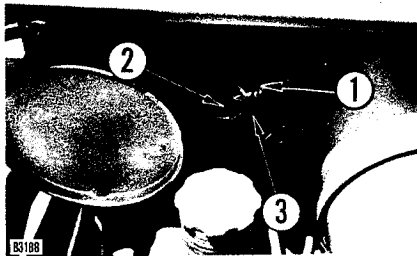
D20A: 12 ± 2kg.m

D20P, PL: 14 ± 2kg.m



**d. CRANKCASE BREATHER ELEMENT**

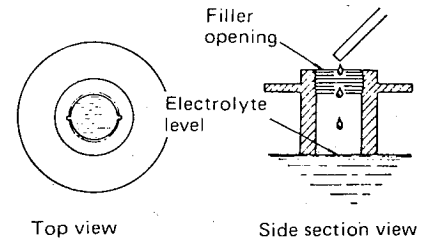
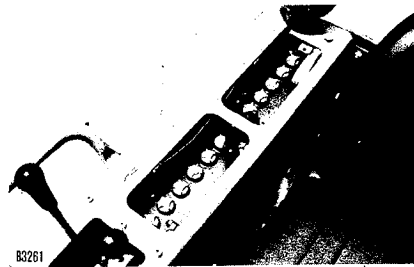
This element is installed in upper part of cylinder head cover. To clean, loosen clamps (1) and (3), remove cover (2) and breather. Rinse breather in diesel fuel and reinstall it.



**e. ELECTROLYTE LEVEL IN BATTERY**

If the electrolyte level is lower than the prescribed level (10 to 12mm above the plate), supply distilled water. Should any of the acid be spilt, have it replenished by the nearest battery shop with acid of the correct specific gravity.

When inspecting electrolyte level, clean the air hole of the battery cap.  
★ Never use metal funnel for electrolyte supply.

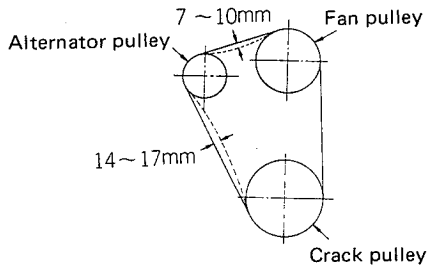
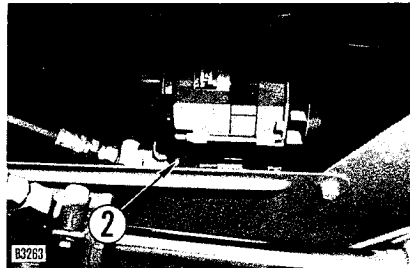
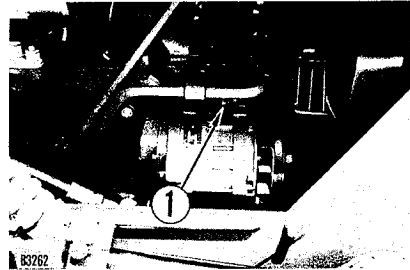


**f. FAN BELT TENSION**

Push the position indicated by the arrow with your finger (approximately 6kg).

The adjustment is made by loosening the nuts (1) and (2), and shifting the position of the alternator.

- ★ Each pulley should be checked as to breakage, abrasion of V groove, and abrasion of V belt. In particular, check with care that V belt is not touching the bottom of V groove.
- ★ In case the belt is so elongated that there remains no margin for adjustment, or in case cut or crank is found on the belt, you should replace the belt by new one at the same time.
- ★ When adjusting the V-belt, do not attempt to push the alternator stator core directly with a bar or the like, but use a wood pad to prevent damage to the core.

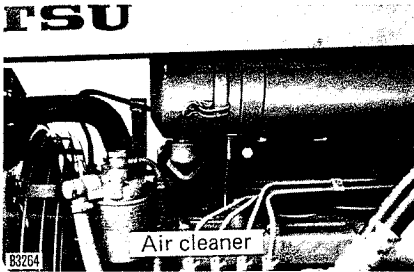


### g. AIR CLEANER ELEMENTS

#### Cleaning and inspecting the outer element

1. Remove the cover and remove the outer element.
2. Clean the air cleaner body interior and the removed cover.
3. Clean and inspect the element. (See the next page for cleaning procedure.)

Install the cleaned element.



- ★ Replace the outer element which has been cleaned 6 times repeatedly or used throughout a year. Replace the inner element at the same time.
- ★ Replace the outer element when smoky exhaust with lack of engine output due to insufficient intake air flow is noted even after cleaning the element.
- ★ Check inner element mounting nuts for looseness and, if necessary, retighten.

#### Replacing the inner element

1. First remove the cover and the outer element, and then remove the inner element.
  2. Cover the air outlet port.
  3. Clean the air cleaner body interior. Remove the cover from the air inlet port.
  4. Fit a new inner element to the connector.
  5. Install a new outer element and the cover.
- ★ Do not attempt to reinstall a cleaned inner element.



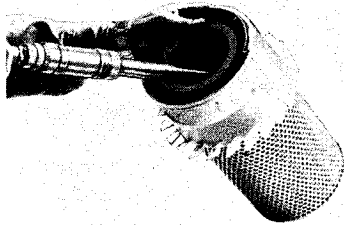
Do not remove the air cleaner with the engine running.

## Cleaning outer element

### With compressed air

Direct dry compressed air (less than  $7\text{kg}/\text{cm}^2$ ) to element from inside along its folds, then direct it from outside along its folds and again from inside, and check element.

**!** When using compressed air, wear safety glasses and other things required to maintain the safety.



B0599

The following methods requires spare parts.

### With water

Dash city water (less than  $3\text{kg}/\text{cm}^2$ ) on element from inside along folds, then from outside and again from inside. Dry and check it.

### With cleaning agent

For removing oils and fats as well as carbon etc. attached on the element, the element may be cleaned in lukewarm solution of mild detergent, then rinsed in clean water and let to drip dry.

- ★ Drying can be speeded up by blowing dried compressed air (less than  $7\text{kg}/\text{cm}^2$ ) from the inside to the outside of the element.
- Never attempt to heat the element.
- ★ Using hot water (about  $40^\circ\text{C}$ ) instead of soapy water may also be effective.

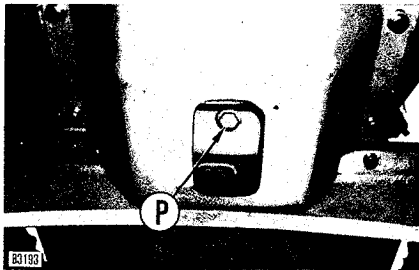
- ★ If small holes or thinner parts are found on element when it is checked with an electric bulb after cleaning and drying, replace the element.
- ★ If element is usable, rap it and store it in dry place.
- ★ When cleaning element, do not hit it nor beat it against something.
- ★ Do not use element whose folds or gasket or seal is damaged.



