

SHOP MANUAL

KOMATSU

WD600-1H

-50°C Specification

MACHINE MODEL

SERIAL NUMBER

WD600-1H

10169 and up

- This shop 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.
- WD600-1H mount the SA6D170E-2 engine.
For details of the engine, see the 6D170-2 Series Engine Shop manual.

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TABLE OF TIGHTENING TORQUES FOR SPLIT FLANGE BOLTS

★ In the case of split flange bolts for which there is no special instruction, tighten to the torque given in the table below.

Thread diameter	Width across flat	Tightening torque	
		Nm	kgm
mm	mm		
10	14	65.7 ± 6.8	6.7 ± 0.7
12	17	112 ± 9.8	11.5 ± 1
16	22	279 ± 29	28.5 ± 3

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PIPING JOINTS

★ Unless there are special instructions, tighten the O-ring boss piping joints to the torque below.

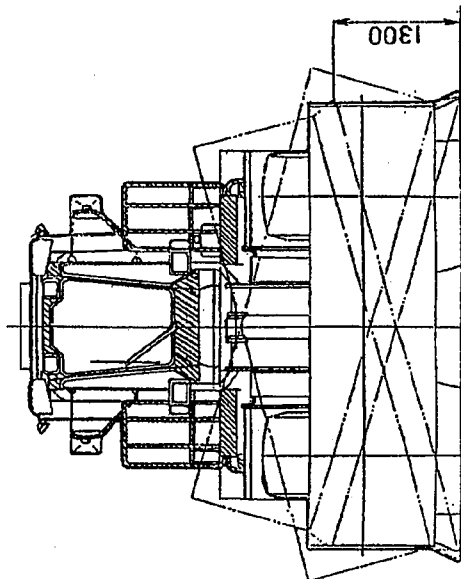
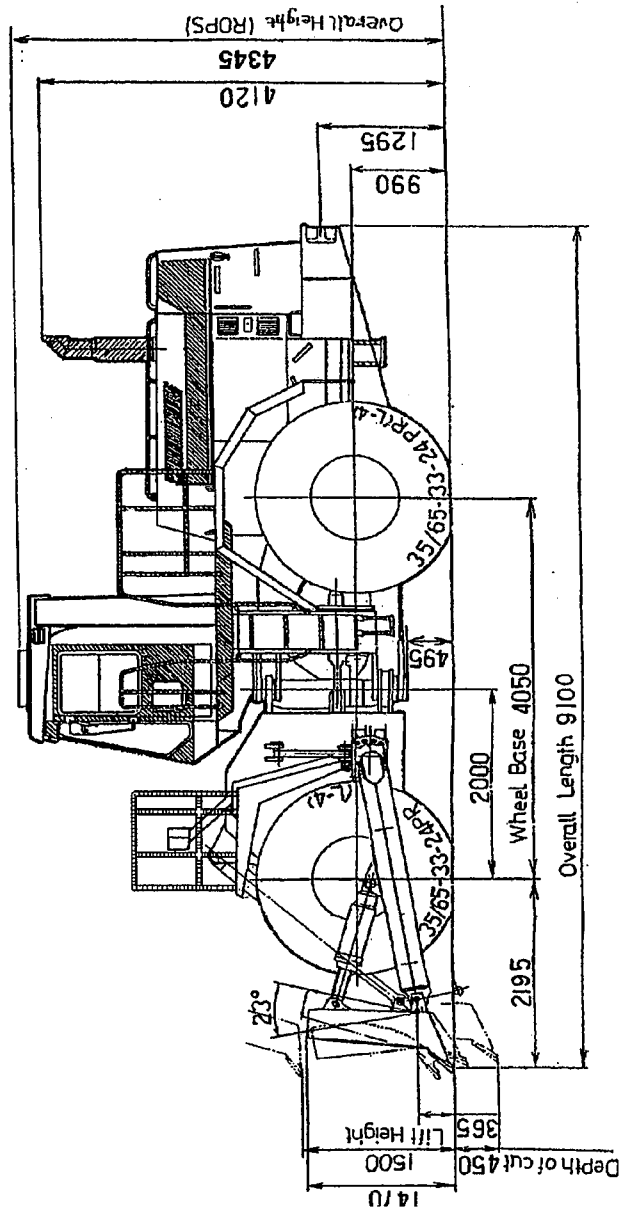
