

# Operation & Maintenance Manual

**KOMATSU**

**D20A,P,PL,PLL-6**

**D21A,E,P,PL-6**

**D20P-6A,D21P-6A,6B**

**BULLDOZER**

SERIAL NUMBERS

D20A,P,PL,PLL-60001

D21A,E,P,PL -60001


D20P-6A -60001

D21P-6A,6B -60001

and up

## FOREWORD

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

- Please read this manual carefully BEFORE operating the machine.
- Please continue studying this manual until proper operation is completely reinforced into personal habit.
- This manual describes the basic techniques. Skill is performed as the operator or anyone get the correct knowledge and performance of the machine.
- Operation, inspection, and maintenance should be carefully carried out, and the safety must be given the first priority. Safety precautions are indicated with  marks and technical precautions with ★ marks in this manual. The safety information contained in this manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
- Some photographs and illustration pictures are different from your machine as technical improvement is continuously reflected on it. Revision to up-to-date manual's content is performed in later editions.
- This operation & maintenance manual may contain attachments and optional equipment that are not available in your area. Please consult your local Komatsu distributor for those items you may require.  
Materials and specifications are subject to change without notice.

## 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 in addition to usual 250 hours service:
  - 1) Changing all oil and oil filter, fuel filter elements
  - 2) Checking and adjustment of engine valve clearance  
For replacement procedure and details, see maintenance table in the maintenance section.
- If the machine is delivered without any cooling water in the radiator, flush the cooling system with ample clean water to clean the system, then fill the radiator with cooling water.
- When the machine is shipped from the factory, the engine corrosion resistor valve is closed, so open the valve before starting the engine to allow the cooling water to circulate.
- ★ 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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## MAINTENANCE

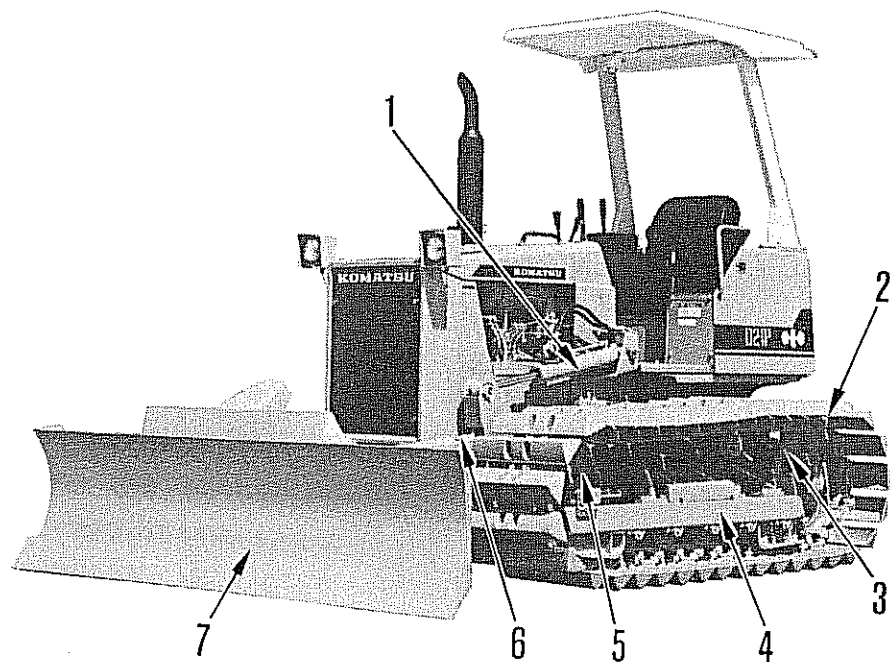
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# GENERAL LOCATIONS AND SPECIFICATIONS

- 1. Lift cylinder
- 2. Track shoe
- 3. Sprocket
- 4. Track frame

- 5. Idler
- 6. Angle cylinder
- 7. Blade



D21P-6A

## OPERATING WEIGHT

D20A-6:	3530 kg	D21A-6:	3580 kg
D20P-6:	3820 kg	D21P-6:	3870 kg
D20PL-6:	4010 kg	D21PL-6:	4060 kg
D20PLL-6:	4650 kg	D21P-6A:	3970 kg
D20P-6A:	3920 kg		
D21E-6 with ROPS canopy:			4000 kg
D21P-6B with ROPS canopy:			4300 kg

## TRAVEL SPEED

D20A, P, PL, PLL-6, D20P-6A

Forward Max. 7.5 km/h  
Reverse Max. 6.5 km/h

D21A, P, PL-6, D21P-6A

Forward Max. 4.4 km/h  
Reverse Max. 5.6 km/h

D21E-6, D21P-6B

Forward Max. 6.8 km/h  
Reverse Max. 7.4 km/h

## ENGINE

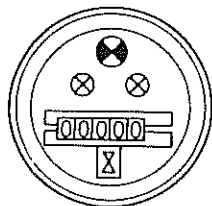
Model	Komatsu 4D95S-W-1 diesel engine	
Flywheel horsepower (at 2450 rpm)		
D20A, P, PL, PLL-6, D20P-6A		39.5 HP
D21A, P, PL-6, D21P-6A		39.5 HP
D21E-6, D21P-6B		44.4 HP

NOTE: Specifications are subject to change without notice.

# INSTRUMENTS AND CONTROLS

## METERS, LAMPS AND SWITCHES

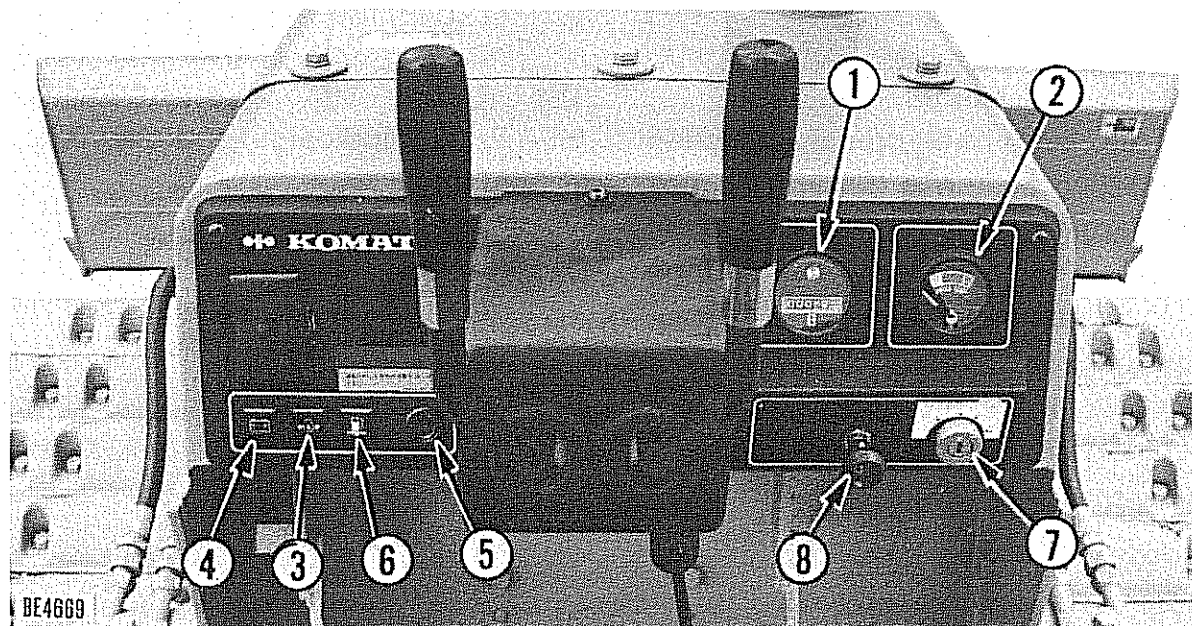
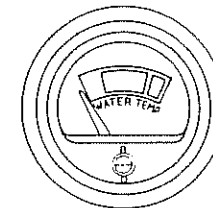
### 1. SERVICE METER



This meter shows the total operation hours of the machine.

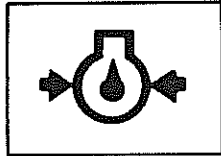
Refer to the section "SERVICE METER".

### 2. ENGINE WATER TEMPERATURE GAUGE



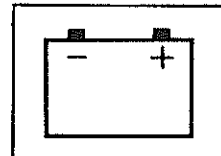
- When indicator is in the green range during operation, water temperature is normal.
- After engine start-up, warm up the engine until indicator moves into green range.
- If indicator moves from green into red range during operation, run the engine at low idling speed until indicator returns green range.

### 3. ENGINE OIL PRESSURE WARNING LAMP



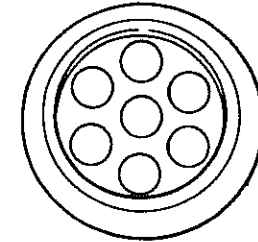
- This lamp indicates a low engine oil pressure.
- Oil pressure is normal when lamp is off during operation. If lamp is on, oil pressure is lower. Stop engine, determine the cause and take necessary corrective steps.

### 4. 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.

### 5. HEATER SIGNAL



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

## 6. FUEL LEVEL WARNING LAMP

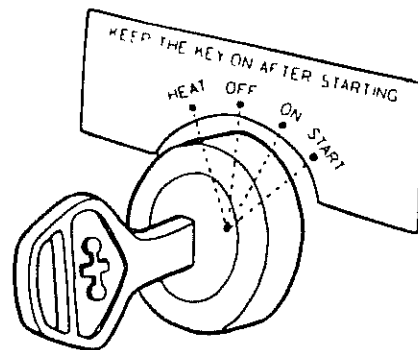


This lamp indicates there is less than 10 liters of fuel in the tank.

If the warning lamp comes on, add fuel.

★ Park the machine on level ground and check the warning lamp.

## 7. STARTING SWITCH



### OFF

Key insertion-withdrawal position. None of electrical circuits activate.

### ON

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

### START

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

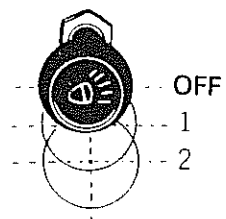
### HEAT

Use this position when starting in cold weather.

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

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

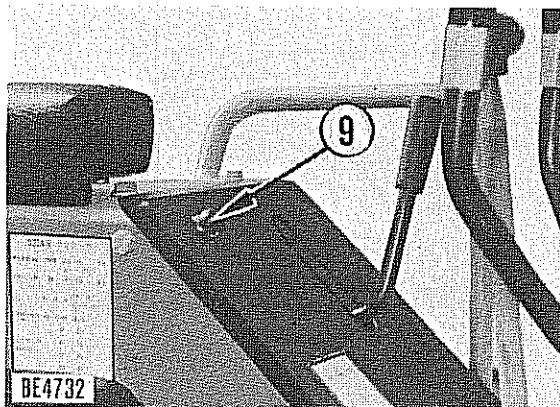
### 8. LAMP SWITCH



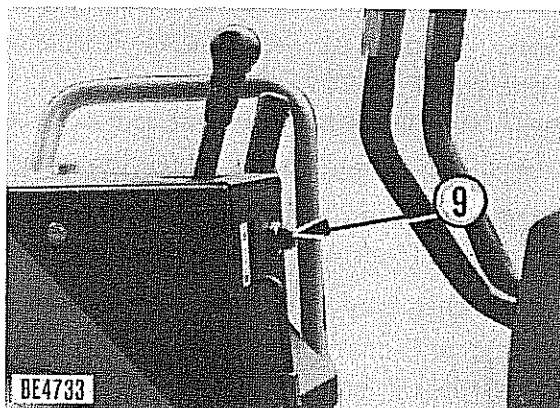
With the lamp switch in position 1, the head lamp and illumination lamp for gauges will light.

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

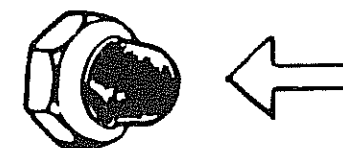
D20



D21



### 9. HORN BUTTON

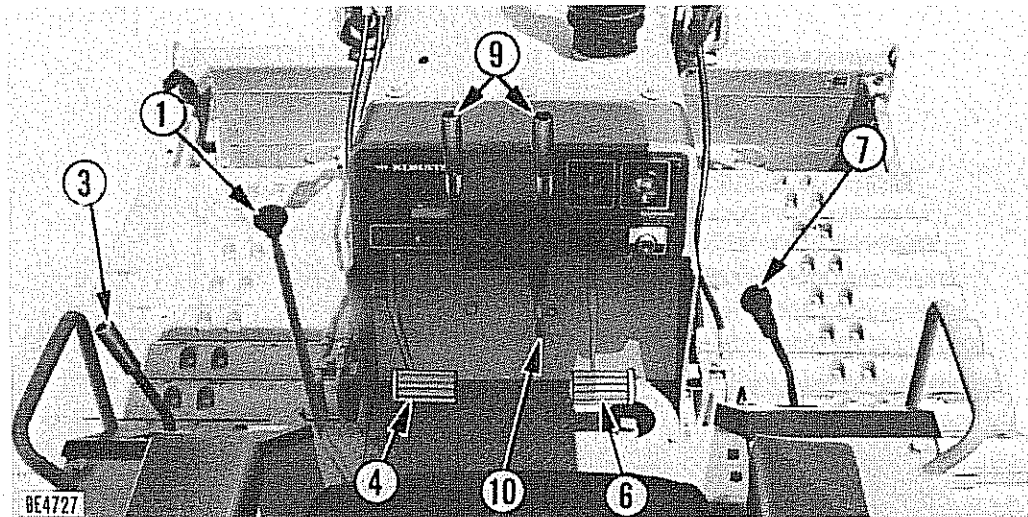


To sound the horn, push the button located in front of the L.H. arm rest.

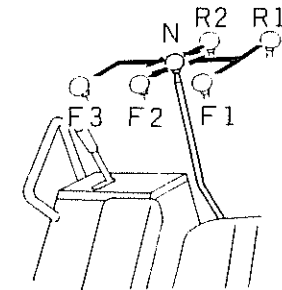


**LEVERS AND PEDALS**

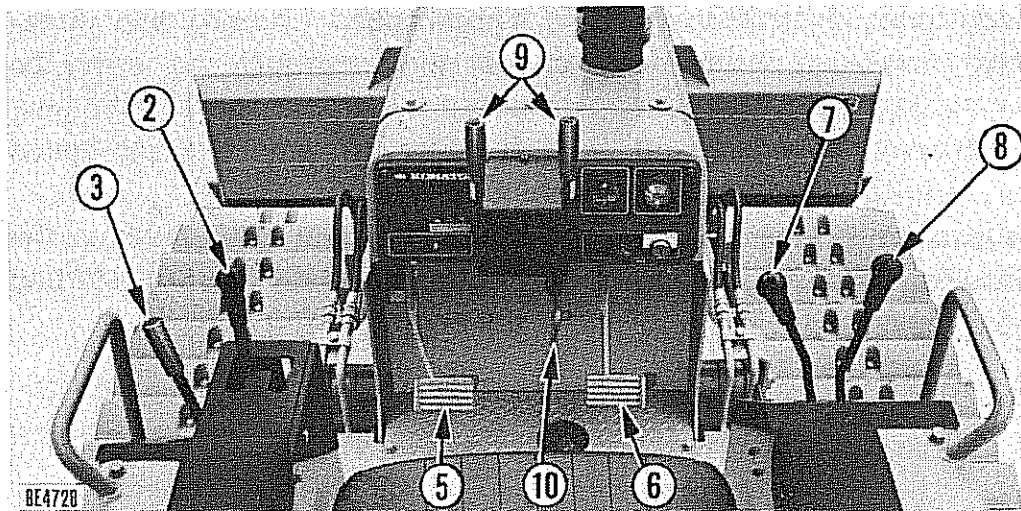
**D20**



**1. GEAR SHIFT LEVER (D20)**

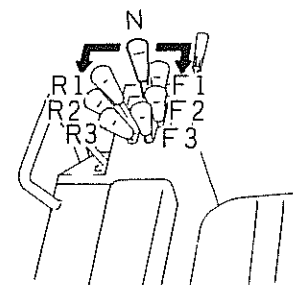
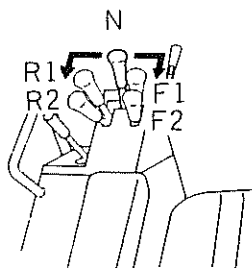


**D21**



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.

## 2. GEAR SHIFT LEVER (D21)



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

(D21A, P, PL-6, D21P-6A)

Two-speed forward and two-speed reverse travel can easily be selected by simply shifting the gear shift lever to any desired speed position.

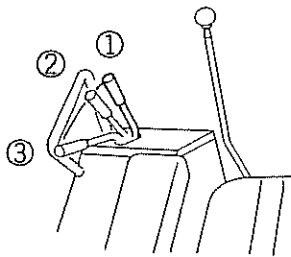
★ Place the gear shift lever in the neutral position before starting the engine.

(D21E-6, D21P-6B)

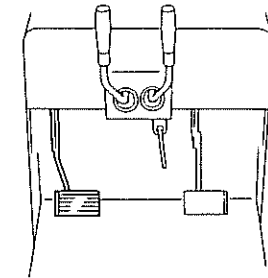
Three-speed forward and three-speed reverse travel can easily be selected by simply shifting the gear shift lever to any desired speed position.

★ Place the gear shift lever in the neutral position before starting the engine.

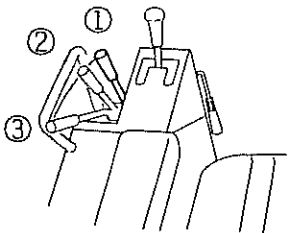
### 3. FUEL CONTROL LEVER D20



### 4. MAIN CLUTCH PEDAL (D20)



### D21



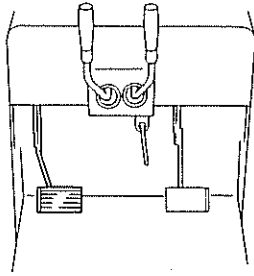
This lever is used to control the engine speed and output.

- ① Engine stop position:  
Push the lever fully.
- ② Low idling position:  
Pull the lever from engine stop position ① until you feel the operating force falls off.
- ③ High idling position:  
Pull the lever fully from low idling position ②.

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.**

### 5. INCHING PEDAL (D21)



(D21A, P, PL-6, D21P-6A)

This pedal engages and cuts the transmission of motive force from the engine and is used to carry out fine travel operations.

When the pedal is depressed, the travel speed drops; if it is depressed fully, the transmission of motive force is cut and the machine will stop.

This operation is used when approaching the target.

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

(D21E-6, D21P-6B)

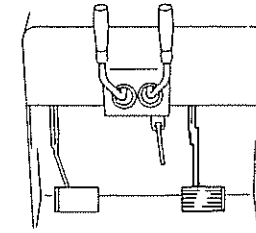
This pedal engages and cuts the transmission of motive force from the engine and is used to carry out fine travel operations.

If the pedal is depressed half way, the motive force is cut; if the pedal is depressed fully, the brake is applied and the machine will stop.

This operation is used when approaching the target.

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

### 6. BRAKE PEDAL



Depress the pedal to apply the brake.

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

7. E  
(

Lev

① |

② |

|

|

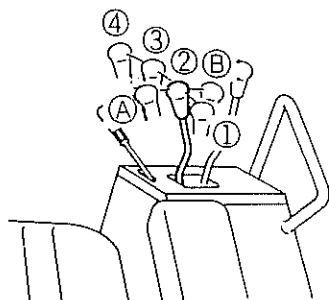
③ |

④ |

|

|

## 7. BLADE CONTROL LEVER (For lift and tilt control)



### Lever position

① RAISE (  )

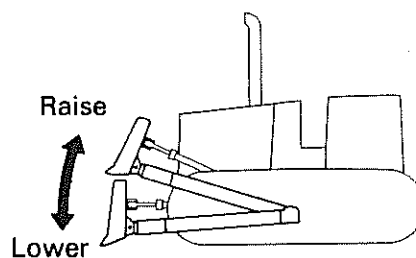
② HOLD (  )

Blade is stopped and held in this position.

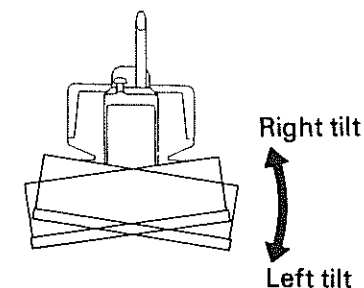
③ LOWER (  )

④ FLOAT (  )

Blade will move freely according to external force.



★ When released from FLOAT position, this lever will not return to HOLD position, so it must be moved back by hand.



Ⓐ LEFT TILT 

The left end of the blade falls.

Ⓑ RIGHT TILT 

The right end of the blade falls.

★ The extent of tilt is as follows.

D20A-6, D21A, E-6      250 mm

D20P-6A, D21P-6A, -6B

280 mm

D20P, PL, PLL-6      320 mm

D21P, PL-6      320 mm

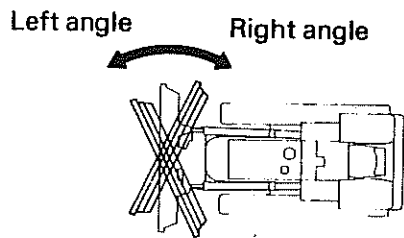
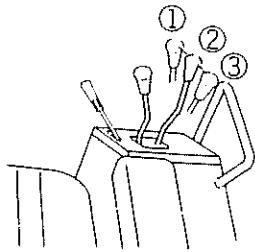


**8. BLADE CONTROL LEVER**

(For angle control)

(D20, 21A-6, D21E-6

D20, 21P-6A, D21P-6B)



Lever position

① LEFT ANGLE (  )

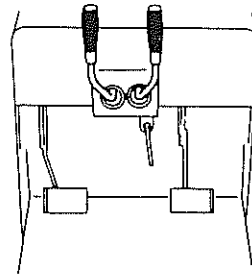
② HOLD

Blade is stopped and held in this position.