## EVERY 500 HOURS SERVICE

### a. ENGINE OIL PAN

1. After removing cover from underside of machine, 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 tool. Clean dust and unfiltered oil collected on filter base. Install a new element after applying engine oil (or a thin coat of grease) on packing surface.

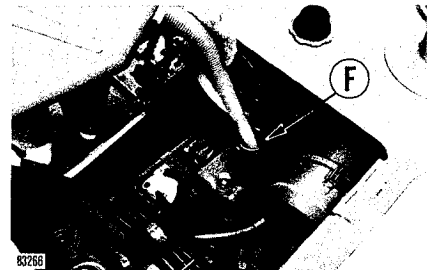


To install element, bring its packing surface into contact with sealing surface of filter base and then tighten element  $2/3$  turn by hand (Be careful not to over-tighten.).

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 to see that it is even with the H marking on the level gauge.



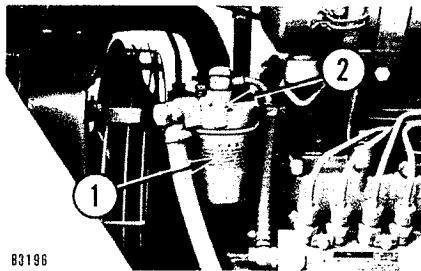
- ★ Maintenance for every 50 and 250 hours should be carried out at same time.
- ★ Above 0°C: Use engine oil CLASS-CD SAE30.  
Below 10°C: Use engine oil CLASS-CD SAE10W.
- ★ Oil capacity: 9.5ℓ
- ★ Use a genuine Komatsu cartridge.
- ★ Replace cartridge element every 6 months irrespective of number of operating hours.
- ★ Check the oil level before daily operation of the machine, as it takes as long as about 30 minutes after stopping the engine to allow the oil spread over the various engine inner parts to drop into and accumulate in the engine oil pan.





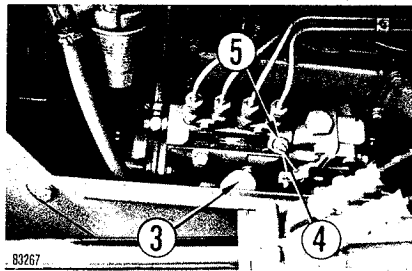
**b. FUEL FILTER ELEMENT**

1. Remove cartridge element (1) by turning it counterclockwise with a tool. Install a new element after applying engine oil to packing surface. To install element, bring packing surface into contact with sealing surface of filter base and then tighten element  $2/3$  turn by hand. (Be careful not to overtighten.)



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2. After replacing element (1) loosen air purging plug (2). Loosen knob of feed pump (3) and move pump up and down and let fuel overflow until air bubbles cease to come out of air purging plug (2). Tighten air purging plug (2).



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3. Loosen lock nut (5) of injection pump and loosen air purging plug (4). Purge air by following same procedure as that for fuel filter. After air is purged, tighten plug (4) and lock nut (5). Push in and tighten knob on feed pump (3).

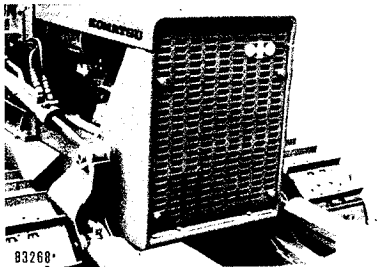
- ★ Use a genuine Komatsu cartridge.
- ★ After replacing cartridge element, start engine and check filter sealing surface for any oil leakage.

## EVERY 500 HOURS SERVICE

### c. RADIATOR FINS

Clean the radiator fins clogged with mud, dust and leaves with compressed air. Steam or water may be used instead of compressed air.

- ★ The rubber hose should be checked at the same time. If the hose is found to have cracks or to be hardened by ageing, such hose should be replaced by new one. Further, loosened hose clamp should also be checked.



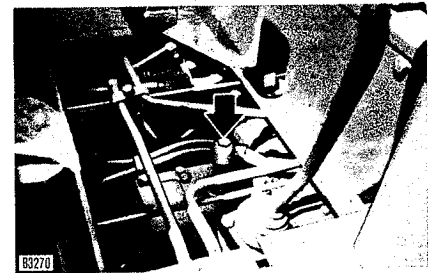
### d. BREATHERS

Remove the breather and wash out dust remaining inside with diesel fuel.

- Main clutch case breather



- Transmission case breather



## EVERY 1000 HOURS SERVICE

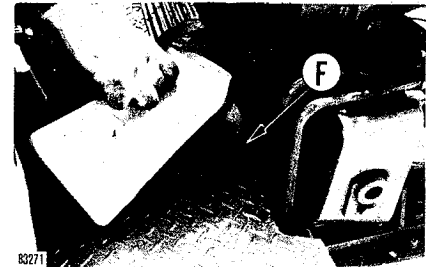
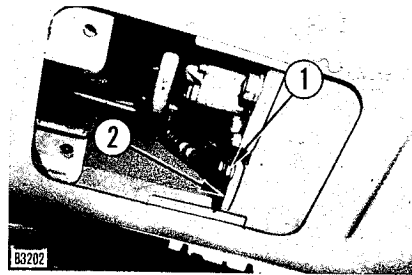
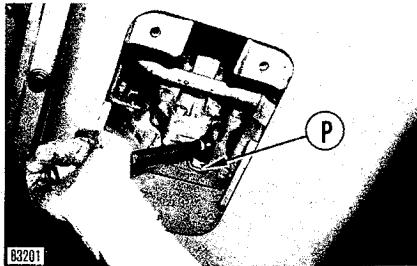
### a. MAIN CLUTCH CASE

1. Remove cover from underside of machine and then remove drain plug (P) to drain oil. After draining, tighten drain plug (P).
2. To clean strainer, first remove three bolts (1) and then pull cover (2) downward and remove strainer.
3. Clean strainer and inside of case, then reinstall strainer. If strainer is broken or damaged, replace it with a new one.

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

4. Fill with engine oil through oil filler (F) to prescribed level.

- ★ Oil capacity: 6 ℓ
- ★ Use CLASS-CD SAE10W engine oil for all seasons.



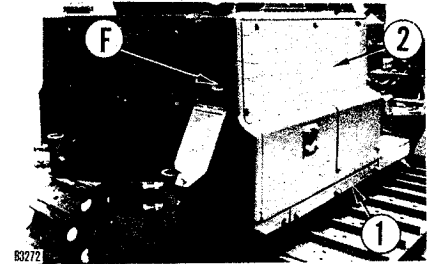
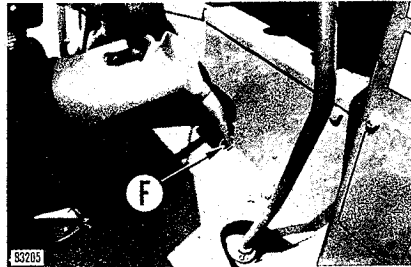
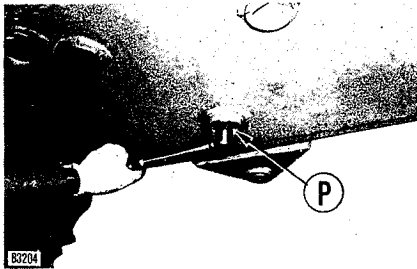
**b. TRANSMISSION (INCLUDING BEVEL CASE)**

Drain oil by removing drain plug (P). After draining, tighten drain plug (P) and fill with engine oil through oil filler (F) to prescribed level.

- ★ Oil capacity: 16.5ℓ
- ★ Above 0°C: Use engine oil CLASS-CD SAE30.  
Below 10°C: Use engine oil CLASS-CD SAE10W.

**c. HYDRAULIC TANK**

1. Stop engine with blade lowered to the ground in the horizontal position. Move blade control lever back and forth and left and right. Before removing oil filler (F), relieve pressure by slowly turning cap.



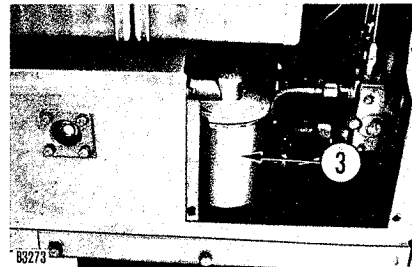
2. Remove the cover (1), then remove drain plug (P) from underside of tank and drain oil from the tank. After draining, tighten drain plug (P).
3. Remove cover (2) and cartridge element (3) by turning it counterclockwise with the supplied tool. Remove dust and unfiltered oil accumulated in the bottom of the filter base.

4. Install a new cartridge element after applying engine oil (or a light coat of grease) on its packing surface. To install cartridge element, bring packing surface into contact with sealing surface of filter base and tighten cartridge element about  $3/4$  turn. (Be careful not to over-tighten.)

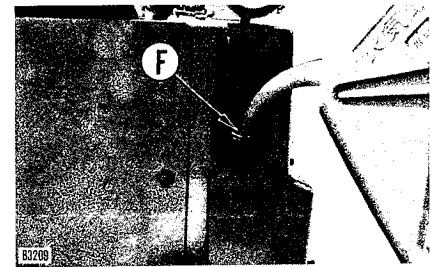
5. Fill tank with engine oil through oil filler (F).
- ★ Oil capacity: D20A            33ℓ  
                          D20P, PL        31ℓ
  - ★ Use CLASS-CD SAE10W engine oil for all seasons.
  - ★ Use a genuine Komatsu cartridge.



B3207



B3273



B3209

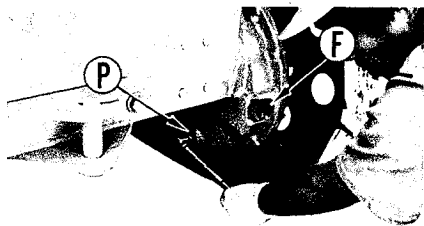
**d. FINAL DRIVE CASE**

Remove oil fillers (F) from both sides of machine and drain oil by removing drain plug (P). After draining, tighten drain plug (P) and fill with engine oil through respective oil fillers (F) to prescribed level.

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

Below 10°C: Use engine oil  
CLASS-CD SAE10W.

★ Oil capacity:  
D20A, P      4ℓ (each side)  
D20PL      6ℓ (each side)



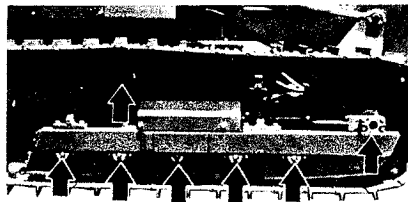
B3210

**e. UNDERCARRIAGE COMPONENTS**

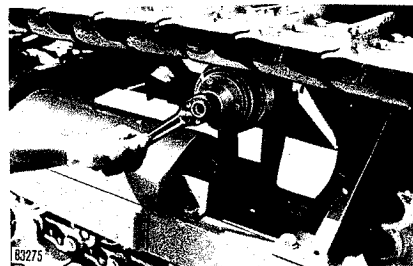
Stop machine on level ground and check consumption of oil in track roller, carrier roller and idler.

- Slowly loosen seal bolt and see if oil oozes out of screw. If oil oozes out, oil is still sufficient. Tighten bolt immediately.
- If oil does not flow even after seal bolt has been removed, oil amount is insufficient. Request Komatsu distributor to perform necessary repairs.

★ Use CLASS-CD SAE30 engine oil for all seasons.



B3274



B3275

## EVERY 2000 HOURS SERVICE

### a. ENGINE VALVE CLEARANCE

As special tool is required for removing and adjusting the parts, you shall request Komatsu distributor for service.

### b. ALTERNATOR AND STARTING MOTOR

As the hours of engine employment indicate that the brushes are already worn out, you should request repair from a Komatsu distributor.

When it is disassembled without proper care, the drip-proof function may be damaged resulting in the intrusion of water. So, you shall contact a Komatsu distributor for repair.

- ★ They should be repaired every 1000 hours, if the machine is frequently operated at night.

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

## WHEN REQUIRED


### a. CHANGE COOLING WATER

Perform twice a year in spring and autumn (when changing antifreeze solution).

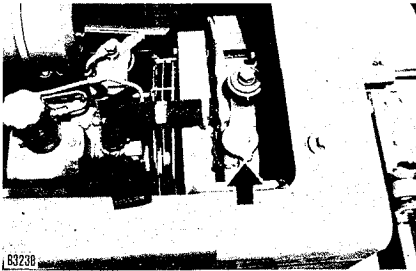
In case antifreeze is not used, change coolant every 1000 hours.

#### Change

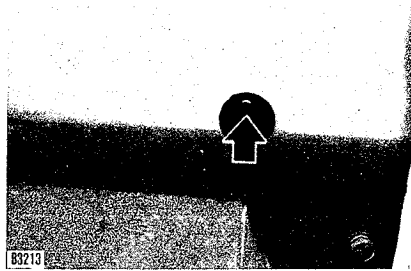
1. Stop engine and loosen cap slowly.  
Open drain valve and plug on bottom of radiator and cylinder block side to drain oil.
2. After draining, clean inside using a wash sold on the market. Follow the maker's instructions.
3. After cleaning, drain thoroughly, close drain valve and plug, and fill clean water (for example, city water).
4. When water is filled up to the filler, open drain valve and plug while keeping engine at low idling and keep feeding water until clear water comes out from drain valve and plug.
5. When water becomes clear, close drain valve and plug. Stop feeding water when water is filled up to the filler.
6. After filling water, in order to let out air mixing in coolant, run the engine for five minutes at low idling, then another five minutes at high idling. (During this time, the feed water cap is removed.)
7. Stop engine after three minutes, again feed water up to the filler and close cap.