③ RIGHT ANGLE (  )

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

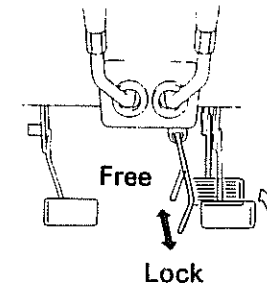
**9. STEERING LEVER**



To turn the machine gently to one direction, pull the steering lever on the same side halfway.

When the steering lever is further pulled all the way out, the machine will make a sharp pivot turn.

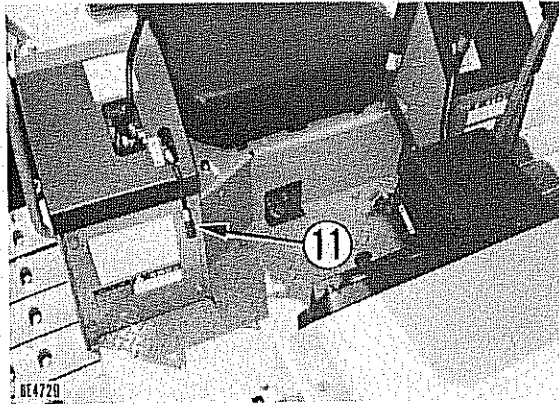
**10. BRAKE LOCK LEVER**



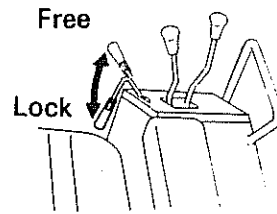
This is the locking device of the brake pedal when parking. Operate the lever for locking or unlocking while depressing brake pedal.

**⚠ Whenever machine is parked, lock brake pedal without fail.**

D20



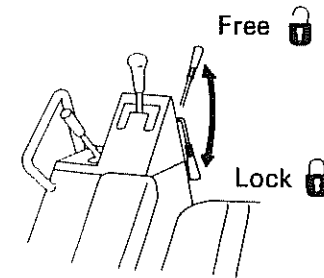
11. SAFETY LEVER  
(For blade control lever)



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 LOCK position.**

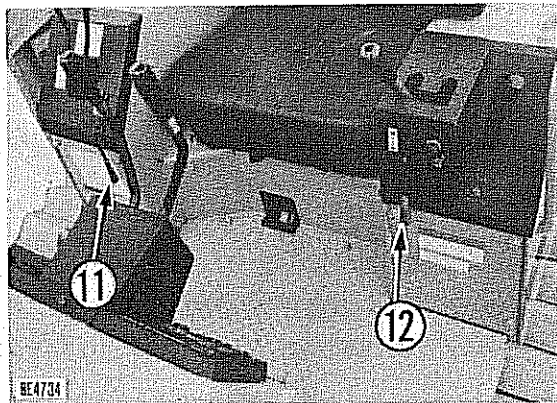
12. SAFETY LEVER  
(For gear shift lever)  
(D21)



This is the locking device of the gear shift lever.

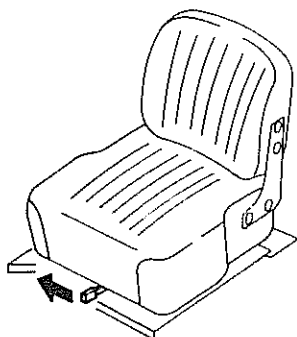
**⚠ When the machine is stopped for a while, be sure to set the gear shift lever in neutral and set the safety lever to LOCK.**

D21



## OPERATOR'S SEAT

Set operator's seat as follows for maximum comfort.

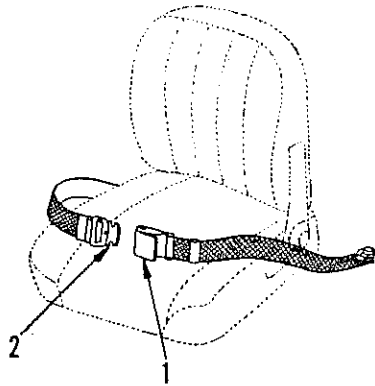


### FORWARD – BACKWARD ADJUSTMENT

Set the seat in the desired position by moving the lever to right; then release the lever.

The seat can be adjusted forward or backward 160 mm (in 9 steps).

## SEAT BELT



**⚠ Before fastening the seat belt, inspect the securing brackets and belt for abnormal conditions.**

Fasten the belt and remove it in the following manner.

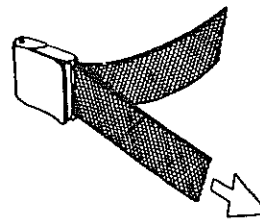
1. Adjust the seat so that the brake pedal can be depressed all the way with the operator's back against the backrest.

2. Sit in the seat. Hold buckle (1) and insert (2) into the buckle (1). Check that the belt is locked by pulling it.
3. When removing the belt, raise the tip of the buckle lever to release it.

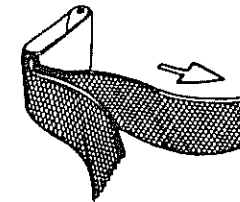
★ Fasten belt along your body without kinking it. Adjust the lengths of the belt on both the buckle and the insert sides so that the buckle is located at the mid-point of your body front.

Adjust the belt length in the following manner.

- i) To shorten the belt, pull the free end of the belt on either the buckle body or insert side.

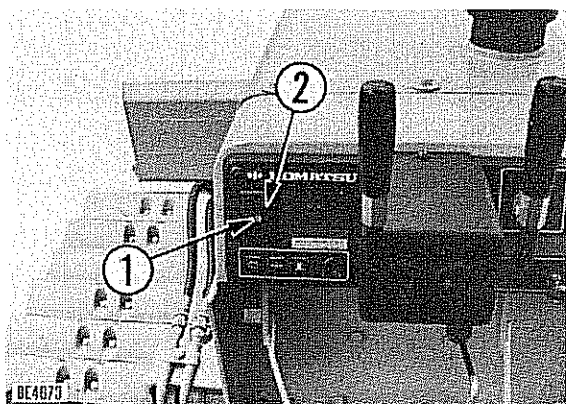


- ii) To lengthen, pull the belt while holding it at a right angle to buckle or insert.



- ★ When operating a machine equipped with ROPS, be sure to use the seat belt.
- ★ Inspect bolts and fittings on the chassis for tightness. Retighten any loose bolts to 2 to 3 kgm torque.
- ★ If the seat belt is scratched or frayed or if any of the fittings are broken or deformed from long service, replace the seat belt immediately.

### FUSE BOX

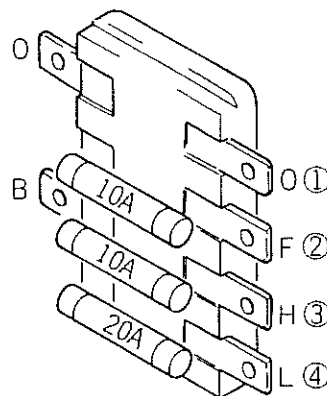


Loosen bolt (1) and remove cover (2).

★ Replace a fuse with another of the same capacity.

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

### Fuse arrangement and circuit



No.	Terminal mark	Fuse capacity	Circuit	Remark
①	O	—	—	—
②	F	10A	—	—
③	H	10A	Horn	—
④	L	20A	Head lamp Rear lamp Panel lamp	—



## 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, track roller supports and shoe bolts.

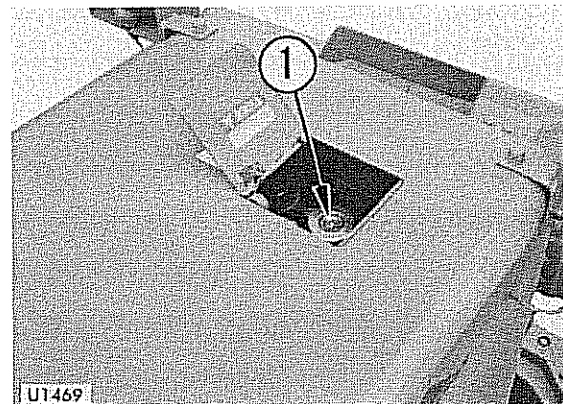
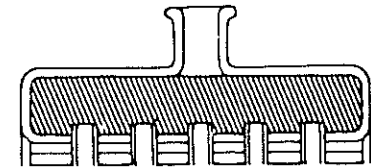
- c. Check for broken electric wirings, short circuits and loose terminals.

### d. CHECK AND REFILL COOLANT

Remove the radiator cap (1) and check that the coolant level is in the shaded area. If level is low, add water. If more water than normal is required to fill up to the specified level, coolant is considered to be leaking somewhere. Immediately locate the leak and plug it.

**⚠ Do not remove cap (1) while cooling water is hot. Hot water may spout out.**

**When removing cap (1), turn it slowly to relieve inner pressure.**



## CHECK BEFORE STARTING

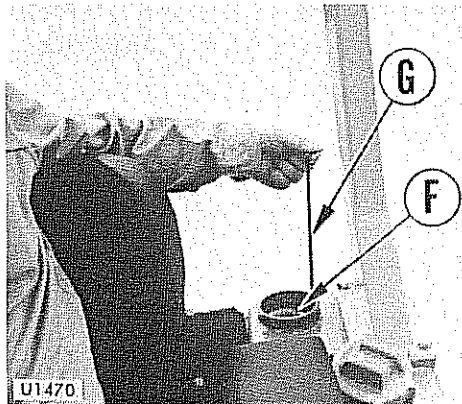
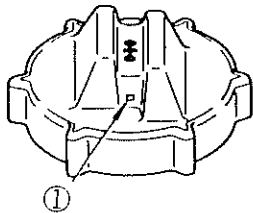
### e. CHECK FUEL LEVEL

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

After each operation, fill up the fuel tank through filler (F).

★ A clogged cap breather hole (1) may stop the fuel flow to the engine. Check it from time to time and clean.

★ Fuel capacity: 60 ℓ

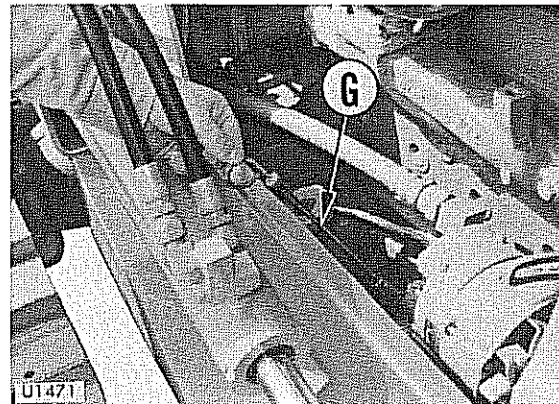


### f. CHECK OIL LEVEL IN ENGINE OIL PAN

Use dipstick (G) to check the oil level. The oil level should be between mark L and H. If necessary, add oil at oil filler (F).

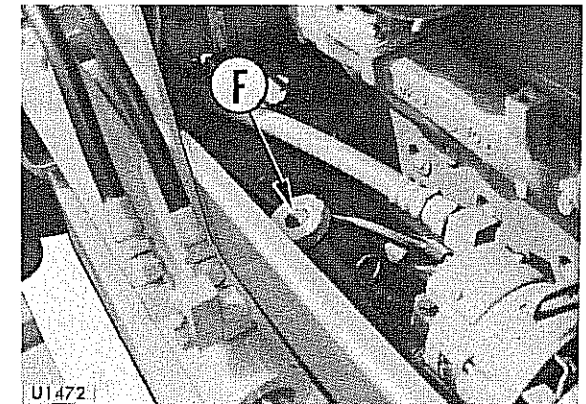
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

★ Make an oil level check before starting engine or 15 minutes or more after the engine is stopped. If oil remains at various portions of the engine, the correct oil level cannot be measured.



★ When checking oil level, park the machine on level ground and stop the engine.

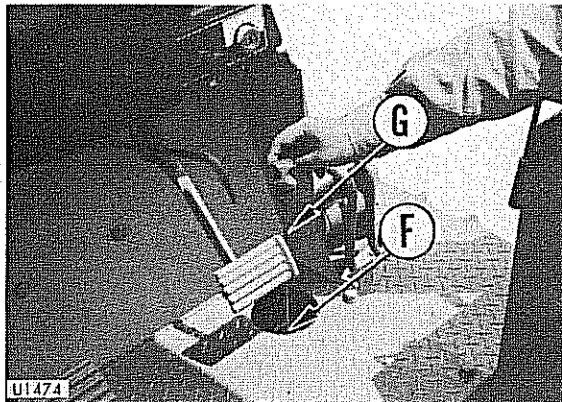
★ Do not add oil above the H level mark.



**g. CHECK OIL LEVEL IN MAIN CLUTCH CASE (D20)**

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

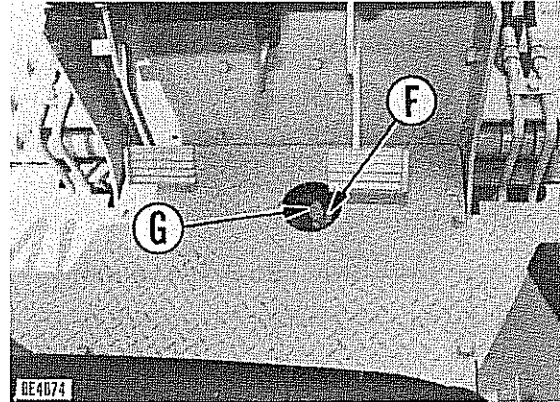
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".



**h. CHECK OIL LEVEL IN TRANSMISSION CASE (D21)**

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

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

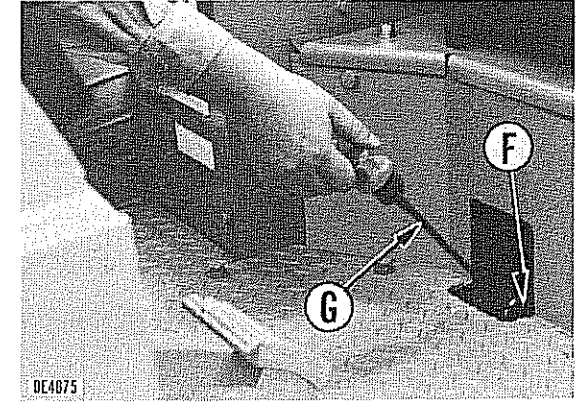


**i. CHECK OIL LEVEL IN TRANSMISSION, BEVEL GEAR CASE (D20)**

**j. CHECK OIL LEVEL IN TRANSFER, BEVEL GEAR CASE (D21)**

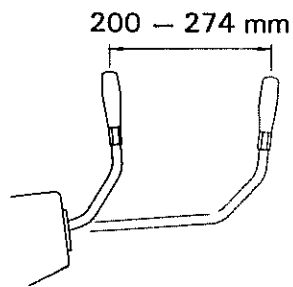
Use dipstick (G) to check the oil level. If necessary, add oil at oil filler (F).

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".



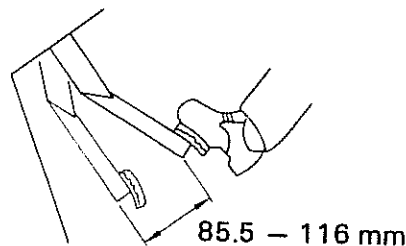
**k. CHECK STEERING LEVER TRAVEL**

The standard travel is 200 to 274 mm at the top end of the lever. When this value exceeds 274 mm, or the steering is not sufficient, adjust it referring to the ADJUSTMENT section.



**l. CHECK BRAKE PEDAL TRAVEL**

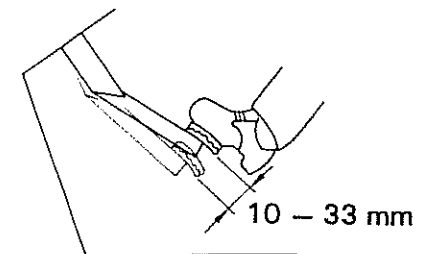
The standard travel is 85.5 to 116 mm at the top end of the pedal. When this value exceeds 116 mm, or the brake fails to work, adjust the pedal referring to the ADJUSTMENT section.



**m. CHECK MAIN CLUTCH PEDAL FOR PROPER PLAY (D20)**

The standard play is 10 to 33 mm 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.



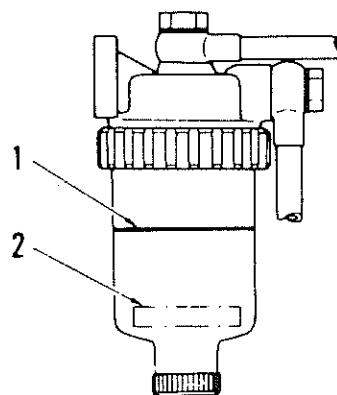
**n. CHECK MAIN CLUTCH  
INERTIA BRAKE FOR PROPER  
EFFECT (D20)**

When depressing main clutch pedal fully with engine at full speed, clutch shaft must stop within 2.5 to 3.5 seconds. This is the standard.

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

**o. CHECK FOR SEDIMENT AND  
WATER IN THE WATER  
SEPARATOR**

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



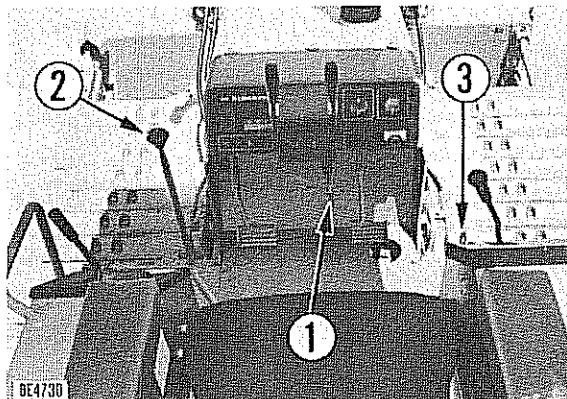
★ Even if a water separator is installed, be sure to check the fuel tank to remove water and sediment in the fuel.



# OPERATING YOUR MACHINE

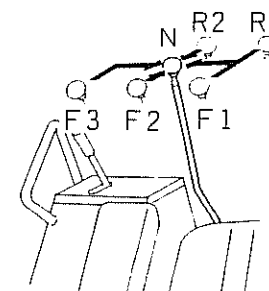
## HANDLING ENGINE

(D20A,P,PL,PLL-6, D20P-6A)  
BEFORE STARTING



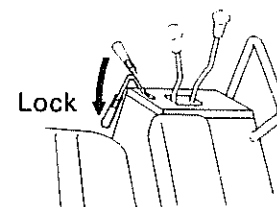
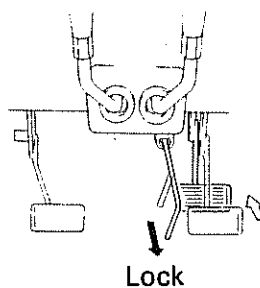
1. Carry out an initial inspection.  
(For details of the inspection see  
CHECK BEFORE STARTING.)

3. Is gear shift lever (2) in NEUTRAL  
position?

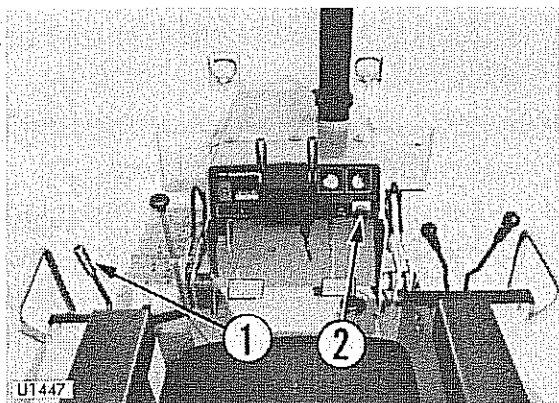


2. Is brake lock lever (1) in LOCK  
position?

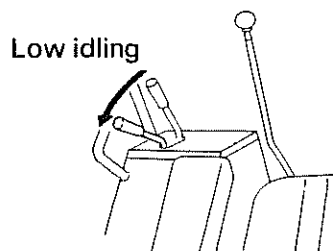
4. Is the blade lowered on the  
ground?  
And is safety lever (3) for blade  
control lever in LOCK position?



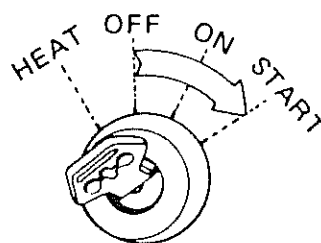
## STARTING ENGINE



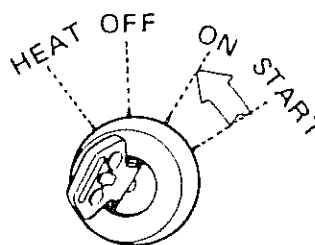
1. Pull fuel control lever (1) a little toward you from low idling position.



2. Turn starting key (2) to START and start engine.



3. Release key (2), 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.
- ★ To start engine in cold weather, refer to "COLD WEATHER OPERATION".