 **When removing cap, turn cap slowly to allow pressure to be relieved.**

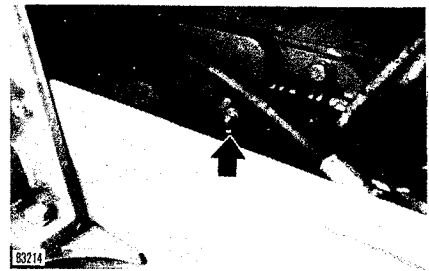
Water filler



Drain valve (radiator)



Drain plug (cylinder block)





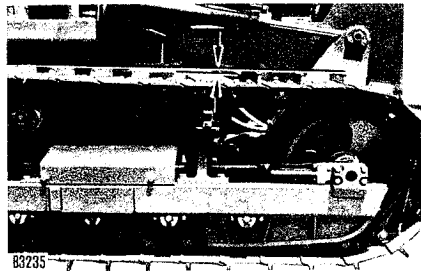
## b. TRACK TENSION

### Inspection

Without applying brakes, stop the machine during forward travel on a flat land, and put a straight rod on the carrier roller and the idler as shown on the Photo. When the distance between the rod and the shoe grouser is 20 to 30mm at the center, the tension is the standard one.

### Adjustment

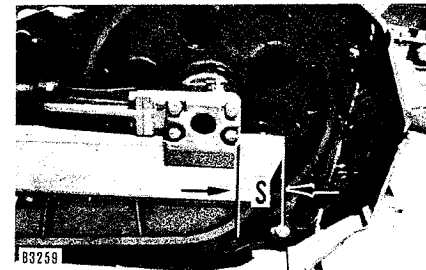
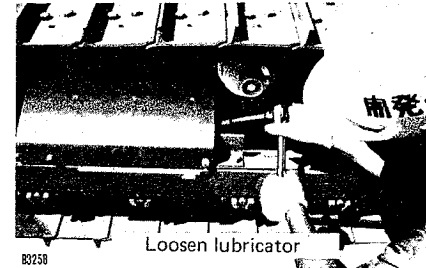
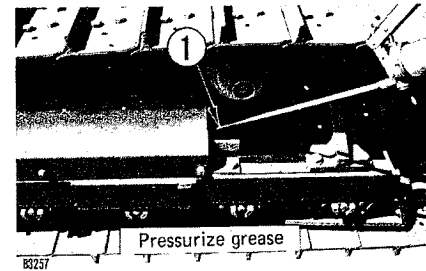
For tightening the tension, pressurize grease through lubricator (1). On the other hand, for loosening the tension, extract grease by reversely rotating the lubricator (1) slowly.



Grease may be pressurized till S will be 4mm. In case the tension is yet loose after applying pressurized injection of grease till the abovementioned limit, it indicates that the pin bush is reduced by too much abrasion. So it is necessary either to turn or replace the pin and bushings. Consult your Komatsu distributor for repair.

**⚠ Do not loosen the lubricator (1) over one complete rotation. Also, be careful not to loose any part other than the lubricator (1).**

If the lubricator (1) or any other part should be loosened excessively, it will be liable to fly out under the high pressure of jammed grease. If grease does not ooze smoothly, try moving the machine back and forth for a short distance.



## ADJUSTMENT

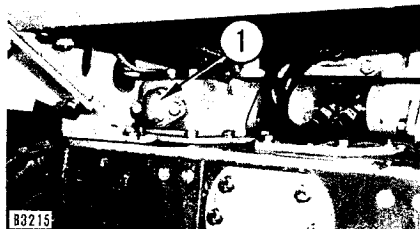
### ADJUSTMENT OF STEERING BRAKES

When brake lining wears, travel of steering pedal will increase, making steering difficult. To adjust, proceed as follows:

Standard travel: 100 ~ 120mm.  
Standard clearance between lining and drum: 0.9mm.

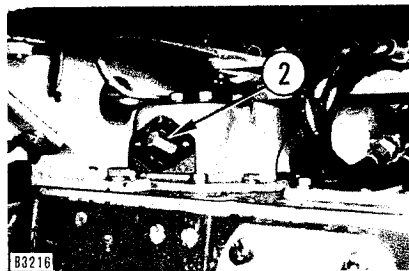
#### Adjustment

1. Remove inspection cover (1).



2. Tighten adjustment nut (2) to a tightening torque of 5kg.m, so that the lining comes into tight contact with drum. (The contact should be confirmed by depressing the steering pedals.)
3. Turn back the adjusting nut (2) by approx. 4.5 turns so that the travel of steering pedals is 100 to 120mm.

- ★ Adjust so that both left and right pedals will have same travel. If there is a difference in travel between the pedals, brake on one side only will give effective response to pedal action.
- ★ If brakes still give poor response after adjustment, refer to Komatsu distributor for repair.



## ADJUSTMENT OF CLUTCH

Standard clutch pedal play is **20 to 25mm** at tip of pedal. If less or slippery, adjust as follows:

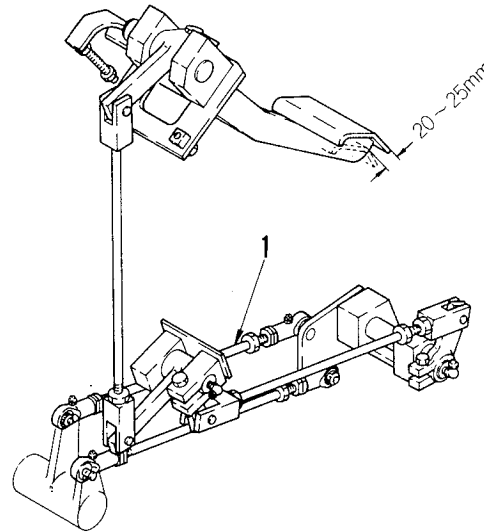
### ADJUSTMENT

Remove floor board.

Lengthen adjustment rod (1) until the standard play is obtained.

- ★ The pedal play tends to increase with rise of the main clutch case oil temperature. Wait for lowering of oil temperature when an adjustment is to be made during or after operation of the machine.

**Be sure to adjust clutch properly. If you leave the less play or slippery clutch unadjusted, clutch lining will be worn out soon and the machine will be damaged due to heat generation.**



## ADJUSTMENT

### ADJUSTMENT OF INERTIA BRAKE

If it takes 1.5 to 2.2 seconds for inertia brake to stop clutch shaft with running engine fully and depressing clutch fully, the inertia brake works well.

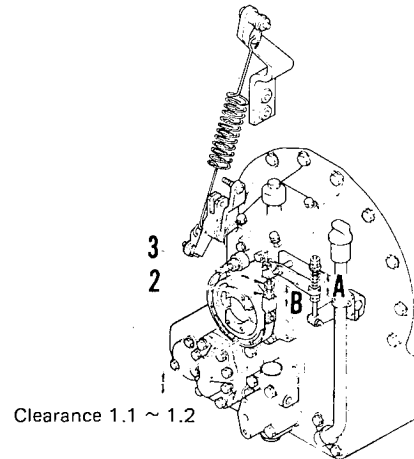
#### ADJUSTMENT

Confirm that dimension **A** is 42 mm.

Loosen adjustment lock nut (2). If the brake works excessively, turn adjustment bolt (3) and lengthen dimensions **B**. If the brake does not work well, shorten **B**.

Retighten nut (2) tightly.

**Be sure to adjust properly. If not, transmission gears and gear shift lever will be damaged.**



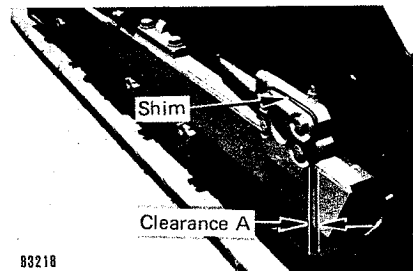
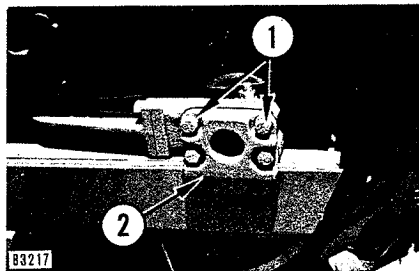
## ADJUSTMENT OF IDLER CLEARANCE

The track frame is inserted into the guide (2) so that the idler may shift in longitudinal direction by external force, and the guide (2) will be worn out by the shifting motion of the idler.

When the guide (2) is worn out, the idler may sometimes generate vibration to the cross direction or incline to one side so that the track may be disengaged. So, the following adjustment should be applied.

When the clearances (A) (4 locations: left, right, inside, and outside) are larger than 3 mm after travelling for 1 to 2 m on a plane ground, loosen the bolt (1), pull out the shim, and adjust the clearance on one side to 0.5 mm.

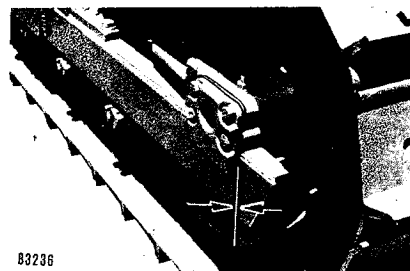
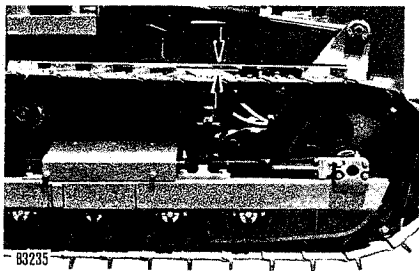
The thickness of a single shim is 0.5 mm.



## ADJUSTMENT

### INSPECTION AND ADJUSTMENT OF UNDERCARRIAGE

- Properly adjust track tension. Tension should be measured at clearance shown in photograph; usually 20 to 30mm at this point. For rocky terrain, tighten tracks slightly. In clay or sandy areas, slightly loosen them. (For inspection and adjustment procedures, refer to EVERY 250 HOURS SERVICE.)
- Check idler rollers for oil leakage, and check tightness of bolts and nuts. If any defect is noticed, repair immediately.
- Check idler guide plate for clearance. If it increases, idler may develop side motion and tracks may come off.



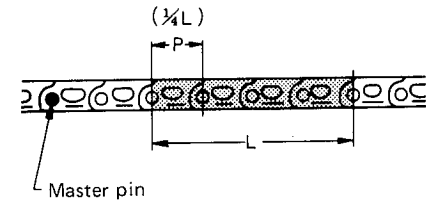
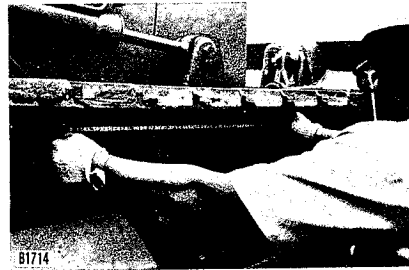
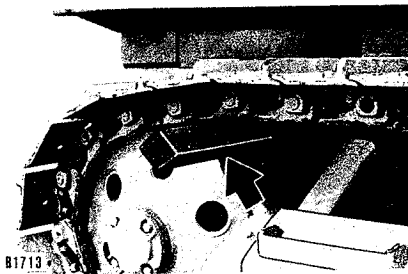
## INSPECTION AND REPAIR

Frequent inspection and prompt repair will reduce repair costs. The following items for inspection will serve as a guide to maintenance service of each undercarriage part. Perform periodical inspection and contact the Komatsu distributor in your area when machine has approached repairable limits and reversing limits.

- Measuring Link Pitch

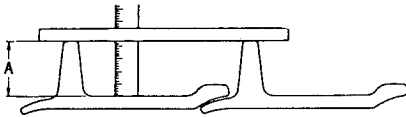
1. Insert a wooden block between track shoe and sprocket to take up the slack in track shoes.
2. Measure pitch length of 4 links in stretched portion at more than 2 links away from master pin. Of length obtained,  $1/4$  is the link pitch.

- ★ Standard link pitch: 135mm
- ★ Reversing limit link pitch: 138mm
- ★ A center hole is provided on both ends of master pin.