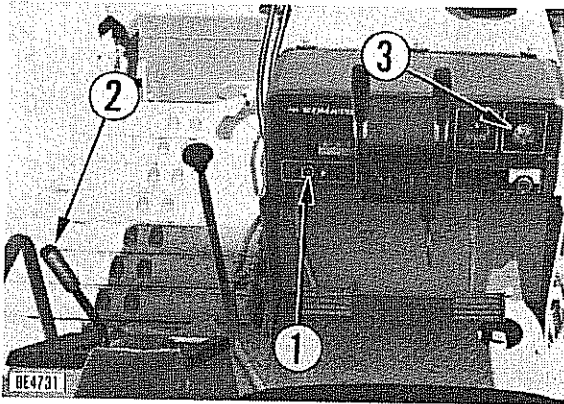
### Special starting

When starting after running out of fuel, fill with fuel, then fill the fuel filter cartridge with fuel and bleed the air from the fuel system before starting.

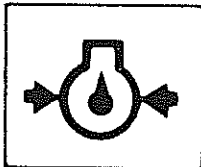
Refer to FUEL FILTER in every 500 hours services.

### CHECKS AFTER START-UP

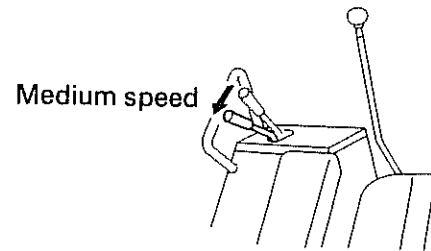
After starting the engine, carry out the following checks prior to machine operation.



1. Run the engine at low idling speed, and check that engine oil pressure warning lamp (1) has gone out.



2. Pull fuel control lever (2) and run the engine at medium speed for about 5 minutes with no load.

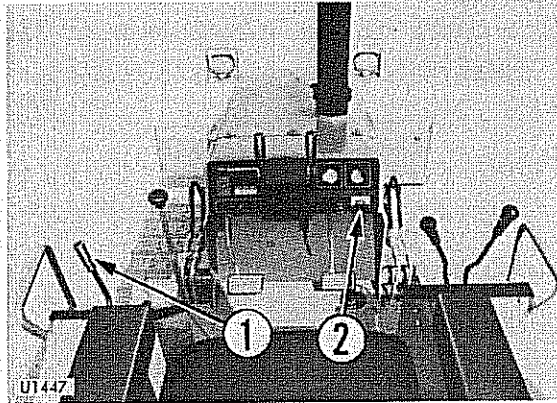


3. After warm-up run is completed, check gauges, warning lamp and charge lamp for proper operation.
  - ★ Continue to run the engine at light load until engine water temperature gauge (3) falls within the green range.

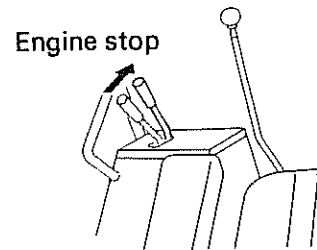
4. Check for normal coloration of exhaust, any abnormal sound or vibration.

- ★ Avoid abrupt acceleration until warm-up run is completed.
- ★ When warm-up run is continued for more than 20 minutes, the engine should be run with load from time to time. If warm-up run with load is impossible, the engine should be run at mid-range speeds.

## STOPPING ENGINE



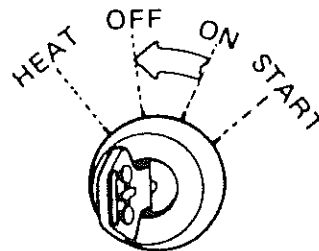
2. Place fuel control lever (1) in ENGINE STOP position.



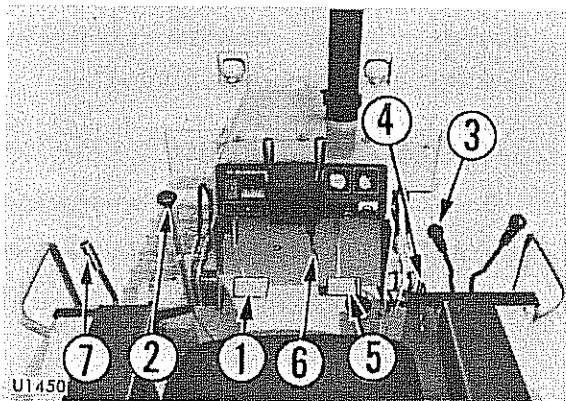
- ★ If engine is stopped abruptly before it cools down, engine life may be greatly shortened. Never stop engine abruptly except in case of emergency.
- ★ Especially when the engine is overheated, allow the engine to idle without immediate stoppage so that the engine is gradually cooled down to be ready for proper stoppage.

1. Cool the engine by running it at low idling speed for about 5 minutes.

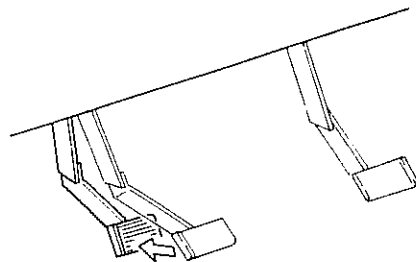
3. Return starting switch key (2) to OFF and remove key.



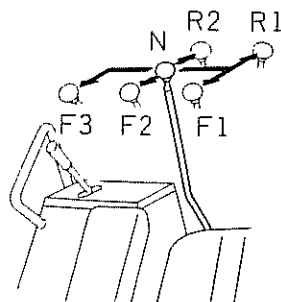
**OPERATING MACHINE**  
**(D20A,P,PL,PLL-6, D20P-6A)**  
**TRAVELING**



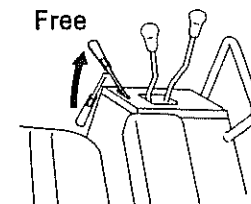
1. Depress main clutch pedal (1).



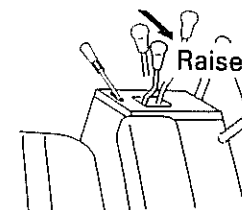
2. Place gear shift lever (2) in a desired speed position.



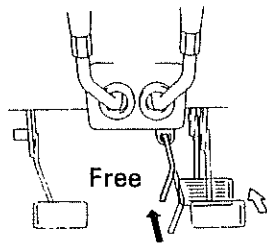
3. Unlock blade control lever (3) with safety lever (4).



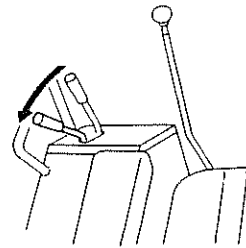
4. Put blade control lever (3) in RAISE position to raise blade 400 to 500 mm off ground.



- (3) 5. Depress brake pedal (5) and place brake lock lever (6) in FREE.

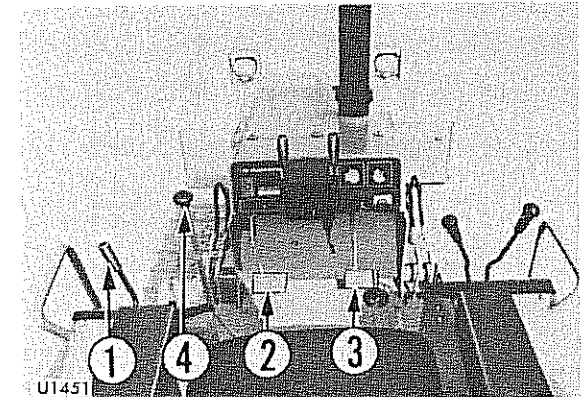


7. By pulling fuel control lever (7), increase the engine speed.

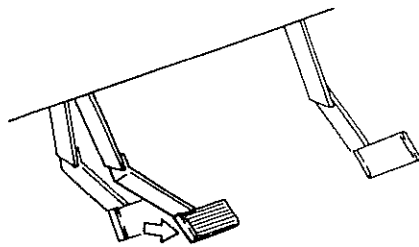


### GEAR SHIFTING OR FORWARD-REVERSE SHIFTING

Depress main clutch pedal and brake pedal to stop the machine, and place gear shift lever in a desired speed position.

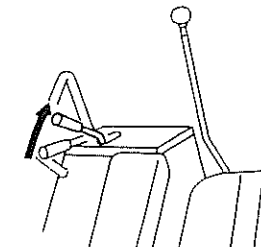


6. Gradually release your foot from main clutch pedal (1) and the machine will start.



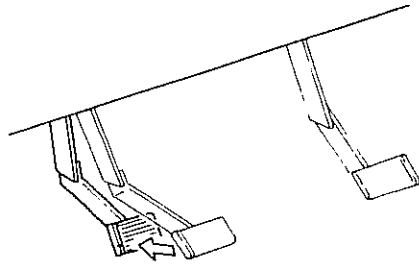
- ★ When starting machine on a steep uphill grade, depress the brake pedal and main clutch pedal, place gear shift lever in 1st speed with engine full speed. Release main clutch pedal gradually, and machine will start slowly or shoe-slip. Then release brake pedal and main clutch pedal completely.

1. Decrease engine speed by fuel control lever (1).

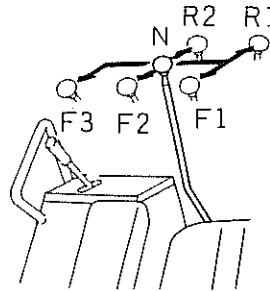


## OPERATING YOUR MACHINE

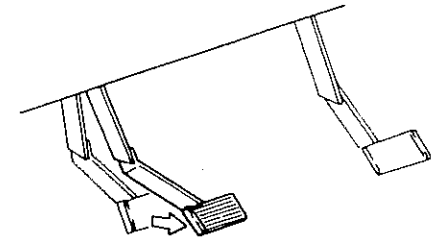
2. Step on main clutch pedal (2) to disengage the clutch.



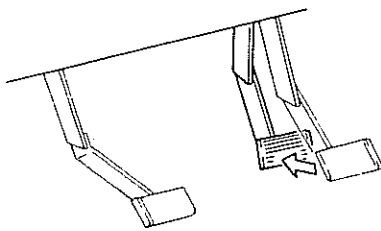
4. Place gear shift lever (4) in a desired speed position.



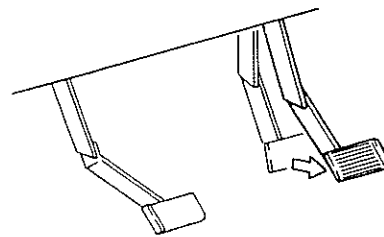
6. Gradually release main clutch pedal (2) to start machine.



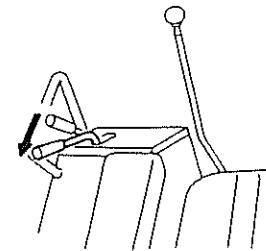
3. Depress brake pedal (3).



5. Release brake pedal (3).

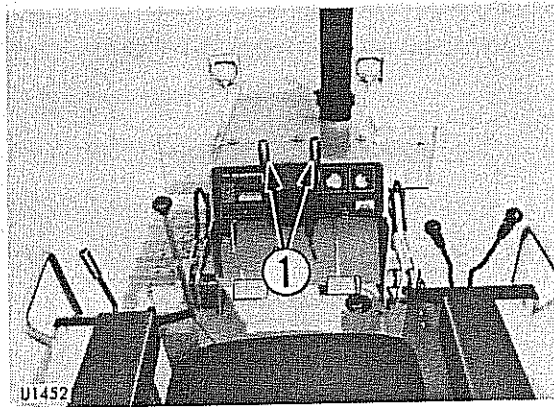


7. By pulling fuel control lever (1), increase the engine speed.

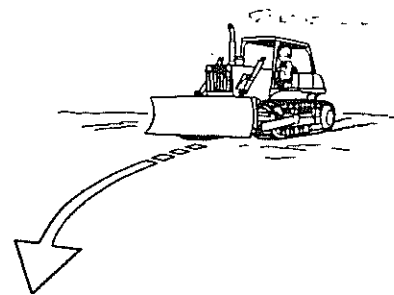
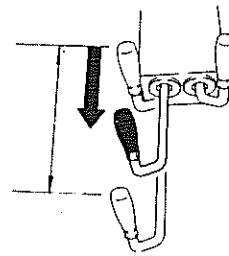


**TURNING**

To make a turn while traveling, pull steering lever (1) on the side in which you would like to turn.

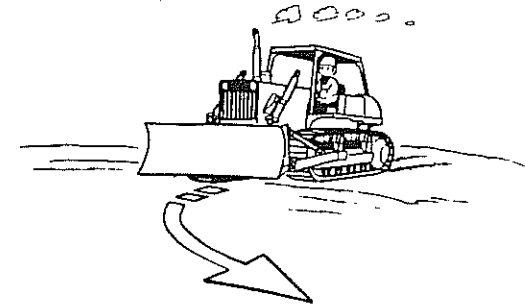
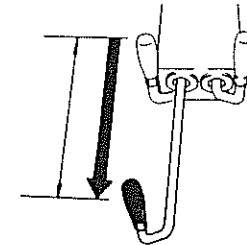


- **To make a gradual left turn**  
Pull the L.H. steering lever half-way (to the detent). The steering clutch will be disengaged, allowing the machine to make a gradual left turn.



- ★ To make a gradual right turn, manipulate the R.H. steering lever in the same manner as described above.

- **To make a pivot left turn**  
Pull the L.H. steering lever all the way backward. The steering clutch will be disengaged and the steering brake will be applied.



- ★ To make a pivot right turn, manipulate the R.H. steering lever in the same manner as described above.

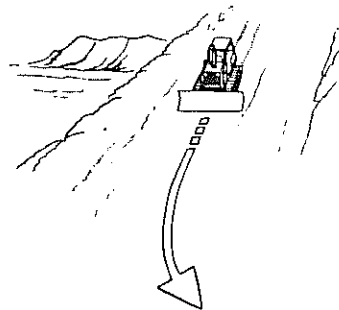
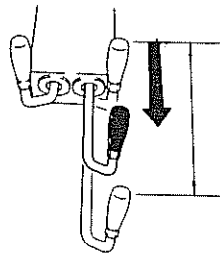


## TURNING WHILE DESCENDING A SLOPE

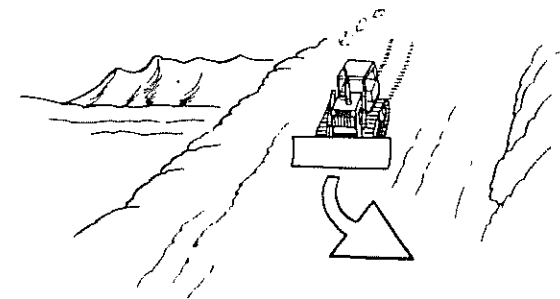
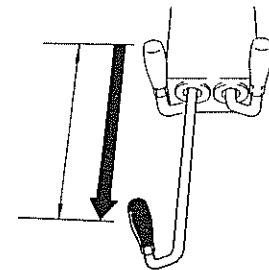
When descending such a sharp slope that the machine will go down of its own weight or when going down a slope with a scraper or the like, you should exercise great care. The machine will turn to the opposite side to that of the pulled lever.

**⚠** 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.

- **To make a gradual left turn**  
Pull the R.H. steering lever half-way to its stroke end. The machine will make a gradual left turn (compensation steering).



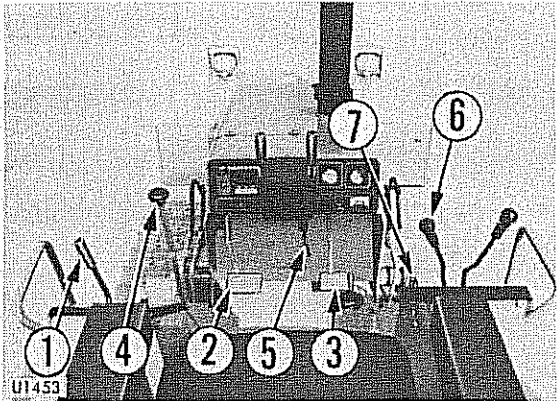
- **To make a pivot left turn**  
Pull the L.H. steering lever all the way backward. Then, the machine will make a pivot left turn (no compensation steering).



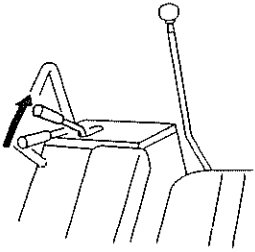
- ★ To make a gradual right turn, manipulate the L.H. steering lever in the same manner as described above.

- ★ To make a pivot right turn, manipulate the R.H. steering lever in the same manner as described above.

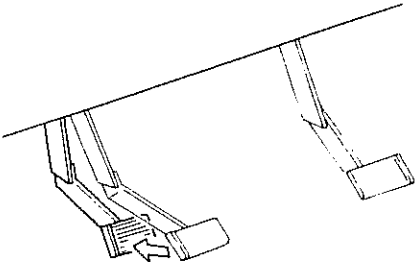
**STOPPING MACHINE**



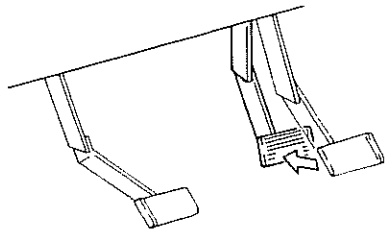
1. Lower engine speed by operating fuel control lever (1).



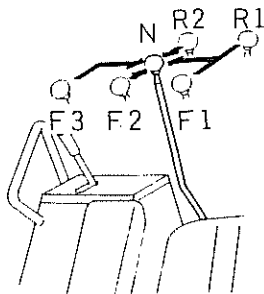
2. Depress main clutch pedal (2).



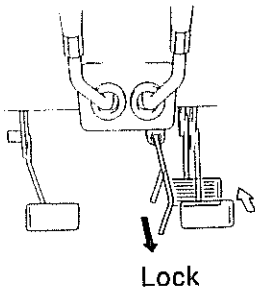
3. Apply brakes by depressing brake pedal (3).



4. Shift gear shift lever (4) to N position.



5. Using brake lock lever (5), lock the steering brake pedal (3).

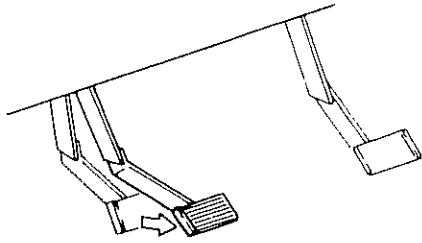


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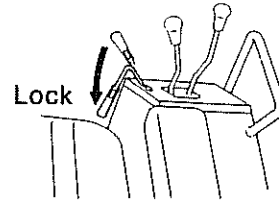
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OPERATING YOUR MACHINE

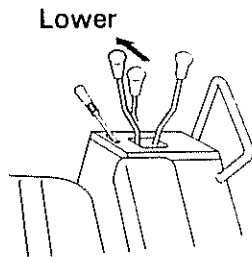
6. Release main clutch pedal (2).



8. Lock blade control lever (6) with safety lever (7).



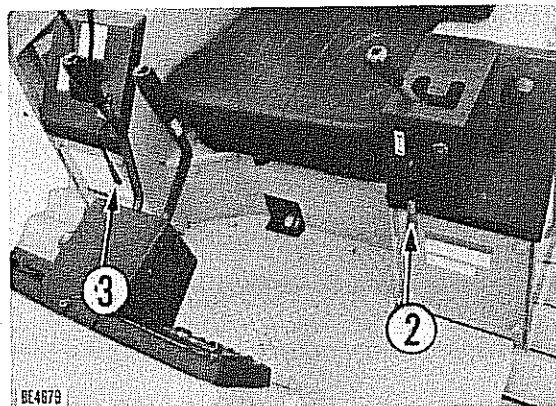
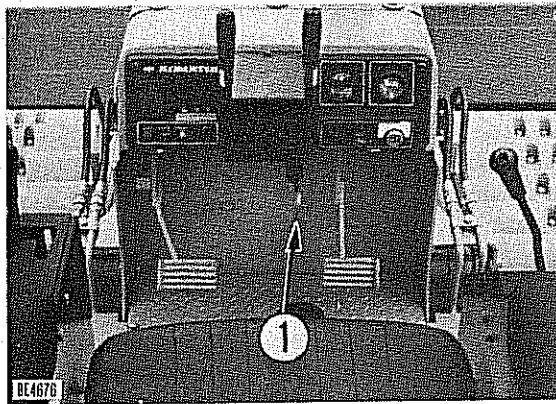
7. Put blade control lever (6) in LOWER position to lower blade to ground while keeping it horizontal.



★ For stopping engine, refer to section HANDLING ENGINE (STOPPING ENGINE).

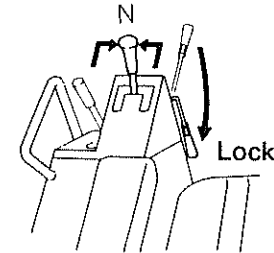
**⚠ Always stop the machine on flat, stable ground. Avoid parking in a dangerous place.**

## HANDLING ENGINE (D21A,E,P,PL-6, D21P-6A, -6B) BEFORE STARTING



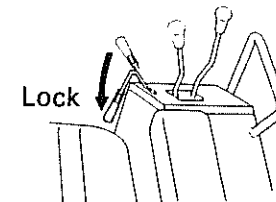
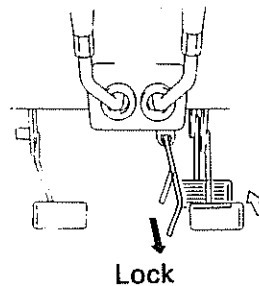
1. Carry out an initial inspection.  
(For details of the inspection see  
CHECK BEFORE STARTING.)