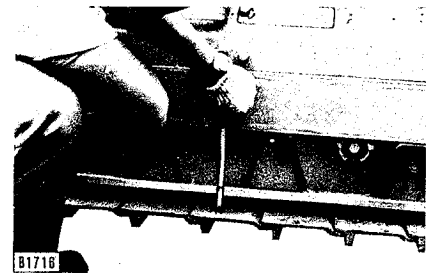
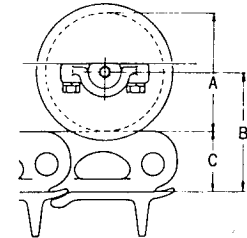
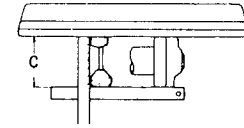


## ADJUSTMENT

- Measuring Height of grouser (D20A)  
After taking up slack in track shoes, measure height at center of shoe as shown below.
- ★ Standard height: **38.5 mm**
- ★ Repair limits: **15 mm**



- Measuring Outside Diameter of Track Roller
  1. Measure height (size C) of link tread as shown.
  2. Stop machine at position where link tread, whose size C has been measured completely, contacts roller tread. Then measure size B.
  3. Calculate outside diameter of tread (size A):  
$$A = (B - C) \times 2$$
- ★ Standard size: **135mm**
- ★ Repair limits: **127mm**





## ADJUSTMENT OF BLADE CUTTING ANGLE AND AIR-BLEEDING ANGLING CYLINDER HEAD CIRCUIT (D20A)

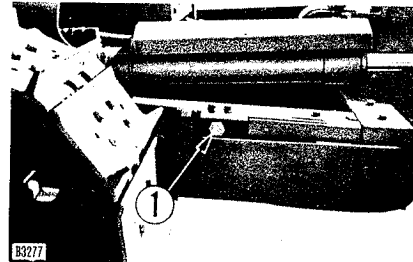
- Blade cutting angle ( $\theta$ ) can be adjusted for different types of soils.
- The standard of cutting angle is  $57^\circ$  and the adjustable range is from  $55^\circ$  to  $59^\circ$ .
- The relation between cutting angle ( $\theta$ ) and distance between joints (L) is shown below.

Cutting angle, $\theta^\circ$	Distance between joints, L
55	353mm
57	368mm
59	383mm

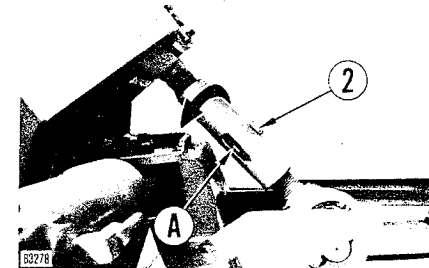


1. Adjustment procedure for increasing cutting angle.

- 1) Raise the blade about 300mm off the ground and support the frames on blocks.
- 2) Loosen the valve (1) two turns.



- 3) Loosen the stopper bolt (2), and turn the brace in the direction shown by the arrow with the bar handle inserted in the hole (A) in the brace.



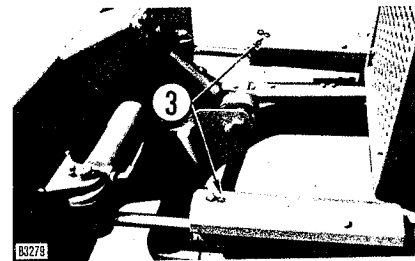
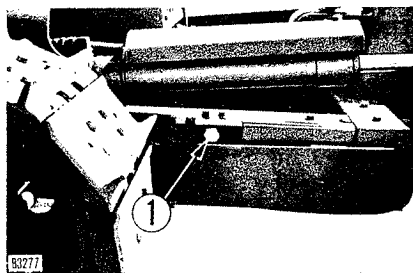
When too much resistance to rotate the brace is felt, before a desired cutting is obtained, try alternately moving the blade control lever (for tilting) between L.H. TILT and R.H. TILT positions and the blade control lever (for angling) between L.H. ANGLE and R.H. ANGLE positions, three or five times repeatedly, without starting the engine. Carry on rotating the brace until the desired cutting angle can be obtained.

## ADJUSTMENT

- 4) Tighten the valve (1) and the stopper bolt (2).
  - 5) Perform bleeding air from the angling cylinder head oil circuit.
2. Adjustment procedure for decreasing cutting angle.
- Blade cutting angle can be decreased by reversing the above-mentioned direction of rotation of the brace for increasing cutting angle.

### BLEEDING AIR FROM THE ANGLING CYLINDER HEAD OIL CIRCUIT

1. Raise the blade about 300mm off the ground and run the engine at a low-idling speed.
2. Move the blade control lever between L.H. TILT and R.H. TILT positions 5 to 10 times repeatedly to bleed air from the tilt cylinder oil circuit.
3. Loosen the valve (1) two turns and the cylinder air bleeding plugs (3) (one plug each side) three turns.
4. Move the blade control lever to the R.H. TILT position and, after confirming that oil spurts out of the air bleeding plugs (3), tighten the valve (1) and the plugs (3).



# TROUBLE SHOOTING GUIDE

For problems or probable causes other than given below, contact a Komatsu distributor for repairs.

## ENGINE

**Oil pressure caution lamp lights even when engine speed is increased after warm-up run.**

- Oil level in oil pan low (drawing air).
- Oil filter element clogged.
- Oil leaks due to insufficient tightening or damage of oil pipe or pipe joint.

**Steam is emitted from top of radiator (from valve).**

**Indicator on engine water gauge is in red range on R.H. side.**

- Cooling water insufficient or leaks.
- Fan belt slackened.
- Dust and scales accumulated in cooling system.
- Radiator fins clogged or deformed.
- Thermostat defective.
- Radiator filler cap loosened (when operating at high altitude).
- Engine water gauge defective.

**Indicator on engine water gauge is in white range on L.H. side.**

- Thermostat is defective.
- Engine water gauge is defective.

**Engine fails to start.**

- Insufficient fuel.
- Air entrapped in fuel supply system.
- Fuel injection pump or nozzle defective.
- Starter cannot crank engine fast enough.
- Preheater signal fails to become red hot.
- Insufficient compression.
  - Incorrect valve clearance.

**Exhaust is white or bluish.**

- Excessive oil in oil pan.
- Improper fuel used.

**Exhaust is black.**

- Air cleaner element clogged.
- Nozzle defective.
- Insufficient compression.

**Combustion occasionally gives stuttering sound.**

- Nozzle defective.

**Abnormal sound (in combustion or mechanical operation).**

- Fuel of inferior quality used.
- Overheating occurs.
- Muffler broken.
- Excess valve clearance.

## ELECTRICAL SYSTEM

**Lamps are not bright despite maximum engine revolution.**

**Lamps flicker while engine is in operation.**

- Electrical wiring defective.
- Belt tension out of adjustment.

**Ammeter gives no deflection despite engine operation.**

- Ammeter defective.
- Electrical wiring defective.

**Alternator has abnormal sound.**

- Alternator defective.

**Starting motor fails to turn when starting switch is turned on.**

- Electrical wiring defective.
- Battery charge low.

**Starting motor pinion moves in and out repeatedly.**

- Battery charge low.

**Cranking of engine by starting motor is too slow.**

- Battery charge low.
- Starting motor defective.

**Starting motor slips out of engagement before start-up of engine.**

- Electrical wiring defective.
- Battery charge low.

**Preheater signal does not become red.**

- Electrical wiring defective.
- Disconnection in intake preheater.