3. Is the gear shift lever in NEUTRAL  
position and locked with safety  
lever (2)?

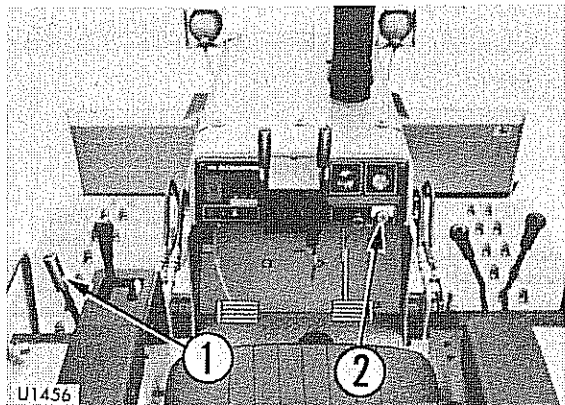


2. Is brake lock lever (1) in LOCK  
position?

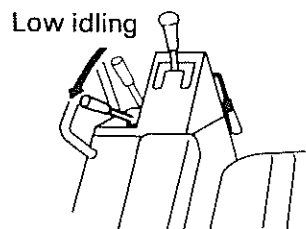
4. Is the blade lowered on the  
ground?  
And is safety lever (3) for blade  
control lever in LOCK position?



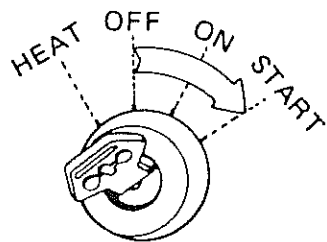
### STARTING ENGINE



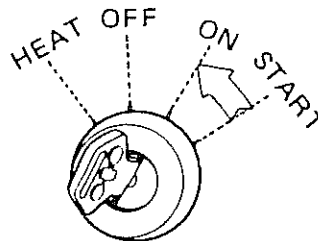
1. Pull fuel control lever (1) a little toward you from low idling position.



2. Turn starting key (2) to START and start engine.



3. Release key (2), 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.
- ★ To start engine in cold weather, refer to "COLD WEATHER OPERATION".

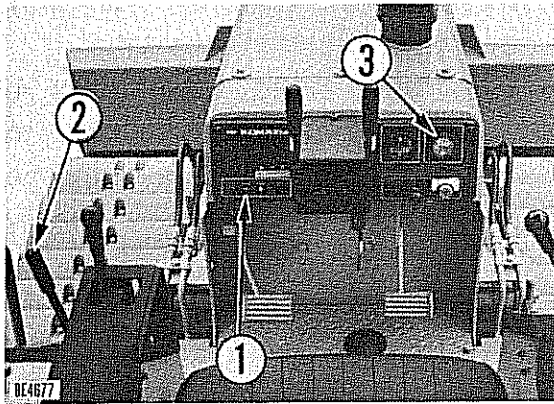
#### Special starting

When starting after running out of fuel, fill with fuel, then fill the fuel filter cartridge with fuel and bleed the air from the fuel system before starting.

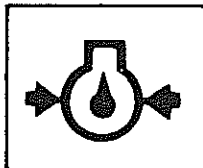
Refer to FUEL FILTER in every 500 hours services.

### CHECKS AFTER START-UP

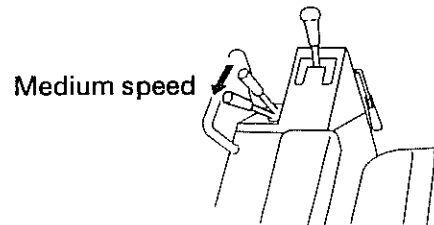
After starting the engine, carry out the following checks prior to machine operation.



1. Run the engine at low idling speed, and check that engine oil pressure warning lamp (1) has gone out.



2. Pull fuel control lever (2) and run the engine at medium speed for about 5 minutes with no load.

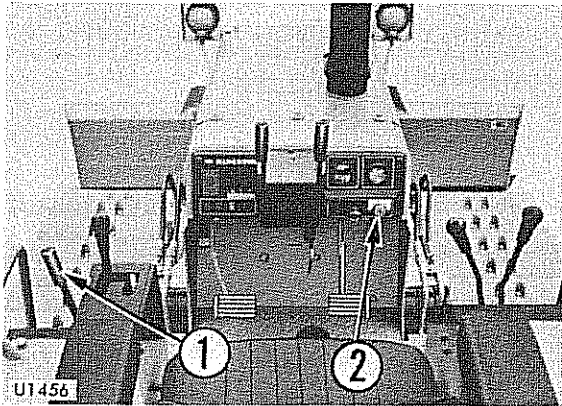


3. After warm-up run is completed, check gauges, warning lamp and charge lamp for proper operation.  
 ★ Continue to run the engine at light load until engine water temperature gauge (3) falls within the green range.

4. Check for normal coloration of exhaust, any abnormal sound or vibration.

- ★ Avoid abrupt acceleration until warm-up run is completed.
- ★ When warm-up run is continued for more than 20 minutes, the engine should be run with load from time to time. If warm-up run with load is impossible, the engine should be run at mid-range speeds.

## STOPPING ENGINE

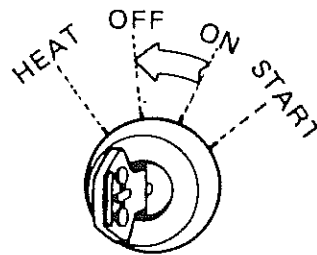


1. Cool the engine by running it at low idling speed for about 5 minutes.

2. Place fuel control lever (1) in ENGINE STOP position.



3. Return starting switch key (2) to OFF and remove key.

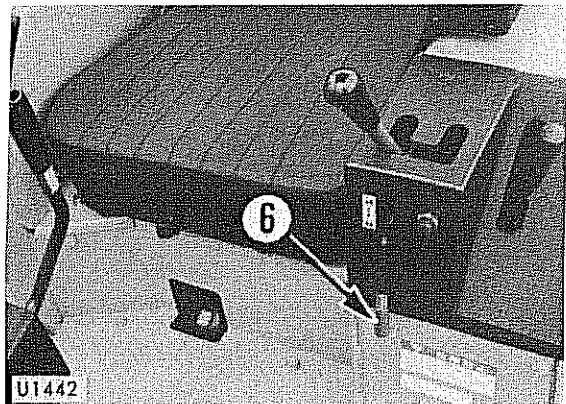
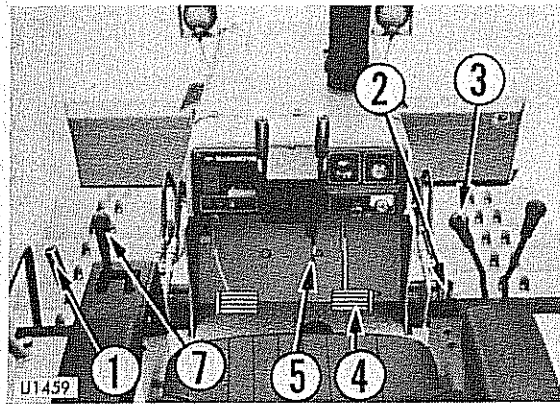


★ If engine is stopped abruptly before it cools down, engine life may be greatly shortened.

Never stop engine abruptly except in case of emergency.

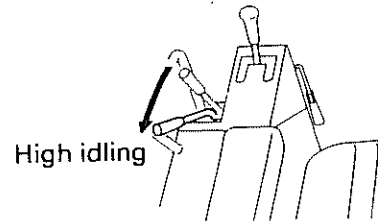
★ Especially when the engine is overheated, allow the engine to idle without immediate stoppage so that the engine is gradually cooled down to be ready for proper stoppage.

**OPERATING MACHINE  
(D21A,E,P,PL-6, D21P-6A, -6B)  
TRAVELING**

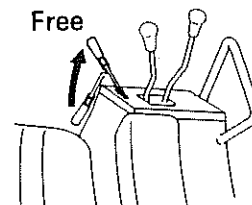


★ The diagram gives an explanation using a machine with 2-speed transmission, but when using a 3-speed transmission, operate in the same way.

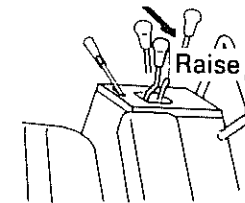
1. Pull fuel control lever (1) to increase engine speed.



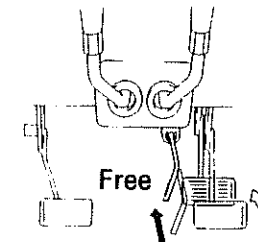
2. Unlock blade control lever (3) with safety lever (2).



3. Put blade control lever (3) in RAISE position to raise blade 400 to 500 mm off ground.



4. Depress brake pedal (4) and place brake lock lever (5) in FREE.

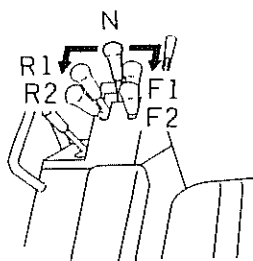




5. Unlock gear shift lever (7) with safety lever (6).



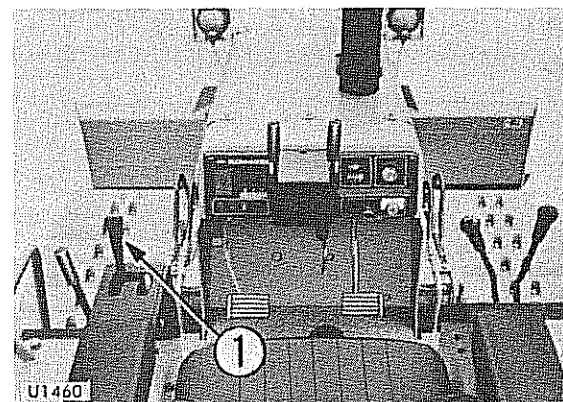
6. Shift gear shift lever (7) in a desired position and start machine.



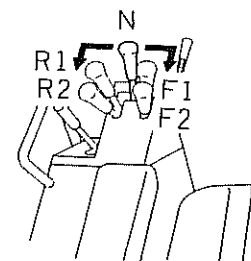
**!** When starting the machine on a steep uphill grade, run engine at full-throttle and shift gear shift lever into 1st with brake pedal depressed. When machine has started slowly (or track shoes are slipping), propel the machine by slowly releasing brake pedal.

## GEAR SHIFTING

There is no need to stop machine to shift gears.

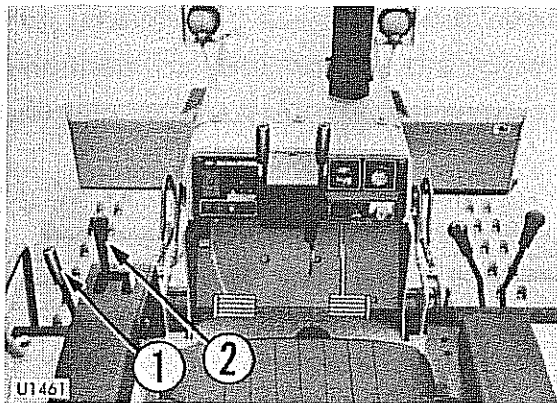


Gears can be shifted into any position by gear shift lever (1).



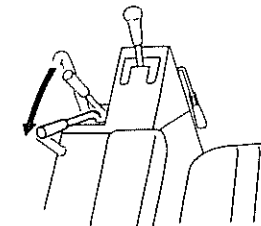
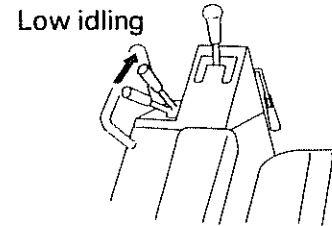
### FORWARD-REVERSE SHIFTING

Forward-reverse shifting should be made after reduction of machine speed for safety purpose and preventing shock to machine.

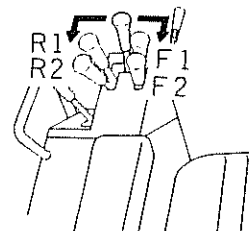


1. Lower engine speed by fuel control lever (1).

3. Increase engine speed by fuel control lever (1).



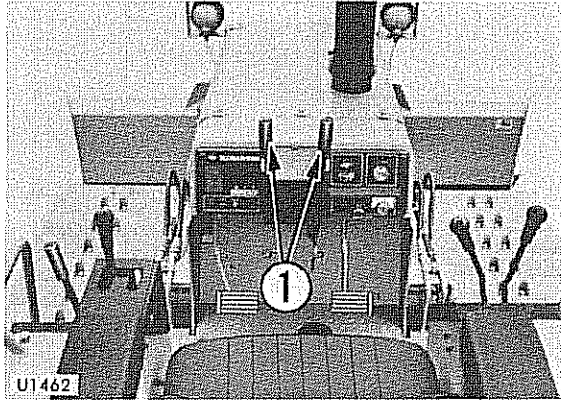
2. Shift gear shift lever (2) to desired position.



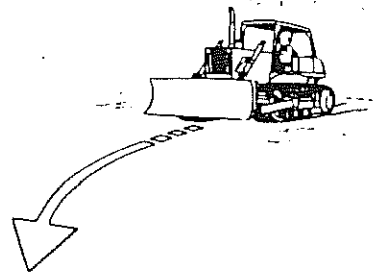
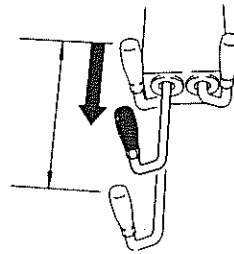
## OPERATING YOUR MACHINE

### TURNING

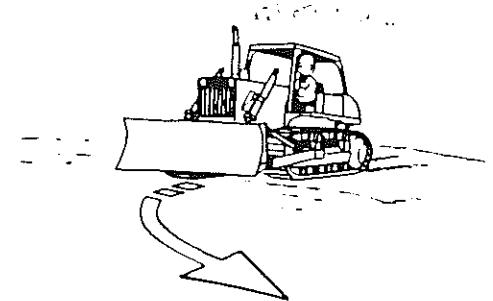
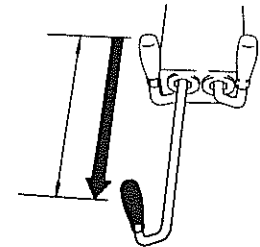
To make a turn while traveling, pull steering lever (1) on the side in which you would like to turn.



- **To make a gradual left turn**  
Pull the L.H. steering lever half-way (to the detent). The steering clutch will be disengaged, allowing the machine to make a gradual left turn.



- **To make a pivot left turn**  
Pull the L.H. steering lever all the way backward. The steering clutch will be disengaged and the steering brake will be applied.



- ★ To make a gradual right turn, manipulate the R.H. steering lever in the same manner as described above.

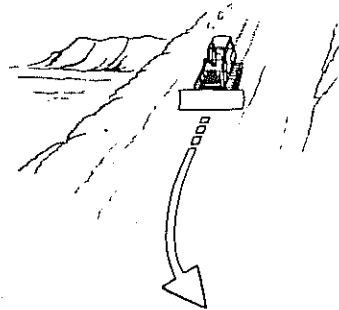
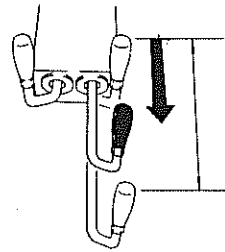
- ★ To make a pivot right turn, manipulate the R.H. steering lever in the same manner as described above.

## TURNING WHILE DESCENDING A SLOPE

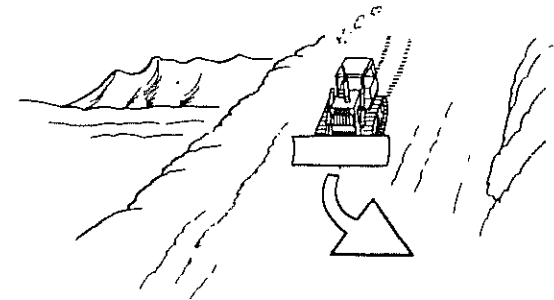
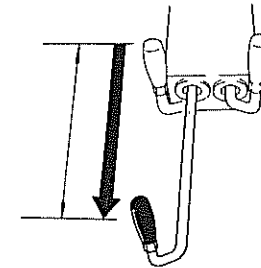
When descending such a sharp slope that the machine will go down of its own weight or when going down a slope with a scraper or the like, you should exercise great care. The machine will turn to the opposite side to that of the pulled lever.

**⚠** 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.

- **To make a gradual left turn**  
Pull the R.H. steering lever half-way to its stroke end. The machine will make a gradual left turn (compensation steering).



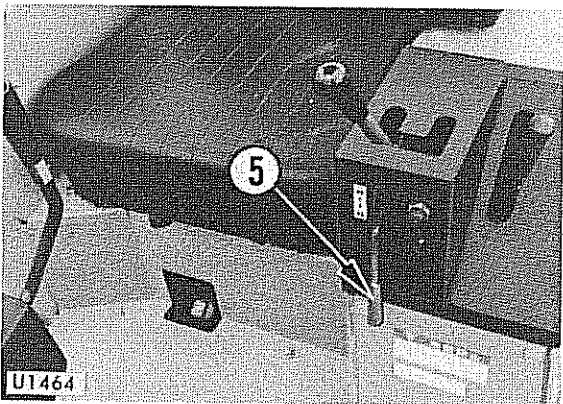
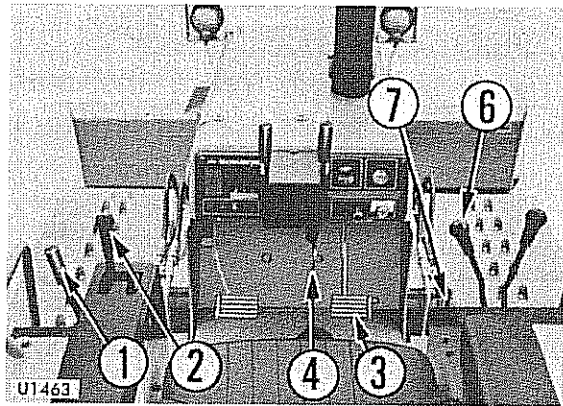
- **To make a pivot left turn**  
Pull the L.H. steering lever all the way backward. Then, the machine will make a pivot left turn (no compensation steering).



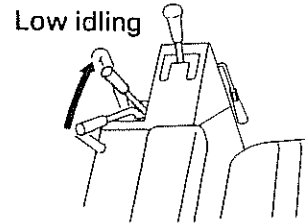
- ★ To make a gradual right turn, manipulate the L.H. steering lever in the same manner as described above.

- ★ To make a pivot right turn, manipulate the R.H. steering lever in the same manner as described above.

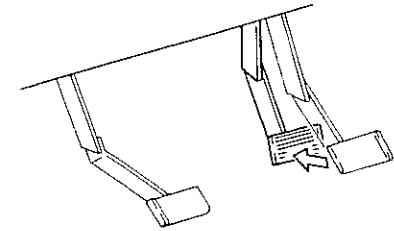
**STOPPING MACHINE**



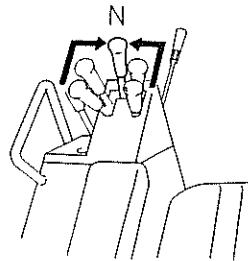
1. Lower engine speed by operating fuel control lever (1).



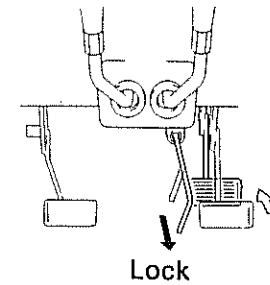
3. Depress brake pedal (3) to stop the machine.



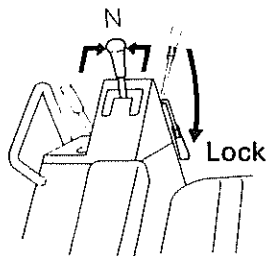
2. Place gear shift lever (2) in NEUTRAL position.



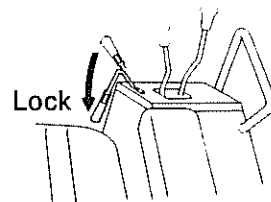
4. Lock the brakes with brake lock lever (4).



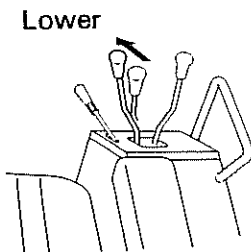
5. Lock gear shift lever (2) with safety lever (5).



7. Lock blade control lever (6) with safety lever (7).



6. Put blade control lever (6) in LOWER position to lower blade to ground while keeping it horizontal.

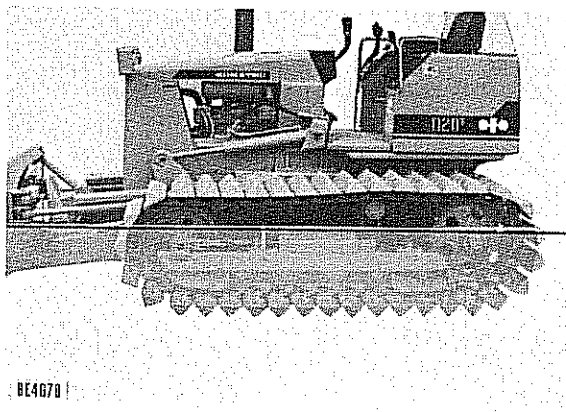


★ For stopping engine, refer to section HANDLING ENGINE (STOPPING ENGINE).

**!** Always stop the machine on flat, stable ground. Avoid parking in a dangerous place..

## PRECAUTIONS FOR MACHINE OPERATION

- If the fuel level is too low on sloped areas, the engine may draw excess air due to sloped grade or machine vibration and stop.
- 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.
- If the steering clutch one side is used frequently or if many gradual turns are made with steering clutch half-engaged, the steering clutch will wear out in a short time. Design the travel road well and steer the machine properly.
- When going downhill, shift gear shift lever into low speed to run engine at slow speed and travel down slope using the engine as a brake. If there is danger of over-running the engine, slow the machine by braking.
- When the engine stops on a slope, immediately depress brake pedal and stop the machine with the work equipment lowered. Then, lock the brake pedal by applying the brake lock lever. Thereafter, move the gear shift lever to neutral position and proceed to the engine starting procedure again.



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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  $-10^{\circ}\text{C}$ .

- 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.

#### Mixing rate of water and antifreeze

Min. atmospheric temperature ( $^{\circ}\text{C}$ )	-5	-10	-15	-20
Amount of antifreeze ( $\ell$ )	2.3	3.0	3.6	4.1
Amount of water ( $\ell$ )	7.7	7.0	6.4	5.9

Coolant capacity: 10  $\ell$

#### ★ 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 so that antifreeze (except permanent type) is not needed, replace by clean water (ex: city water) after perfectly cleaning the cooling system.



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



**Care in using antifreeze**

Use a Permanent Antifreeze (ethylene glycol mixed with corrosion inhibitor, antifoam agent, etc.) meeting the standard requirements as shown below. With permanent antifreeze, no change of coolant is required for a year. If it is doubtful that an available antifreeze meets the standard requirements, ask the supplier of that antifreeze for information.

Standard requirements for permanent antifreeze

- SAE ..... J1034
- FEDERAL STANDARD  
..... O-A-548D

★ Never use any antifreeze made from methyl alcohol or ethyl alcohol which may be a cause of engine trouble.

★ Where no permanent antifreeze is available, an ethylene glycol antifreeze without corrosion inhibitor may be used only for the cold season. In this case, coolant must be changed two times a year (at the beginning and at the end of the cold season).

★ Do not mix and antifreeze with one of different brand.

★ Absolutely avoid using any water leak preventing agent irrespective of whether it is used independently or mixed with an antifreeze.

● Battery

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

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

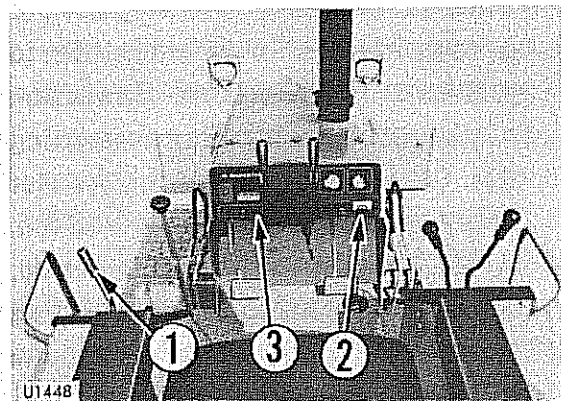
Temp. of fluid Rate of charge	20°C	0°C	-10°C	-20°C
100%	1.28	1.29	1.30	1.31
90%	1.26	1.27	1.28	1.29
80%	1.24	1.25	1.26	1.27
75%	1.23	1.24	1.25	1.26

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

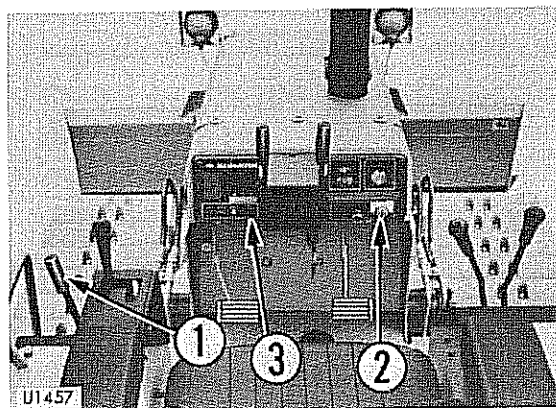
## STARTING IN COLD WEATHER

For the pre- and post-starting inspection, refer to the section OPERATING YOUR MACHINE.

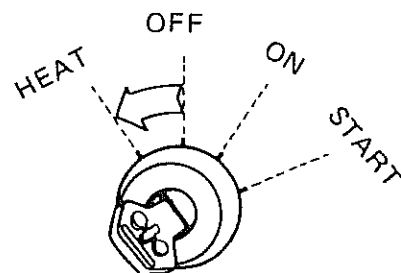
### D20



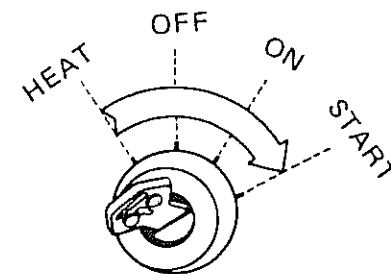
### D21



1. Pull fuel control lever (1) a little toward you from LOW IDLING position.
2. Place starting switch (2) in the HEAT position to red-hot heater signal (3).



3. When heater signal (3) becomes red, turn key (2) to START position to start engine.

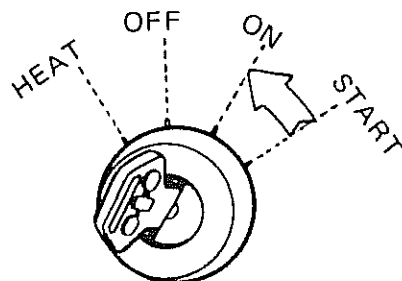


Necessary preheating times are as follows:

Ambient temperature	Preheat time
10°C – 0°C	20 seconds
0°C – –20°C	35 seconds

## COLD WEATHER OPERATION

4. Return key (2) to the ON position.



5. Put fuel control lever (1) in LOW IDLING position.

- ★ If engine fails to start, repeat steps 2 and 3 after about 2 minutes.
- ★ Do not allow the starting motor to run continuously for more than 20 seconds. If the engine fails to start, wait about 2 minutes before trying to start it again.

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

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

## CAUTIONS AFTER COMPLETION OF WORK

1. Mud and water 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 system so that such water may be frozen at night.
3. As battery capacity drops at low ambient temperature, cover the battery or remove it from the machine to be kept warm at night.

## AFTER COLD WEATHER

- When weather becomes warm, perform the following without fail:
- Replace lubricating oils for various units with the ones specified for warm-weather use.
  - Drain antifreeze coolant (except permanent type), flush the inside of cooling system completely, and fill with clean soft water (such as city water).

## 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.

### OPERATION METHOD

- Select the track shoe that best suits the type of soil to be encountered in service.
- Do not allow shoe slipping to occur during operation. If shoe slipping occurs, reduce load until slipping stops.
- Avoid sudden starts, acceleration or stops, unnecessarily high speeds and sharp turns.
- 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.
- 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.
- Prior to operation, clear boulders and obstacles to prevent machine from riding over them while operating.

## PERIODIC MAINTENANCE

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

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

# MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
<b>CHECK BEFORE STARTING</b>			
a	Oil and water leak	Check	19
b	Bolts and nuts	Check and retighten	19
c	Electric wiring	Check and retighten	19
d	Coolant	Check and supply	19
e	Fuel tank	Check and supply	20
f	Engine oil pan	Check and supply	20
g	Main clutch case (D20)	Check and supply	21
h	Transmission case (D21)	Check and supply	21
i	Transmission, bevel gear case (D20)	Check and supply	21
j	Transfer, bevel gear case (D21)	Check and supply	21
k	Steering lever	Check travel	22
l	Brake pedal	Check travel	22
m	Main clutch pedal (D20)	Check play	22
n	Main clutch inertia brake (D20)	Check effect	23

No.	ITEM	SERVICE	PAGE
o	Water separator	Inspect float position	23
<b>EVERY 50 HOURS SERVICE</b>			
a	Fuel tank	Drain water and sediment	58
<b>INITIAL 250 HOURS SERVICE</b>			
a	Fuel filter	Replace cartridge	59
b	Engine oil pan and filter	Change oil and replace cartridge	59
c	Main clutch case (D20)	Change oil and clean strainer	59
d	Transmission, bevel gear case (D20)	Change oil	59
e	Transmission case (D21)	Change oil and clean strainer	59
f	Transfer, bevel gear case (D21)	Change oil	59
g	Hydraulic tank and filter	Change oil and replace element	59
h	Final drive case	Change oil	59
i	Engine valve clearance	Check and adjust	59

MAINTENANCE TABLE

No.	ITEM	SERVICE	PAGE
<b>EVERY 250 HOURS SERVICE</b>			
a	Lubricating		59
•	Hydraulic angle-tilt dozer		59
-1	Angle cylinder bottom pin	Lubricate 2 points	59
-2	Angle cylinder head pin	Lubricate 2 points	59
-3	Tilt cylinder head pin	Lubricate 1 point	59
-4	Tilt cylinder bottom pin	Lubricate 1 point	59
-5	Lift cylinder head pin	Lubricate 2 points	60
-6	Lift cylinder bottom pin	Lubricate 2 points	60
-7	Rod pin	Lubricate 2 points	60
-8	Angle-tilt frame center pin	Lubricate 1 point	60
-9	Angle-tilt frame support pin	Lubricate 2 points	60
•	Hydraulic tilt dozer		60
-10	Lift cylinder yolk	Lubricate 8 points	60
-11	Lift cylinder head pin	Lubricate 2 points	60
-12	Tilt cylinder head pin	Lubricate 1 point	61
-13	Tilt brace pin	Lubricate 2 points	61

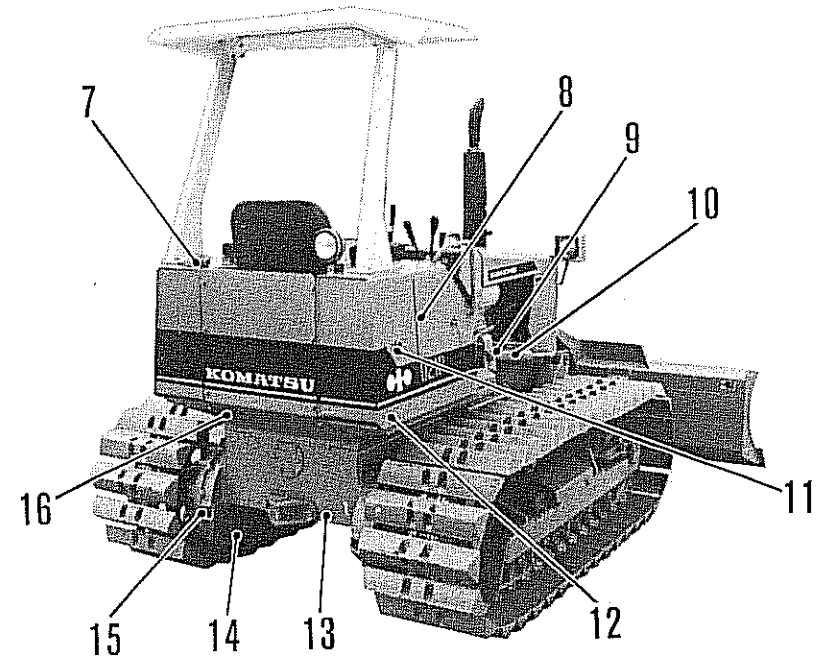
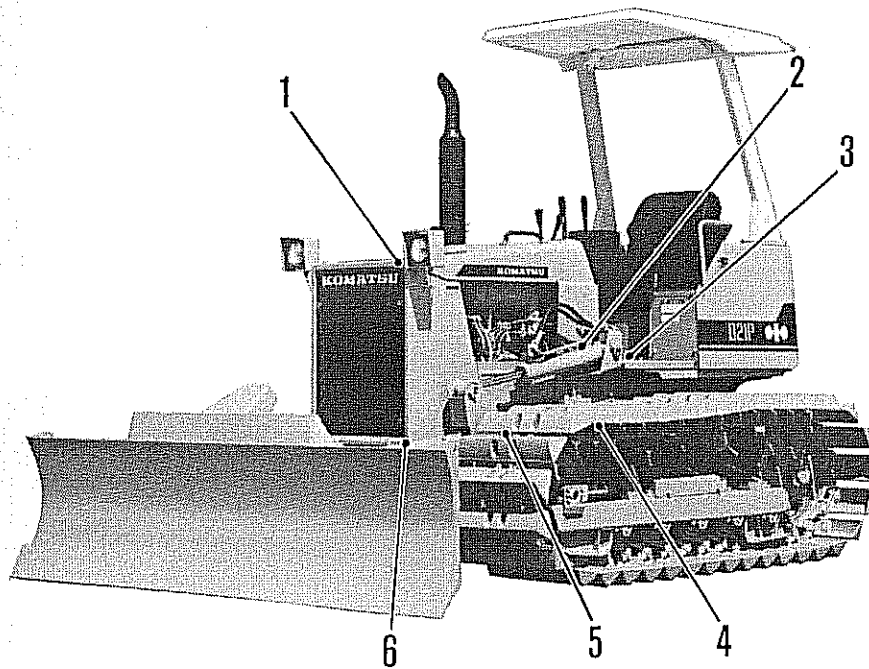
No.	ITEM	SERVICE	PAGE
-14	Center brace pin	Lubricate 4 points	61
b	Check oil level		61
-1	Final drive case	Check and supply	61
-2	Hydraulic tank	Check and supply	62
c	Fan belt	Check tension	62
d	Battery electrolyte level	Check	63
e	Air cleaner element	Clean	64
<b>EVERY 500 HOURS SERVICE</b>			
a	Fuel filter	Replace cartridge	67
b	Engine oil pan and filter	Change oil and replace cartridge	68
c	Breather	Clean	69
d	Radiator fin	Clean	70





## OIL FILLER AND LEVEL GAUGE POSITIONS

- |   |                                      |  |
|---|--------------------------------------|--|
| 1. Cooling water inlet                                      | 4. Main clutch case drain plug (D20) | 10. Engine oil pan level gauge                     |
| 2. Main clutch case oil filler and gauge (D20)              | Transmission case drain plug (D21)   | 11. Hydraulic tank level gauge                     |
| 3. Transmission case oil filler and gauge (D21)             | 5. Engine oil pan drain plug         | 12. Hydraulic tank drain plug                      |
| 3. Transmission, bevel gear case oil filler and gauge (D20) | 6. Cooling water drain valve         | 13. Transmission, bevel gear case drain plug (D20) |
| Transfer, bevel gear case oil filler and gauge (D21)        | 7. Fuel tank oil filler and gauge    | Transfer, bevel gear case drain plug (D21)         |
|   | 8. Hydraulic tank oil filler         | 14. Final drive case drain plug                    |
|   | 9. Engine oil pan oil filler         | 15. Final drive case oil filler                    |
|   |                                      | 16. Fuel tank drain valve                          |



EVERY 50 HOURS SERVICE

## ***EVERY 50 HOURS SERVICE***

### **a. FUEL TANK**

Loosen valve (1) on the bottom of the tank so that the sediment and mixed water will be drained with fuel.



## INITIAL 250 HOURS SERVICE

Perform the following maintenance after running the machine for the first 250 hours.

- a. FUEL FILTER
- b. ENGINE OIL PAN AND FILTER
- c. MAIN CLUTCH CASE (D20)
- d. TRANSMISSION, BEVEL GEAR CASE (D20)
- e. TRANSMISSION CASE (D21)
- f. TRANSFER, BEVEL GEAR CASE (D21)
- g. HYDRAULIC TANK AND FILTER
- h. FINAL DRIVE CASE
- i. ENGINE VALVE CLEARANCE

For details of the method of replacing or maintaining, see the section on EVERY 500 HOURS, 1000 HOURS AND 2000 HOURS SERVICE.

## EVERY 250 HOURS SERVICE

### a. LUBRICATING

Apply grease to grease fittings shown by arrows.

- Hydraulic angle-tilt dozer

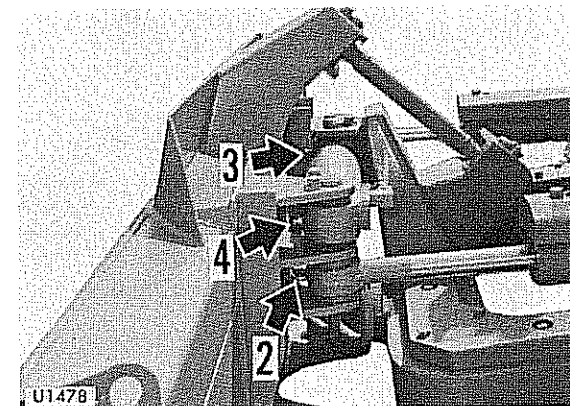
1. Angle cylinder bottom pin (2 points)



INITIAL 250 HOURS SERVICE  
EVERY 250 HOURS SERVICE

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

2. Angle cylinder head pin (2 points)
3. Tilt cylinder head pin (1 point)
4. Tilt cylinder bottom pin (1 point)



EVERY 250 HOURS SERVICE

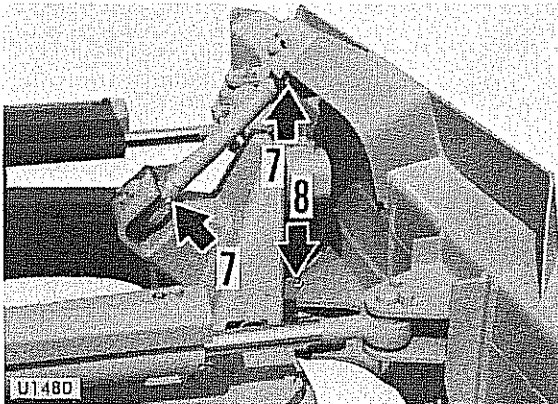
5. Lift cylinder head pin (2 points)

6. Lift cylinder bottom pin (2 points)

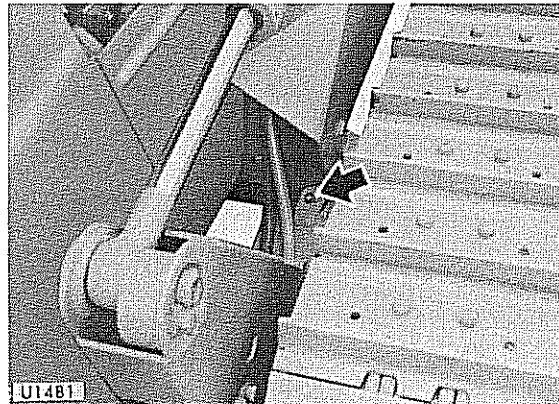


7. Rod pin (2 points)

8. Angle-tilt frame center pin (1 point)

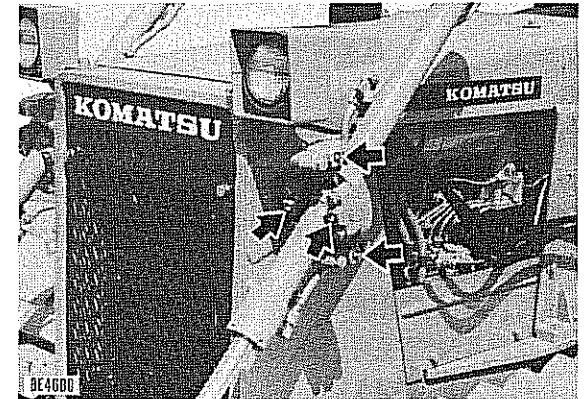


9. Angle-tilt frame support pin (2 points)

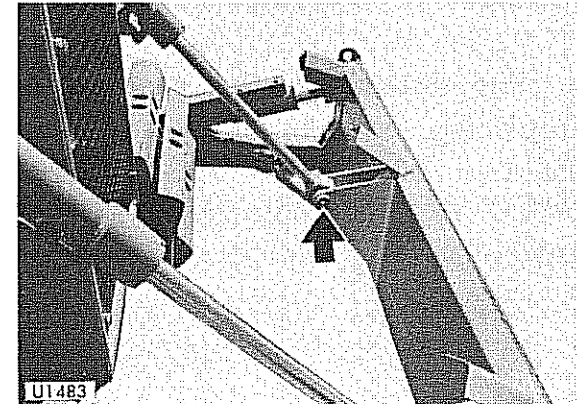


● Hydraulic tilt dozer

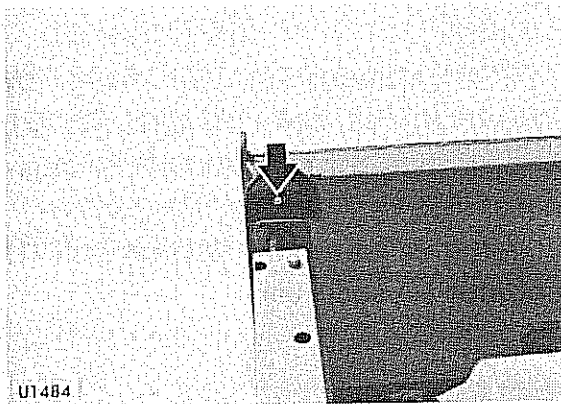
10. Lift cylinder yolk (8 points)



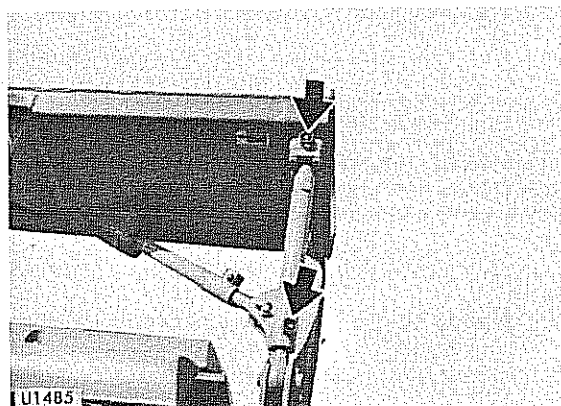
11. Lift cylinder head pin (2 points)



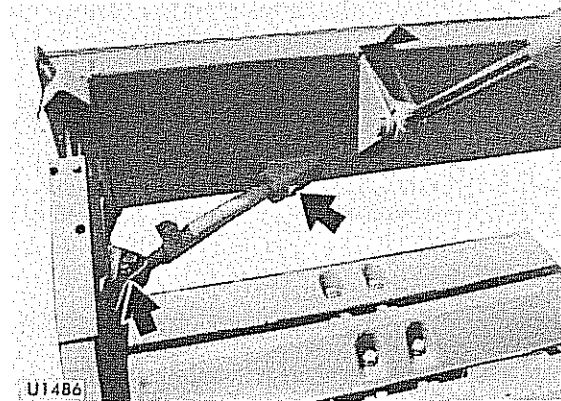
12. Tilt cylinder head pin (1 point)



13. Tilt brace pin (2 points)



14. Center brace pin (4 points)

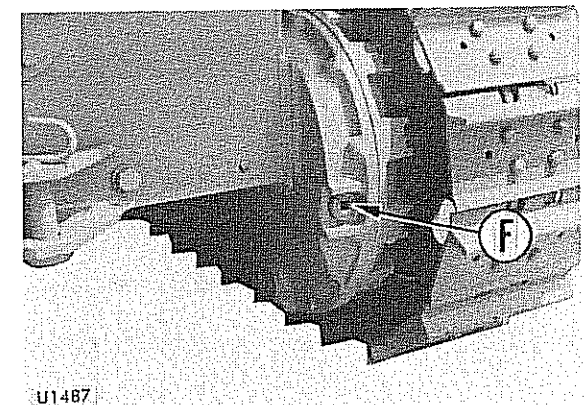


**b. CHECK AND CORRECT OIL LEVEL**

**1. Final drive case**

Remove plug (F) 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.