## CHASSIS

**When steering pedal on one side is depressed, machine does not turn, but instead comes to a stop or engine revolution changes.**

- Steering clutch on same side cannot be disengaged.
  - Excess clearance between adjustment bolt and bell crank.
- Steering clutch on the opposite side slipping due to maladjustment.

**When steering pedal on one side is depressed, machine does not turn, but continues to advance in a straight line.**

- Steering clutch on same side cannot be disengaged.
- Brakes on same side give no response.

**Depression of brake pedal does not stop machine.**

- Brake on R.H. side are defective.

**Track slips out.**

**Sprockets wear excessively.**

- Track too slack.

**Blade lift too slowly or does not lift at all.**

- Insufficient hydraulic oil.

# STORAGE

## BEFORE STORAGE

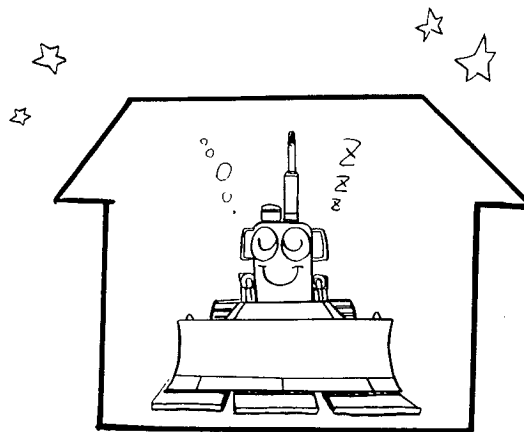
To place the machine in storage for an extended period of time, the following measures must be taken to insure that it can be returned to operation with minimum of service.

- After every part is washed and dried, the machine shall be housed in a dry building. Never leave it outdoors.

In case it is indispensable to leave it outdoors, lay wood plates on the ground, and park the machine on the wood plates and cover it with canvas etc.


- Completely fill fuel tank, lubricate and change oil before storage.

- Apply a thin coat of grease to metal surface (hydraulic piston rods and front idler adjusting rods).
- As to batteries, remove the terminals and cover them, or remove them from the machine and store separately.
- When the atmospheric temperature is anticipated to drop below 0°C, always add antifreeze in the cooling water.
- The gear shift lever shall be set to neutral, the fuel control lever to stop position, and the steering pedal shall not be locked.



## DURING STORAGE

- Operate the engine and move the machine for a short distance once a month so that new oil film will be coated over movable parts and component surfaces.

 **When it is necessary to perform rust-preventing operation of the engine in doors, be sure to keep well ventilation to prevent gas poisoning.**

## AFTER STORAGE

After storage (when it is kept without cover or the rust-preventive operation once a month is not made), you shall apply the following treatment before operation.

- Remove the drain plugs on oil pan and other cases and drain mixed water.
- Remove the rocker housing cover and lubricate sufficiently valves and rocker arms. And inspect the valve operation.
- After the engine is started, operate it until it is warmed up completely.

## SERVICE METER

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

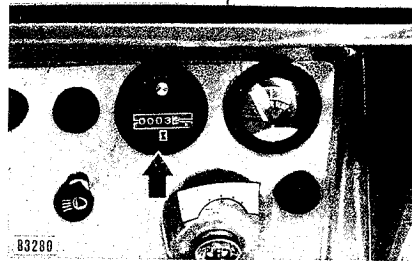
- Record the readings at the start and the end of work, this is the work record of the machine.
- This record will indicate, when periodical maintenance is due.
- It also indicates the integrated working hours when machine problems are encountered.

## SERVICE METER

### ★ How the meter progresses

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

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

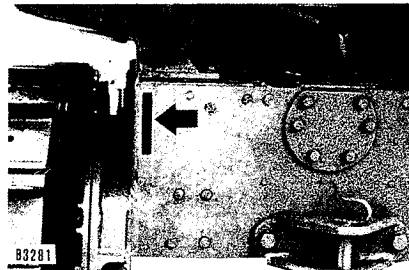




# MACHINE AND ENGINE SERIAL NUMBERS

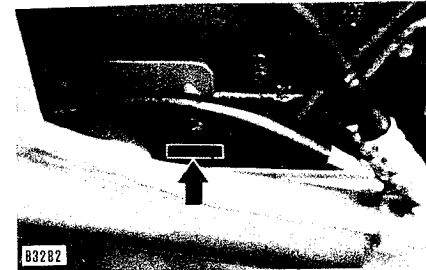
When calling for a service of mechanic or when making replacement parts order, be sure to give your Komatsu distributor the machine and engine serial numbers as well as the service meter reading beforementioned. These numbers are found on the plates shown in the photos below.

- Location of the machine serial number plate



...on the left side of the steering clutch case

- Location of engine serial number plate



...on the right side of the engine cylinder block

## WEAR PARTS

Replace wear parts such as filter elements and cutting edges when periodic maintenance or before they reach their wear limits. Machine is operated most economically by replacing wear parts as recommended. Use genuine Komatsu products for replacement parts.

### Wear Parts List

Item	Description	Q'ty	Replacement Frequency
Engine oil filter	Cartridge	1	Every 500 hours
Fuel filter	Cartridge	1	Every 500 hours
Hydraulic oil filter	Cartridge	1	Every 1000 hours
Air cleaner	Element ass'y	1	_____
Blade (A,P)	Edge	1	_____
	End bit	2	
	(Bolt)	(18)	
	(Nut)	(18)	
Blade (PL)	Edge	2	_____
	End bit	2	
	(Bolt)	(20)	
	(Nut)	(20)	

# SPECIFICATIONS

## D20A-5

**Operating Weight:** 3,560kg

**Blade Weight** (incl. angle and tilt cylinders) 470 kg

### Performance

1. Travel speed:

Forward	1st	0 ~ 2.8 km/h
	2nd	0 ~ 4.0 km/h
	3rd	0 ~ 7.4 km/h
Reverse	1st	0 ~ 4.5 km/h
	2nd	0 ~ 6.5 km/h