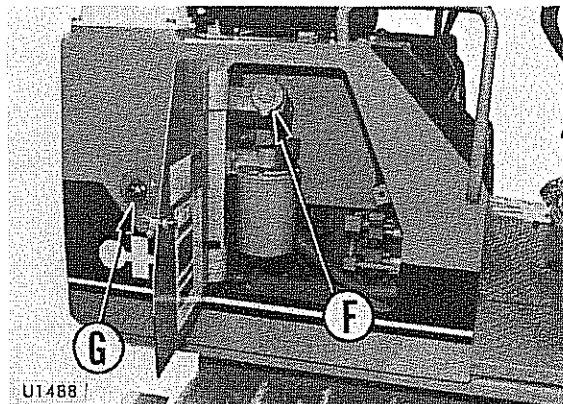
- ★ Check while parking the machine on level ground.
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".





## 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).



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

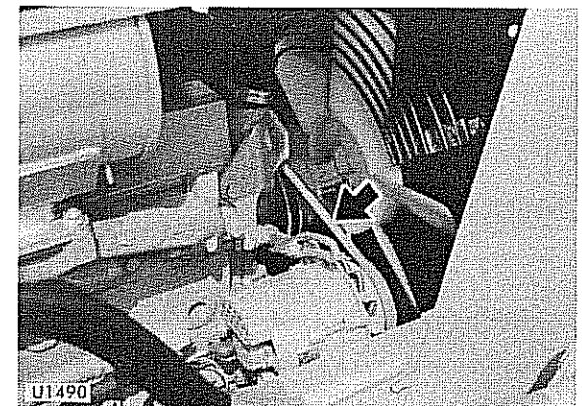
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

## c. FAN BELT

Push the intermediate location between the alternator and the fan pulley with thumb (approximately 6 kg). The standard drooping is 6 to 10 mm.

The adjustment is made by loosening the bolt (1) and nut (2), and shifting the position of the alternator (3).

After adjustment, tighten bolt (1) and nut (2) securely.



- ★ When adjusting the V-belt, do not attempt to push alternator (3) directly with a bar or the like, but use a wood pad to prevent damage to the core.
- ★ Check each pulley for damage, and V-grooves and V-belt for wear. Particularly, check whether V-belt is in contact with bottom of V-groove through wear.

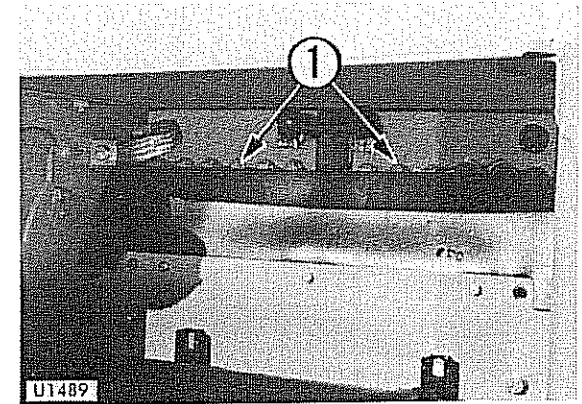
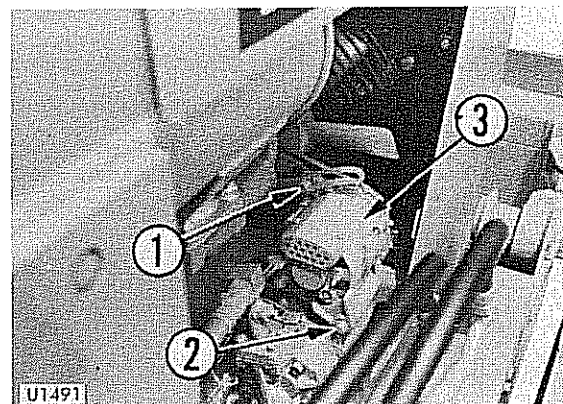
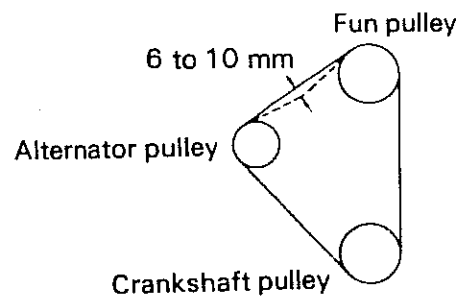
- ★ Replace belt if it has stretched, leaving no allowance for adjustment, or if there is a cut or crack on belt.
- ★ When the new belt is set, readjust it after operation for an hour.

#### d. BATTERY ELECTROLYTE

Add distilled water if battery fluid level is below prescribed level (10 to 12 mm above plates). If electrolyte has been reduced by spilling, have a battery service shop fill battery with dilute sulfuric acid of same strength.

Clean air vent of battery cap (1) when checking fluid level.

- ★ Do not use metallic funnel for adding fluid.





**⚠** To avoid gas explosions, do not bring fire or sparks near the battery.

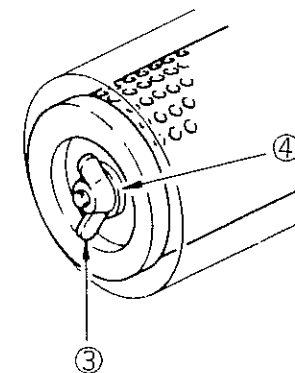
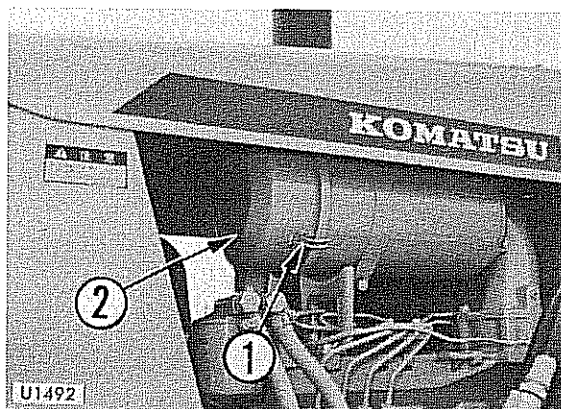
**⚠** If the electrolyte gets on your skin or clothes, immediately wash with plenty of clean water.

### e. AIR CLEANER ELEMENT

Cleaning or inspecting the outer element

1. Loosen clip (1), remove cover (2), wing nut (3) and the outer element.
2. Clean the air cleaner body interior and the removed cover.
3. Clean and inspect the element. (See the item "Cleaning outer element" 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 seal washer (4) or wing nut (3) if they are broken.




- ★ 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 inner element

1. First remove the cover and the outer element, and then remove the inner element.
2. Cover the air inlet 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 and tighten it with nuts.
5. Install the outer element and the cover.

**NOTE: Do not attempt to reinstall a cleaned inner element.**

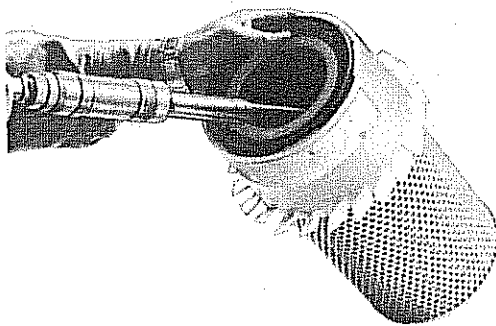
 **Do not clean or replace the air cleaner element with the engine running.**

## Cleaning outer element

### With compressed air

Direct dry compressed air (less than 7 kg/cm<sup>2</sup>) 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 safety.**



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The following methods require spare parts.

### With water

Dash city water (less than 3 kg/cm<sup>2</sup>) on element from inside along folds, then from outside and again from inside. Dry and check it.

### With cleaning agent

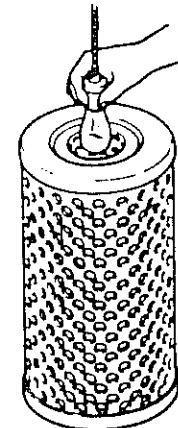
For removing oils and fats as well as carbon etc. attached on the element, the element may be cleaned in lukewarm solution of mild detergent, then rinsed in clean water and left to drip dry.

★ Drying can be speeded up by blowing dried compressed air (less than 7 kg/cm<sup>2</sup>) from the inside to the outside of the element.

Never attempt to heat the element.

★ Using warm water (about 40°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, wrap it and store it in dry place.
- ★ Do not use element whose folds or gasket or seal are damaged.
- ★ When cleaning element, do not hit it or beat it against something.



## EVERY 500 HOURS SERVICE

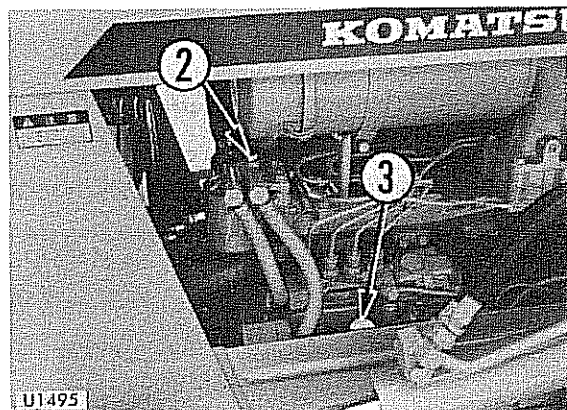
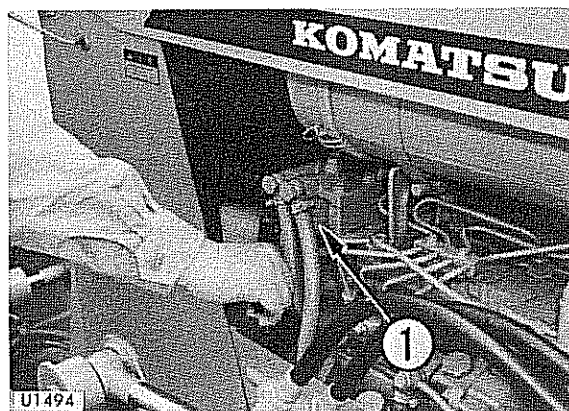
### a. FUEL FILTER

1. Using a filter wrench, remove filter cartridge (1) by turning it counterclockwise.
  2. Clean the filter base, fill the new cartridge with fuel and refit it after applying a dab of oil to the gasket face.
- ★ To refit the cartridge, place the gasket face in contact with the seal face of the filter base, then screw up the cartridge 1/2 to 3/4 turn (be careful not to tighten it up excessively).

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

3. After replacing the cartridge, loosen air vent plug (2).
4. Loosen feed pump knob (3) and move the pump up and down to draw off fuel until air ceases to come out of plug (2).
5. Tighten up air vent plug (2). Push in the knob of feed pump (3) and tighten it.

- ★ After replacing the cartridge, start up the engine and check the filter seal face for possible oil leakage.
- ★ Be sure to use a genuine Komatsu cartridge.



● **Method of using automatic air bleed mechanism**

It is possible to bleed the air from the fuel circuit simply by rotating the starting motor with the starting switch.

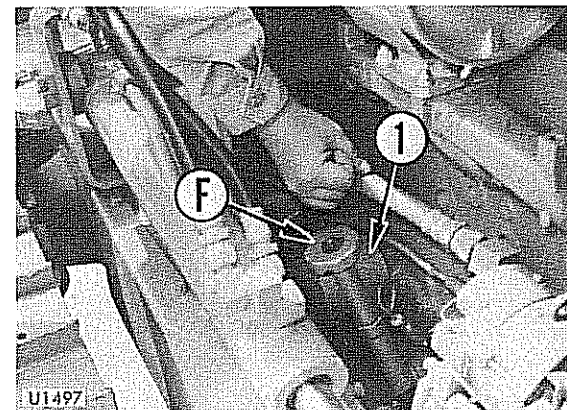
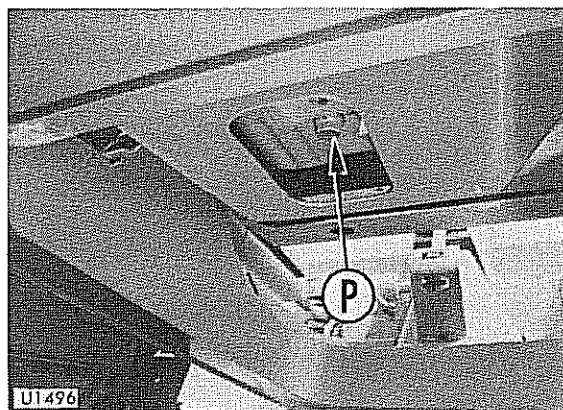
Bleed the air as follows.

1. After replacing the filter cartridge, check that the fuel control lever is at the STOP position.
  2. Turn the starting switch key to the START position and rotate the starting motor for 15 - 25 seconds to crank the engine and bleed the air.
- ★ When the engine has run out of fuel, carry out the same procedure and crank the engine for 30 - 35 seconds.
- Repeat this operation 2 - 3 times to bleed the air.
- ★ Do not rotate the starting motor continuously for more than 35 seconds. Wait for 1-2 minutes before rotating again.
  - ★ The time taken to bleed the air is shorter when the fuel tank is full.

**b. ENGINE OIL PAN AND FILTER**

1. Remove cover mounted under machine body.
2. Remove drain plug (P) to drain oil. After draining, tighten it.
3. Using a filter wrench, remove filter cartridge (1) by turning it counterclockwise.
4. Clean the filter base and refit the new cartridge after applying a dab of oil to the gasket face.

- ★ To refit the cartridge, place the gasket face in contact with the seal face of the filter base, then screw up the cartridge 1/2 to 3/4 turn (be careful not to tighten it up excessively).
5. After replacing the cartridge, fill engine oil through oil filler (F). Then idle the engine for a while, and recheck oil level.
- ★ If filter cartridge is removed immediately after stopping the engine, oil will spill. Wait at least 10 minutes after stopping the engine before replacing the filter cartridge.

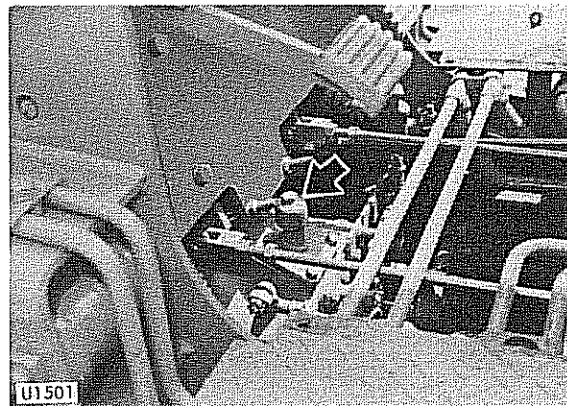


- ★ Refill capacity: 7 ℓ
- ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".
- ★ Use a genuine Komatsu cartridge.
- ★ Change the engine oil every 6 months regardless of service hours.
- ★ Use API category CD class oil. If CC class oil must be used, change the oil and replace the oil filter at half the usual interval (250 hours).

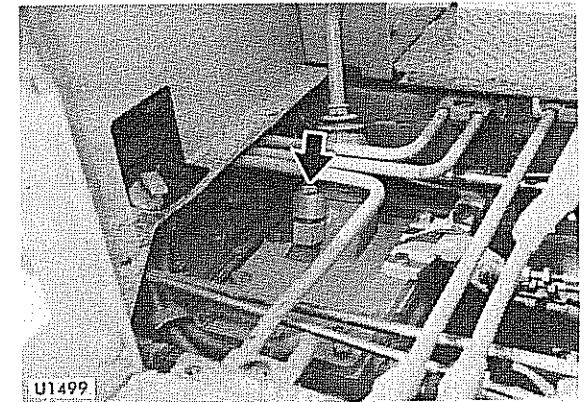
**c. BREATHER**

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

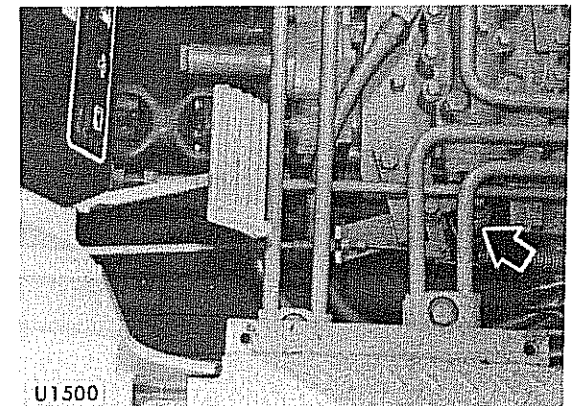
1. Main clutch case breather (1 point)  
D20A,P,PL,PLL-6, D20P-6A



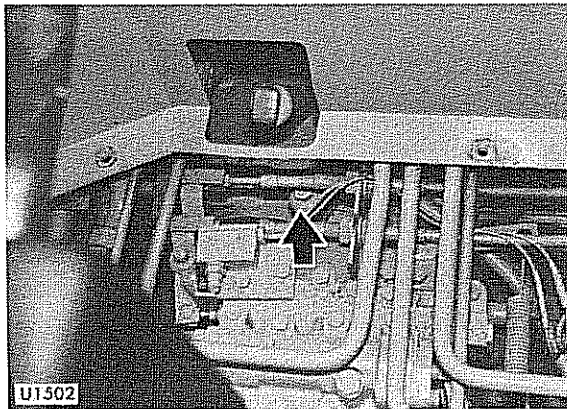
2. Transmission case breather (1 point)  
D20A,P,PL,PLL-6, D20P-6A



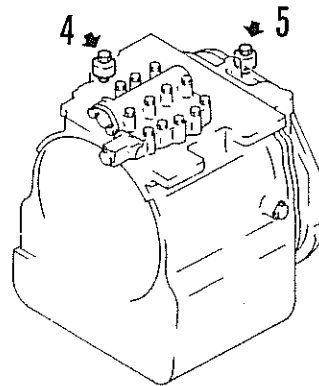
- D21A,P,PL-6, D21P-6A



3. Transfer, bevel gear case breather (1 point)  
D21A,P,PL-6, D21P-6A



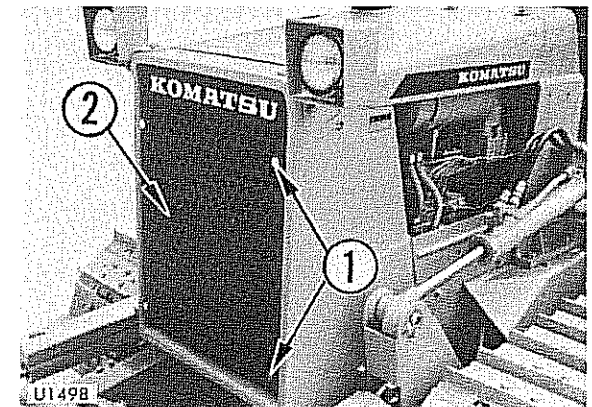
4. Transmission case breather D21E-6, D21P-6B (1 point)  
5. Transfer, bevel gear case breather D21E-6, D21P-6B (1 point)



**d. RADIATOR FIN**

Remove bolts (1) and grille (2). 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.



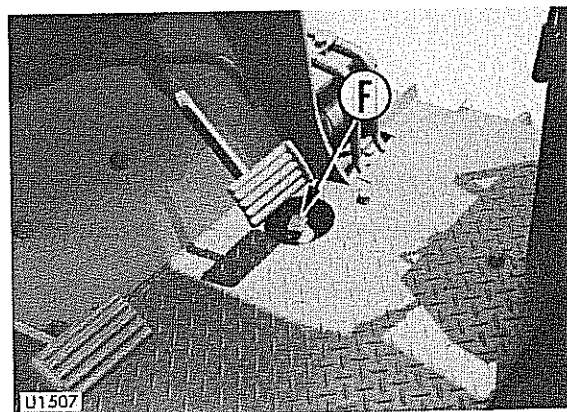
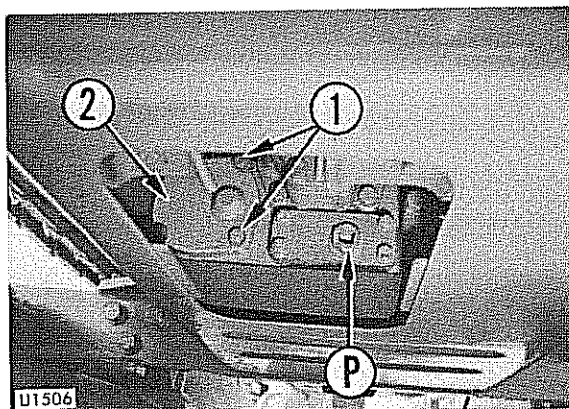


## EVERY 1000 HOURS SERVICE

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

### a. MAIN CLUTCH CASE (D20)

1. Remove cover from underside of machine and then remove drain pulg (P) to drain oil. After draining, tighten drain plug (P).
2. To clean strainer, first remove four 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.
4. Fill with engine oil through oil filler (F) to prescribed level.
  - ★ Refill capacity: 6 ℓ
  - ★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".



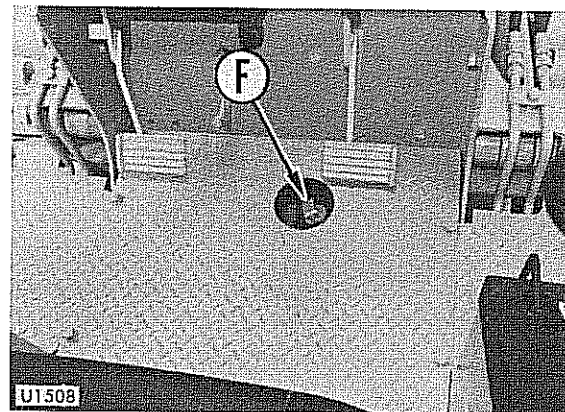
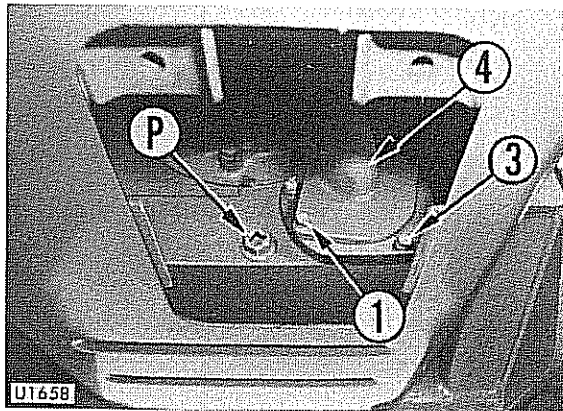
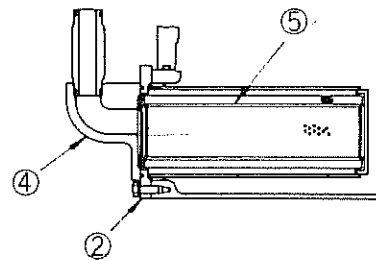


**b. TRANSMISSION CASE (D21)**

1. Removing the cover from underside of machine, remove drain plug (P) and drain oil. After draining, tighten drain plug (P).
2. To clean strainer, first remove two bolts (1) and lowest bolt (3) among three mounting bolts of strainer case (2), and then pull cover (4) downward and remove strainer (5).

3. Clean strainer and inside of case, then reinstall strainer.  
★ If strainer (5) is broken or damaged, replace it with a new one.

4. Fill with engine oil through oil filler (F) to prescribed level.  
★ Refill capacity: 11 ℓ  
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".



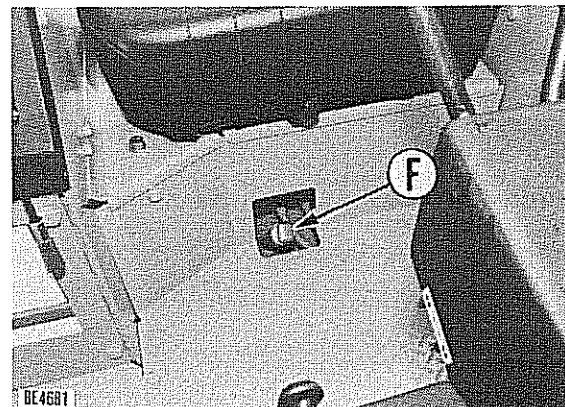
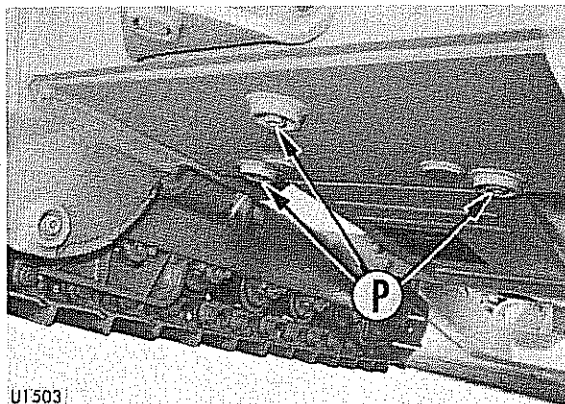
**c. TRANSMISSION, BEVEL GEAR CASE (D20)**

**d. TRANSFER, BEVEL GEAR CASE (D21)**

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.

★ Refill capacity: 16.5 ℓ (D20)  
13 ℓ (D21)

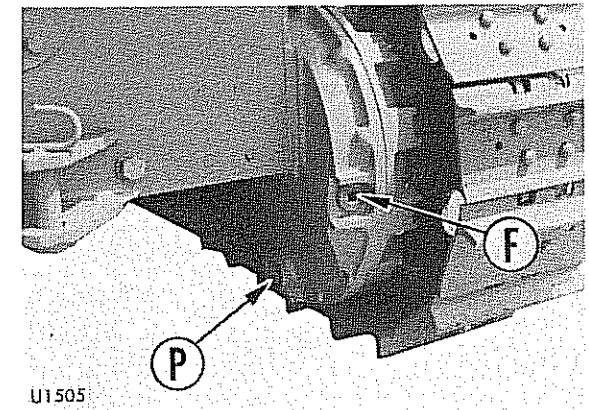
★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".



**e. FINAL DRIVE CASE**

After removal of supply plugs (F) on both sides of the machine body, remove drain plug (P) to drain oil. After draining oil, tighten plug (P). Then, supply new engine oil through oil filler (F) respectively to the specified level.

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

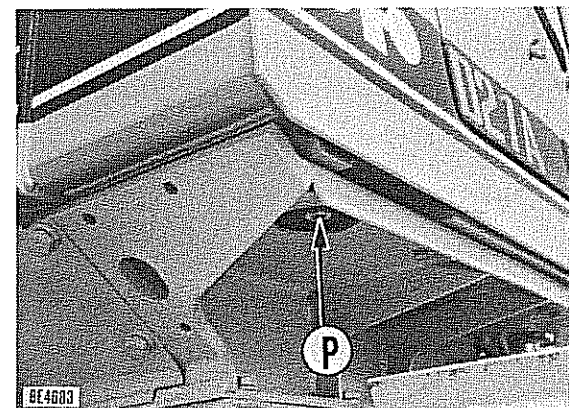
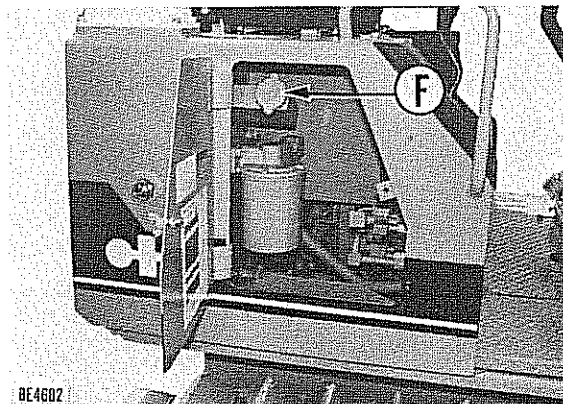


★ Refill capacity:

D20, 21A, P-6, D21E-6	6 ℓ (each side)
D20, 21PL-6 D20, 21P-6A, D21P-6B	8 ℓ (each side)
D20PLL-6	12 ℓ (each side)

**f. HYDRAULIC TANK AND FILTER**

1. Place the blade on the ground horizontally. With the engine stopped, move the blade control lever forward and backward or right and left and slowly turn the cap of oil filler (F) to purge air. Then, remove the cap.
2. To drain oil inside the tank, remove drain plug (P) under the tank. After draining the oil, tighten plug (P).
3. Remove cartridge (1) by turning it counterclockwise with the filter wrench.
4. Clean the filter base, fill the new cartridge with engine oil, and install it after applying engine oil (or a light coat of grease) on its packing surface. To install cartridge, bring packing surface into contact with sealing surface of filter base and tighten cartridge about 3/4 turn. (Be careful not to overtighten.)



5. Supply specified amount of oil through oil filler (F).

★ Refill capacity: 21 ℓ

★ The type of lubricant used depends on the ambient temperature. Select according to the table "FUEL, COOLANT AND LUBRICANTS".

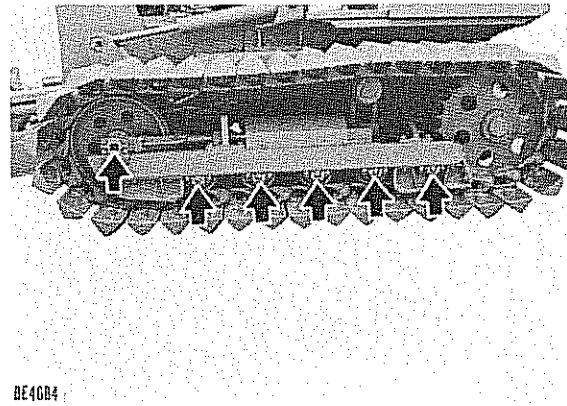
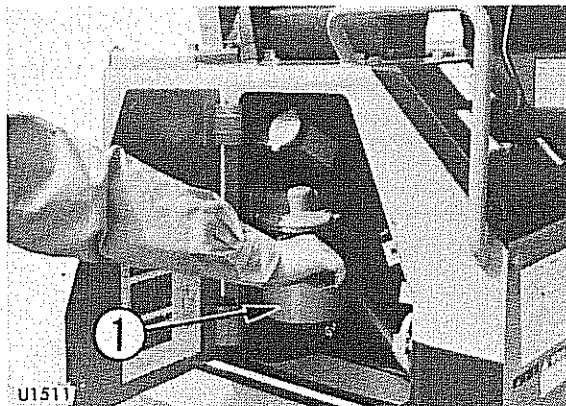
★ Use a genuine Komatsu cartridge.

### g. UNDERCARRIAGE COMPONENTS

Stop machine on level ground and check consumption of oil in track 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.



EVERY 2000 HOURS SERVICE

## EVERY 2000 HOURS SERVICE

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

### a. 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.

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

### b. ENGINE VALVE CLEARANCE

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

## EVERY 4000 HOURS SERVICE

### a. WATER PUMP

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

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

## WHEN REQUIRED

### a. CLEAN INSIDE OF COOLING SYSTEM

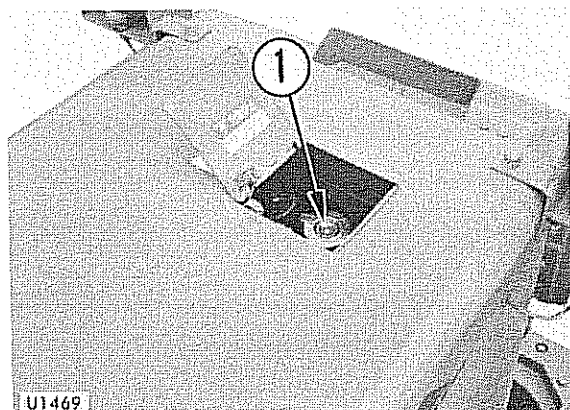
- Change coolant once a year (autumn) when permanent type antifreeze solution is used.
- Change coolant twice a year (spring and autumn) when other permanent type antifreeze of ethylene glycol base is used.
- In case antifreeze is not used, change coolant every 1000 hours, or every six month.
- Change water after first parking the machine on a level surface.

1. Stop the engine, turn radiator cap (1) slowly until it comes off.

**!** If the water temperature is high, do not remove the cap. This is because of the possibility of scalding water spurting out. When removing cap, turn cap slowly to allow pressure to be relieved.

2. Loosen drain valve (2) at the bottom of radiator and drain plug (3) at the side of cylinder block and drain off the cooling water.
3. Close up drain valve (2) and plug (3) and pour in clean water (ex. city water) up to the vicinity of the water filler.

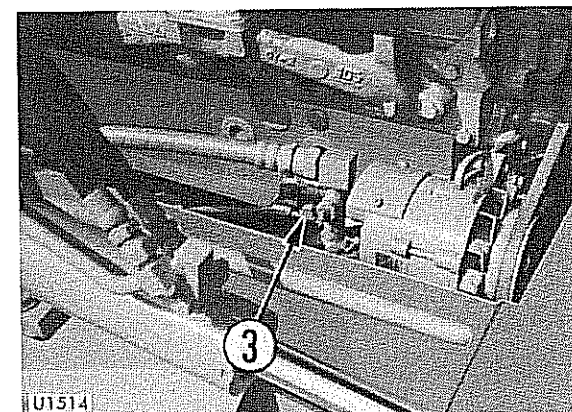
Water filler



Drain valve (bottom of radiator)



Drain plug (cylinder block)



4. When the water reaches the vicinity of the water filler, put the engine at low idling, open the drain valve (2) and plug (3), then pass water through the cooling system until clean water comes out from the drain valve and plug for 10 minutes.
- ★ When flushing, adjust the flow so that water is added at the same rate as the water is drained to keep the radiator always full.
5. After washing the cooling system, stop the engine. Open drain valve (2) and plug (3) to drain water and close drain valve (2) and plug (3).
6. After draining off the cooling water, wash out the cooling system using commercially available detergent. Follow the instructions on the detergent container.
7. After washing the cooling system, drain off all the water, then close up drain valve and plug and pour in clean water (ex. city water) slowly up to the vicinity of the water filler.
8. When the water reaches the vicinity of the water filler, put the engine at low idling, open the drain valve and plug, then pass water through the cooling system until clean water comes out from the drain valve and plug.
- ★ When flushing, adjust the flow so that water is added at the same rate as the water is drained to keep the radiator always full.
9. When the water becomes completely clean, stop the engine and close the all drain valve and plug.
10. Supply water until it overflows from water filler.
11. Run the engine 5 minutes at low idling and then for another 5 minutes at high idling to eliminate air trapped in the cooling system (leave radiator cap off during this operation).
12. Stop the engine and wait for about 3 minutes. supply cooling water up to the specified level. Tighten the cap.

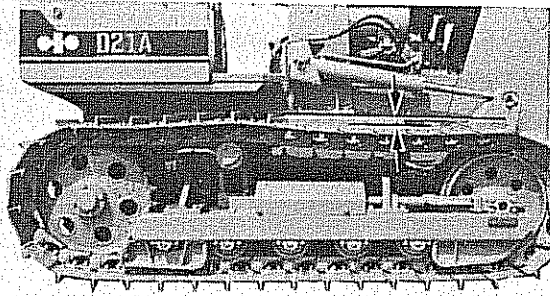


WHEN REQUIRED

## b. CHECK AND ADJUST TRACK TENSION

### Inspection

Without applying brakes, stop the machine 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 30 mm at the center, the tension is the standard one.

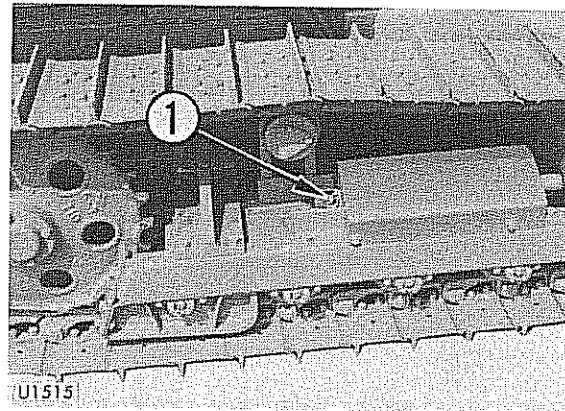


DE4685

### Adjustment

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

Grease may be pressurized till S will be 0 mm. In case the tension is yet loose after applying pressurized injection of grease till the above-mentioned 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.

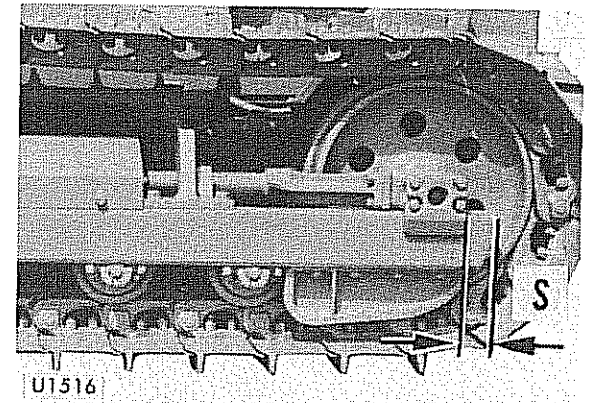


U1515

Consult your Komatsu distributor for repair.

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

If 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.

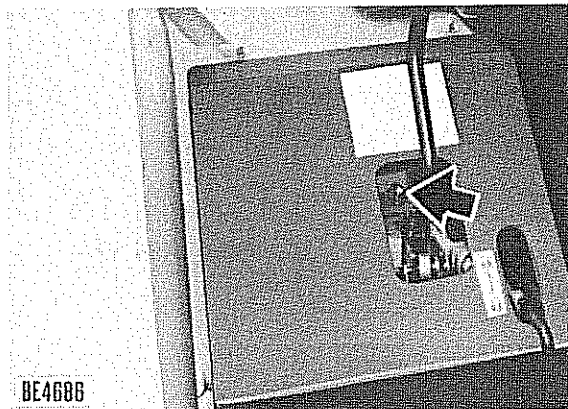


U1516

**c. LUBRICATING**

Apply grease to grease fittings shown by an arrow.

1. Blade control lever pin (1 point)

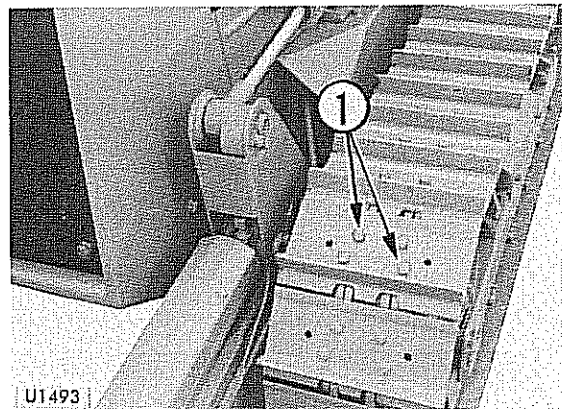


**d. CHECK AND RETIGHTEN TRACK SHOE BOLT**

The shoe bolt (1) attaching the track shoe to the link will be broken if it is used as loosened. So, you are required to retighten every time you find a loosened one.

**Method for tightening (shoe bolt)**

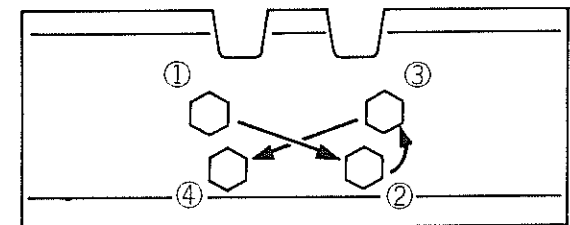
1. First tighten to a tightening torque of  $7 \pm 1$  kgm, then check that the nut and shoe are in close contact with the link contact surface.
2. After checking, tighten a further  $60^\circ \pm 10^\circ$ .



**Method for tightening (master link connecting bolt)**

1. First tighten to a tightening torque of  $7 \pm 1$  kgm, then check that the link contact surfaces are in close contact.
2. After checking, tighten a further  $180^\circ \pm 10^\circ$ .

**Tightening sequence**

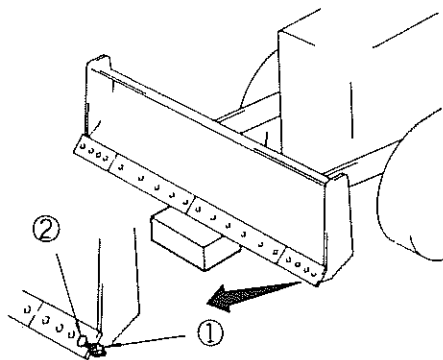


## WHEN REQUIRED

### e. REVERSE AND REPLACE THE END BITS AND CUTTING EDGES

Turn or replace the end bits and cutting edges, before it is worn out to the blade end.

1. Raise the blade to a proper height and apply a block to the frame so as to prevent fall of the blade.
2. Remove the cutting edge and the end bit and clean the mounting surface.
3. Reverse the cutting edge and the end bit when worn out.

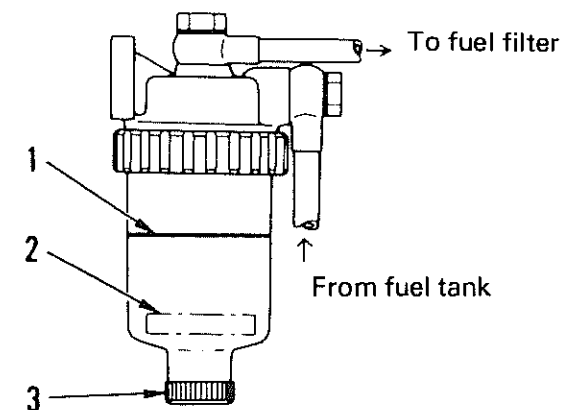


- ★ Nut tightening torque:  $13 \pm 2$  kgm
- ★ After several hours of running, retighten the nuts.
- ★ If the cutting edge and the end bit on both sides are worn out, replace with new one.
- ★ If it has been worn out up to the fitting surface, repair the fitting surface and then reverse or replace.
- ★ If nut (1) and bolt (2) are damaged, replace them with new ones at the same time.