2. Max. drawbar pull 4,220 kg

### Engine

1. Model

KOMATSU 4D94-2N type diesel engine

2. Rated rpm 2,450 rpm

3. Horsepower 39 HP

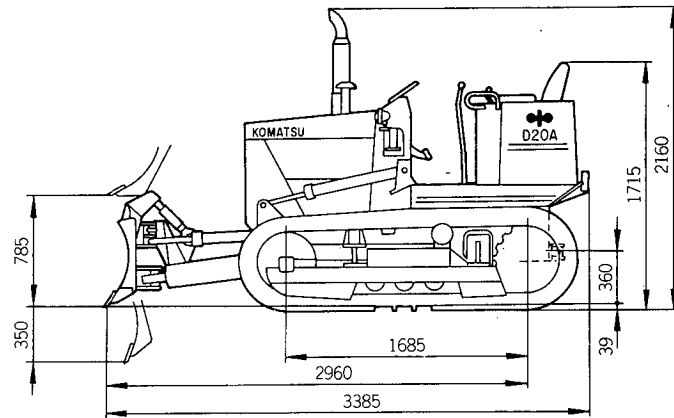
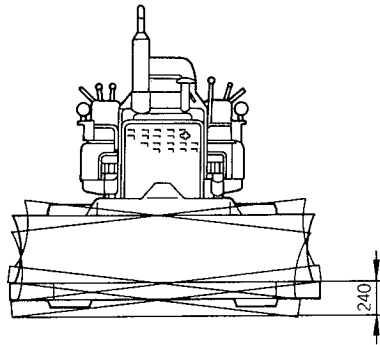
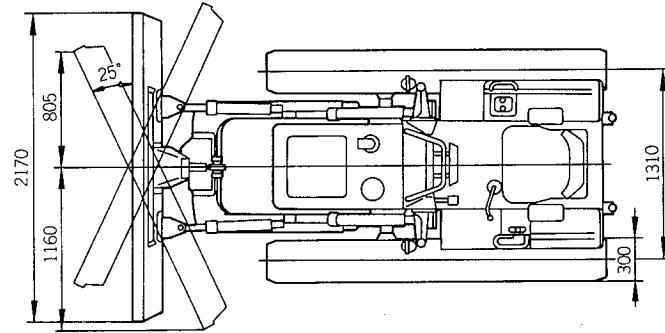
4. Maximum torque  
(at about 1,400 rpm) 15 kg.m

5. Start system:

Starting motor 24V 3.5 kW

**Battery** 12V 60Ah x 2

SPECIFICATIONS



# SPECIFICATIONS

## D20P, PL-5

Note. ( ): D20PL-5

### Operating Weight:

3,780 kg  
(3,880 kg)

### Blade Weight (incl. brace and frame)

460 kg  
(480 kg)

### Performance

#### 1. Travel speed:

Forward	1st	0 ~ 2.8 km/h
	2nd	0 ~ 4.0 km/h
	3rd	0 ~ 7.4 km/h
Reverse	1st	0 ~ 4.5 km/h
	2nd	0 ~ 6.5 km/h

2. Max. drawbar pull 4,220 kg

3. Ground pressure 0.22 kg/cm<sup>2</sup>  
(0.15 kg/cm<sup>2</sup>)

### Engine

#### 1. Model

KOMATSU 4D94-2N type diesel engine

2. Rated rpm 2,450 rpm

3. Horsepower 39 HP

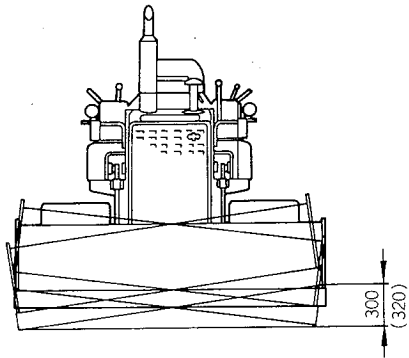
4. Maximum torque  
(at about 1,400 rpm) 15 kg.m

#### 5. Start system:

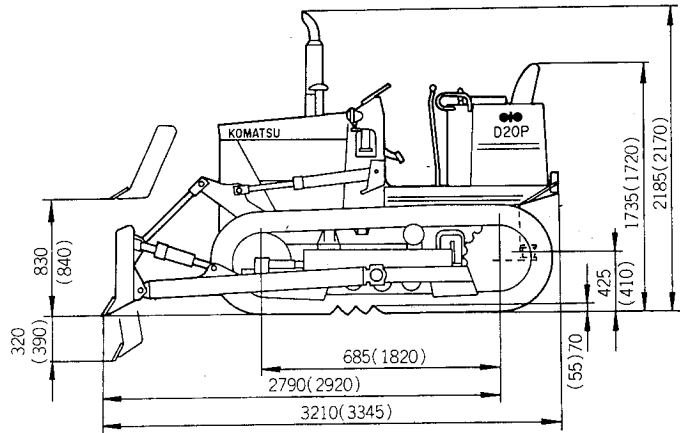
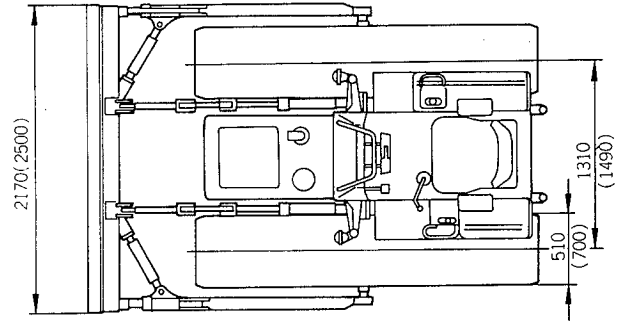
Starting motor 24V 3.5 kW

### Battery

12V 60Ah x 2



( ): D20PL-5



# FUEL AND LUBRICANTS

## PROPER SELECTION OF FUEL AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE					CAPACITY (ℓ)
		14 -10	32 0	50 10	68 20	86°F 30°C	
★★Engine oil pan	Engine oil						9.5
Transmission case (incl. bevel gear case)				SAE 30			16.5
Final drive case(each)		SAE 10W					4 (D20A, P) 6 (D20PL)
Main clutch case		SAE 10W					6
Hydraulic system		SAE 10W					33 (D20A) 31 (D20P, PL)
Fuel tank	Diesel fuel	*					60
			ASTM D975 No. 2				

※ ASTM D975 No. 1

### SPECIFIED FUEL

.ASTM D975 No. 2 diesel fuel (when the atmospheric temperature is above -10°C)

ASTM D975 No. 1 diesel fuel (when the atmospheric temperature is below -10°C).

- ★ Use Engine oil class "CD". If class "CC" oil is used the oil change interval should be reduced to half.
- ★ In case the engine starts in an atmospheric temperature of less than 0°C, engine oil of SAE 10W must be employed, even though its viscosity rises considerably at a temperature of 10°C more or less in the day time.
- ★★ Normal oil change interval when fuel sulphur content is 0.4% or less. When sulphur content is 0.4% to 1.0% reduce oil change interval one-half. When sulphur content is above 1.0% reduce oil change to one-fourth the normal interval.



FUEL AND LUBRICANTS

SPEC. & GRADE  NAME OF SUPPLIER	ENGINE OIL	GEAR OIL	GREASE
	Class CD	Class GL-4, GL-5	NLGI 2
	SAE 30      SAE 10W	SAE 90 SAE 140	
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 myrina oil 20W/40	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	CRO 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	