### f. WATER SEPARATOR

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

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



## ADJUSTMENT

### ADJUSTMENT OF STEERING LEVERS AND BRAKE PEDAL

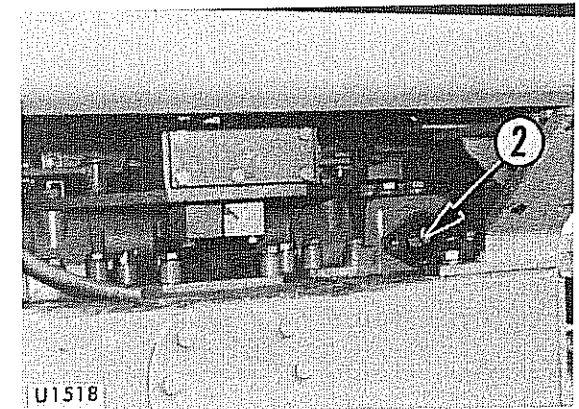
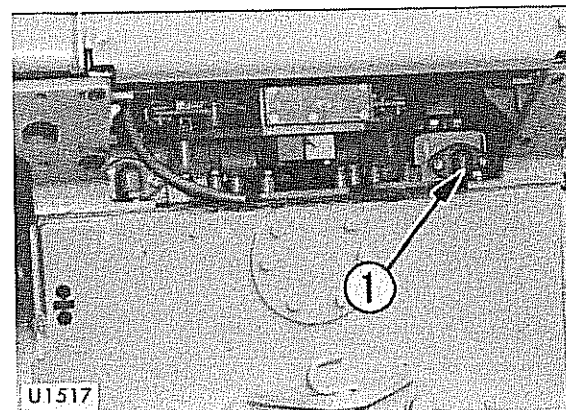
When the brake lining is worn out, the travel of steering levers and the brake pedal will increase, making steering difficult. To adjust, proceed as follows.

The standard clearance between the brake lining and the drum is 1.0 mm.

#### Adjustment

1. Remove the rear cover and inspection cover (1) in this order.
2. Tighten adjustment nut (2) to torque of 4 kgm until the lining contacts the drum.
3. Then, turn adjustment nut (2) in reverse directions for 4 rotation, and standard clearance will be adjusted.

★ Adjust so that both left and right steering levers will have same travel. If there is a difference in travel between them, brake on one side only will give effective response to the action.



## ADJUSTMENT

### ADJUSTMENT OF INERTIA BRAKE (D20)

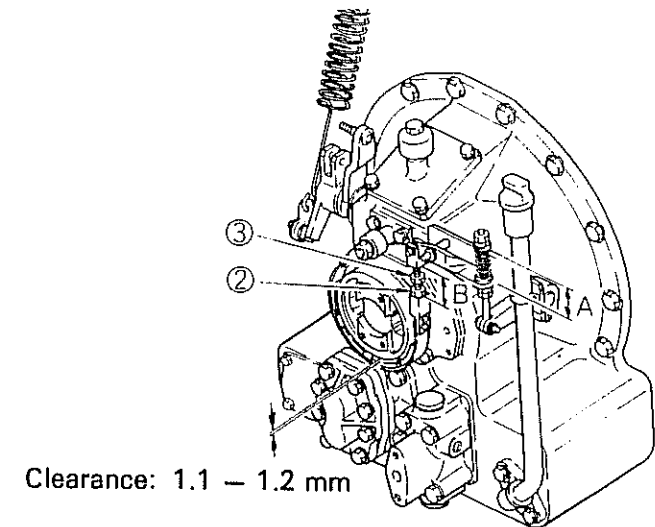
If it takes 2.5 to 3.5 seconds for inertia brake to stop clutch shaft with running engine fully and depressing clutch pedal fully, the inertia brake works well.

★ Be sure to adjust inertia brake properly.

If not, transmission gears and gear shift lever will be damaged.

#### Adjustment

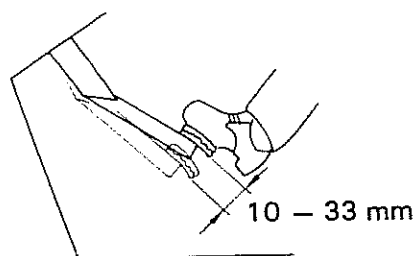
1. Confirm that dimension **A** is 45 mm.
2. Loosen adjustment lock nut (2). If the brake works excessively, turn adjustment bolt (3) and lengthen dimensions **B**. If the brake does not work well, shorten **B**.
3. Retighten nut (2) tightly.



## ADJUSTMENT OF CLUTCH (D20)

Standard clutch pedal play is 10 to 33 mm at tip of pedal. If less or slippery, adjust as follows:

### Check

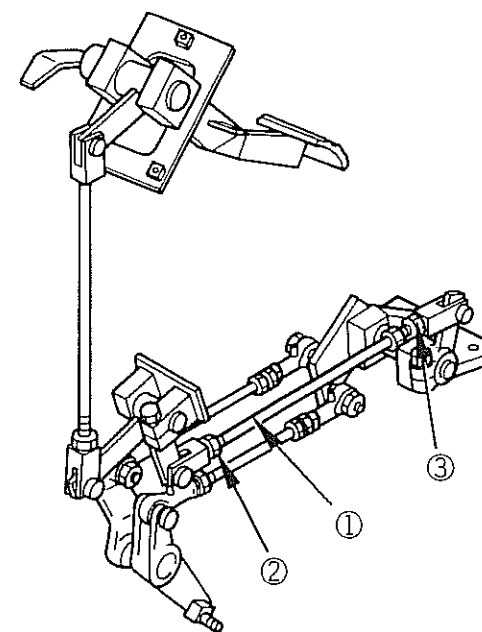


- ★ The pedal play tends to increase with rise of the main clutch case oil temperature. Wait for lowering of oil temperature when an adjustment is to be made during or after operation of the machine.

- ★ 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

Remove the floor board. Loosen nuts (2) and (3), turn adjustment rod (1) to make the clutch pedal play between 10 and 33 mm at tip of pedal.



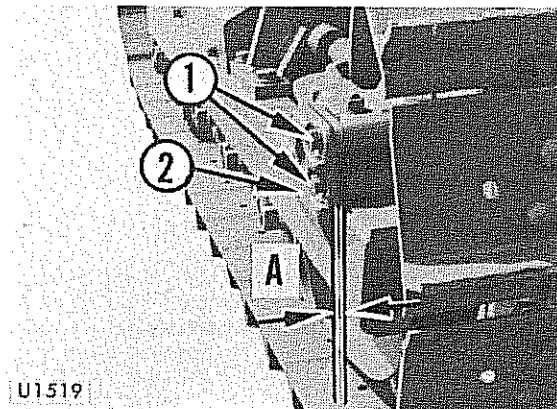
## ADJUSTMENT

### ADJUSTMENT OF IDLER CLEARANCE

Guide (2) pinches the track frame so that the idler can be moved forward and backward by an external force. Therefore, when the idler moves, this guide (2) is subject to wear. Wear of the guide causes the idler to roll and tilt, which results in falling free of the track. To avoid this trouble, make adjustment on the clearance between the track frame and the guide as follows:

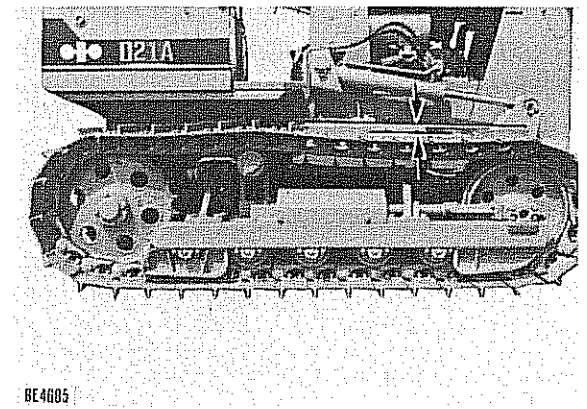
#### Adjustment

Move machine about 1 or 2 meters on a flat ground and measure the clearance **A** (4 locations: left, right, inside and outside) between the track frame and the guide. If the clearance **A** exceeds 1.5 mm, loosen bolt (1), remove guide (2) and pull out the shim to adjust the clearance at one end to 0.5 mm. Thickness of one shim is 1.0 mm.



### ADJUSTMENT OF UNDERCARRIAGE

- Properly adjust track tension. Tension is measured at clearance shown in photograph — usually 20 to 30 mm at this point. For rocky terrain, tighten tracks slightly. In clay or sandy areas, slightly loosen them. (For inspection and adjustment procedures, refer to "WHEN REQUIRED").



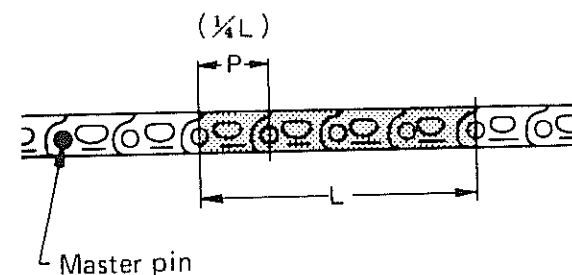
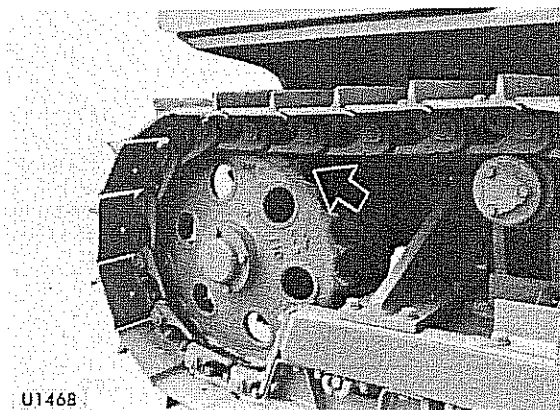
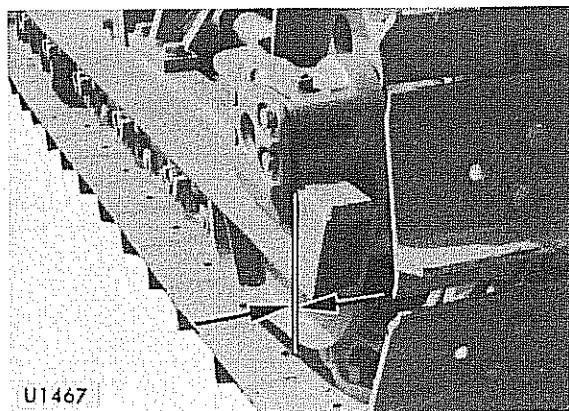
- Check idler rollers for oil leakage as well as for loose bolts and nuts. If any trouble is detected, repair immediately.
- Check idler guide plate for clearance. If clearance increases, idler may develop side motion and tracks may come off.

### 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.





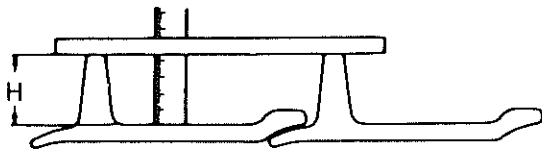
## ADJUSTMENT

### ● Measuring Height of Grouser (D20A, D21A, E)

After taking up slack in track shoes, measure height at center of shoe as shown below.

★ Standard height (H): 38.5mm

★ Repair limits: 15mm



### ● Measuring Outside Diameter of Track Roller

1. Measure height (size C) of link tread as shown.

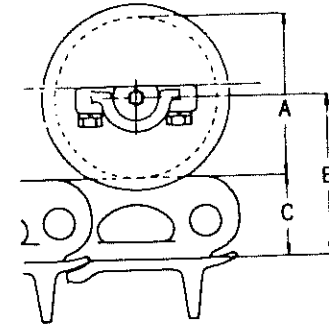
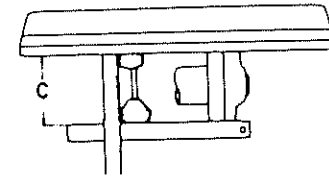
2. Stop machine at position where link tread, whose size C has been measured completely, contacts roller tread. Then measure size B.

3. Calculate outside diameter of tread (size A):

$$A = (B - C) \times 2$$

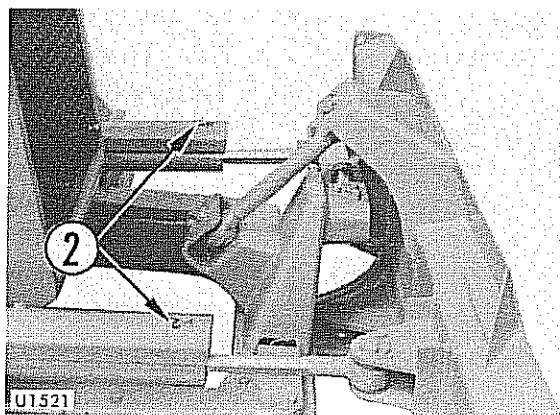
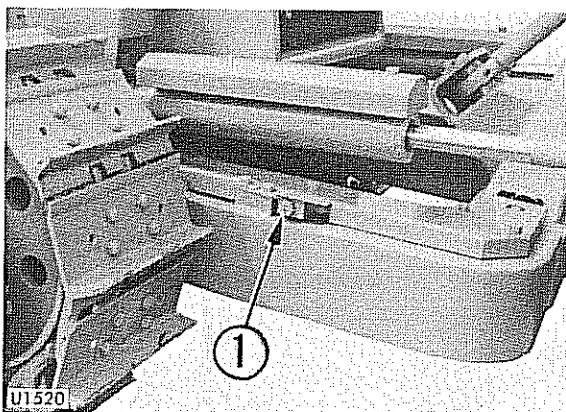
★ Standard size (A): 135 mm

★ Repair limits: 127 mm



## BLEEDING AIR FROM THE ANGLING CYLINDER HEAD OIL CIRCUIT

1. Raise the blade about 300 mm 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 (2) (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 (2), tighten the valve (1) and the plugs (2).



# TROUBLE SHOOTING GUIDE

This guide is not intended to cover every conditions, however many of the more common possibilities are listed.

## ENGINE

**This engine oil pressure warning lamp remains alight when engine speed is raised after completion of warm-up.**

- Add the oil to the specified level.
- Replace the oil filter element.
- Check oil leakage from the pipe or the joint.
- Replace the warning lamp.

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

**The pointer of the water temperature gauge is in red range on right hand side of the gauge.**

- Supply the cooling water and check leakage.
- Adjust fan belt tension.
- Wash out inside of cooling system.
- Clean or repair the radiator fin.
- Replace the thermostat.
- Tighten the radiator cap firmly or replace the gasket of it.
- Replace the water temperature gauge.

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

- Replace the thermostat.
- Replace the water temperature gauge.

**The engine does not start when the starting motor is turned over.**

- Add fuel.
- Repair where air is leaking into fuel system.
- Replace the injection pump or the nozzle.
- Check the valve clearance.
- Check engine compression pressure.
- Refer to the section of electrical system.

**Exhaust gas is white or blue.**

- Adjust to specified oil quantity.
- Replace with specified fuel.

**Exhaust gas occasionally turns black.**

- Clean or replace the air cleaner element.
- Replace the nozzle.
- Check engine compression pressure.

**Combustion noise occasionally changes to breathing sound.**

- Replace the nozzle.

**Unusual combustion noise or mechanical noise.**

- Replace with specified fuel.
- Check over-heating.
- Replace the muffler.
- Adjust valve clearance.

## ELECTRICAL SYSTEM

**Lamp does not glow brightly even when engine runs at high speed.**

**Lamp flickers while engine runs.**

- Check for loose terminals and open-circuit wiring.
- Adjust belt tension.

**Charge lamp does not go out even when engine runs at high speed.**

- Replace the alternator.
- Inspect and repair wiring.

**Unusual noise is emitted from the alternator.**

- Replace the alternator.

**Starting motor does not turn when starting switch is turned on.**

- Inspect and repair the wiring.
- Charge the battery.

**The pinion of the starting motor keeps going in and out.**

- Charge the battery.

**Starting motor turns the engine sluggishly.**

- Charge the battery.
- Replace the starting motor.

**The starting motor disengages before the engine starts up.**

- Check and repair the wiring.
- Charge the battery.

**The heater signal does not glow red.**

- Check and repair wiring.
- Replace the glow plug.
- Replace the heater signal.

**The oil pressure warning lamp does not light up when engine is stationary (when the starting switch is in ON position.)**

- Replace the warning lamp.
- Replace the warning lamp switch.

**Charge lamp does not light up when the engine is stationary. (When the starting switch is in ON position.)**

- Replace the charge lamp.
- Inspect and repair the wiring.

## CHASSIS

**When pulling one steering lever, machine does not turn and goes straight.**

- Check and adjust steering clutch.
  - Steering oil pressure does not reach the specified pressure.  
(Repair where air is leaking into the oil pump.)
- Adjust brake.

**When stepping on the brake pedal, machine does not stop.**

- Adjust brake.

**Track falls free.**

**Sprocket wears abnormally.**

- Adjust track tension.

**Blade is too slow in raising or is non-operative.**

- Add oil to the specified level.

**MEMO**

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## SERVICE METER

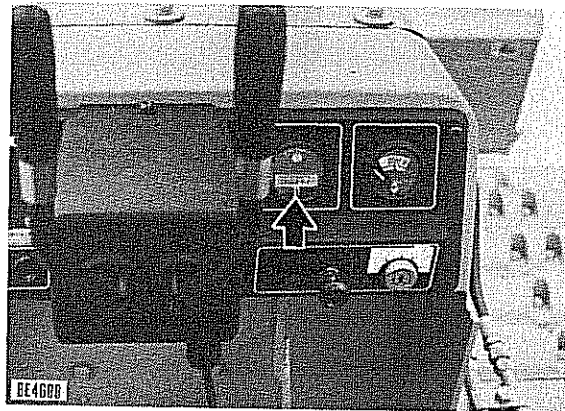
This meter indicates the integrated work hours. So, use it according to the following instructions.

- 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.

### ★ How the meter progresses

- The service meter progresses by 1 when the engine is operated for one hour, regardless of the engine speed.
- ★ The indicator above the service meter rotates when the engine running to show that the meter is running.

Consequently, if the engine is running, the service meter will advance even if the machine does not move.



The meter is installed on the instrument board.

## MACHINE AND ENGINE SERIAL NUMBERS

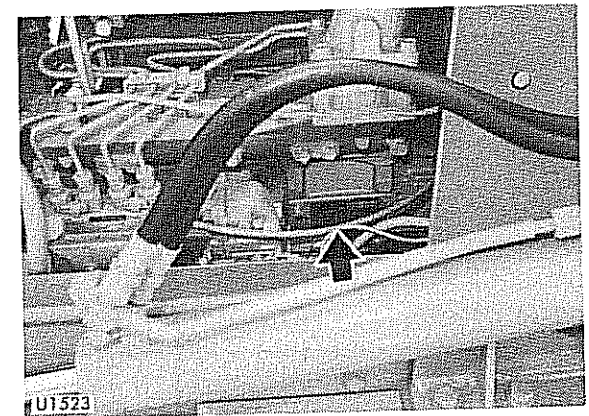
When calling for service of mechanic or when making replacement parts order, be sure to give your Komatsu distributor the machine and engine serial numbers as well as the service meter reading beforementioned. These numbers are found on the plates shown in the photos below.

- Location of the machine serial number mark



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

- Location of the engine serial number mark



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



# FUEL, COOLANT AND LUBRICANTS

## PROPER SELECTION OF FUEL, COOLANT AND LUBRICANTS

RESERVOIR	KIND OF FLUID	AMBIENT TEMPERATURE					CAPACITY (ℓ)	
		14 -10	32 0	50 10	68 20	86°F 30°C	Specified	Refill
Engine oil pan		SAE 30					8	7
		SAE 10W						
		SAE 10W-30						
		SAE 15W-40						
Main clutch case (D20)		SAE 10W					6 (D20)	6
Transmission, bevel gear case (D20) Transmission case (D21) Transfer, bevel gear case (D21) Final drive case (each)	Engine oil						16.5 (D20)	16.5
		SAE 30					13 (D21)	11
							13 (D21)	13
							6 (D20,21A,E,P-6)	6
		SAE 10W					8 (D20,21PL-6, D20,21P-6A,B)	8
Hydraulic tank		SAE 10W					33 (D20,21A,E-6 D20,21P-6A,B)	21
		SAE 10W-30					31	21
		SAE 15W-40					31 (D20,21P,PL, PLL-6)	
Fuel tank	Diesel fuel						60	-
		ASTM D975 No.2						
Cooling system	Water	Add antifreeze					10	-

\* ASTM D975 No.1

**NOTE:**

(1) When fuel sulphur content is less than 0.5%, change oil in the oil pan every periodic maintenance hours described in this manual.

Change oil according to the following table if fuel sulphur content is above 0.5%.

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

ASTM: American Society of Testing and Material

SAE: Society of Automotive Engineers

Specified capacity: Total amount of oil including oil for components and oil in piping.

Refill capacity: Amount of oil needed to refill system during normal inspection and maintenance.

- (2) When starting the engine in an atmospheric temperature of lower than 0°C, be sure to use engine oil of SAE10W, SAE10W-30 and SAE15W-40, even though an atmospheric temperature goes up to 10°C more or less in the day time.
- (3) Use API classification CD as engine oil and if API classification CC, reduce the engine oil change interval to half.