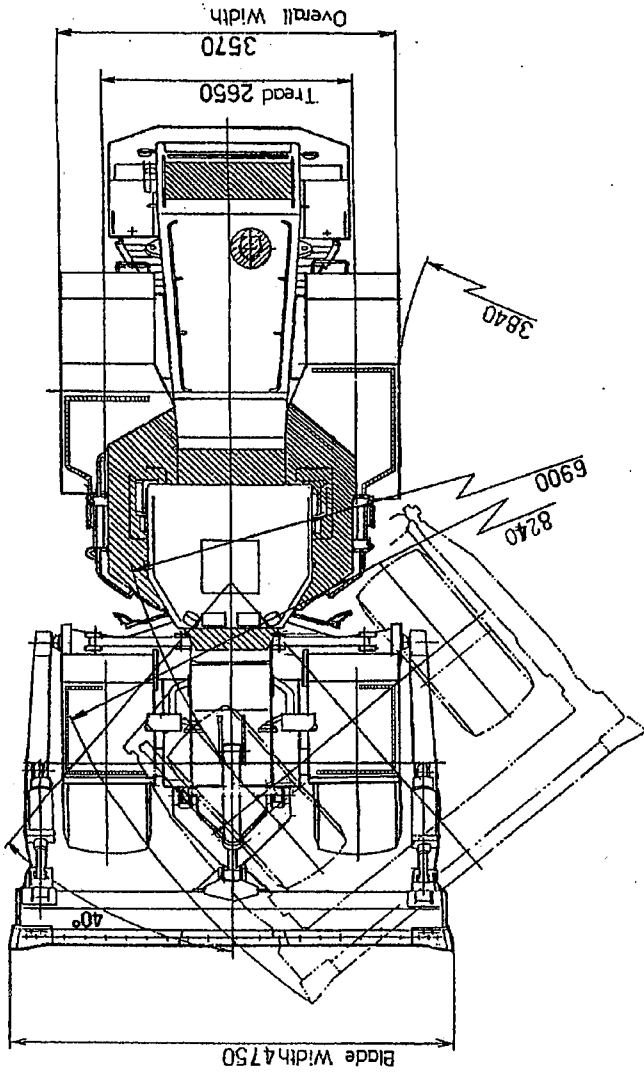
Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	kgm
02	14	Varies depending on type of connector.	34.3 ± 4.9	3.5 ± 0.5
03, 04	20		93.1 ± 9.8	9.5 ± 1
05, 06	24		142.1 ± 19.6	14.5 ± 2
10, 12	33		421.4 ± 58.8	43 ± 6
14	42		877.1 ± 132.3	89.5 ± 13.5

TABLE OF TIGHTENING TORQUES FOR O-RING BOSS PLUGS

★ Unless there are special instructions, tighten the O-ring boss plugs to the torque below.

Nominal No.	Thread diameter	Width across flat	Tightening torque	
	mm	mm	Nm	kgm
08	8	14	7.35 ± 1.47	0.75 ± 0.15
10	10	17	11.27 ± 1.47	1.15 ± 0.15
12	12	19	17.64 ± 1.96	1.8 ± 0.2
14	14	22	22.54 ± 1.96	2.3 ± 0.2
16	16	24	29.4 ± 4.9	3 ± 0.5
18	18	27	39.2 ± 4.9	4 ± 0.5
20	20	30	49 ± 4.9	5 ± 0.5
24	24	32	68.6 ± 9.8	7 ± 1
30	30	32	107.8 ± 14.7	11 ± 1.5
33	33	—	127.4 ± 19.6	13 ± 2
36	36	36	151.9 ± 24.5	15.5 ± 2.5
42	42	—	210.7 ± 29.4	21.5 ± 3
52	52	—	323.4 ± 44.1	33 ± 4.5

GENERAL ASSEMBLY DRAWING

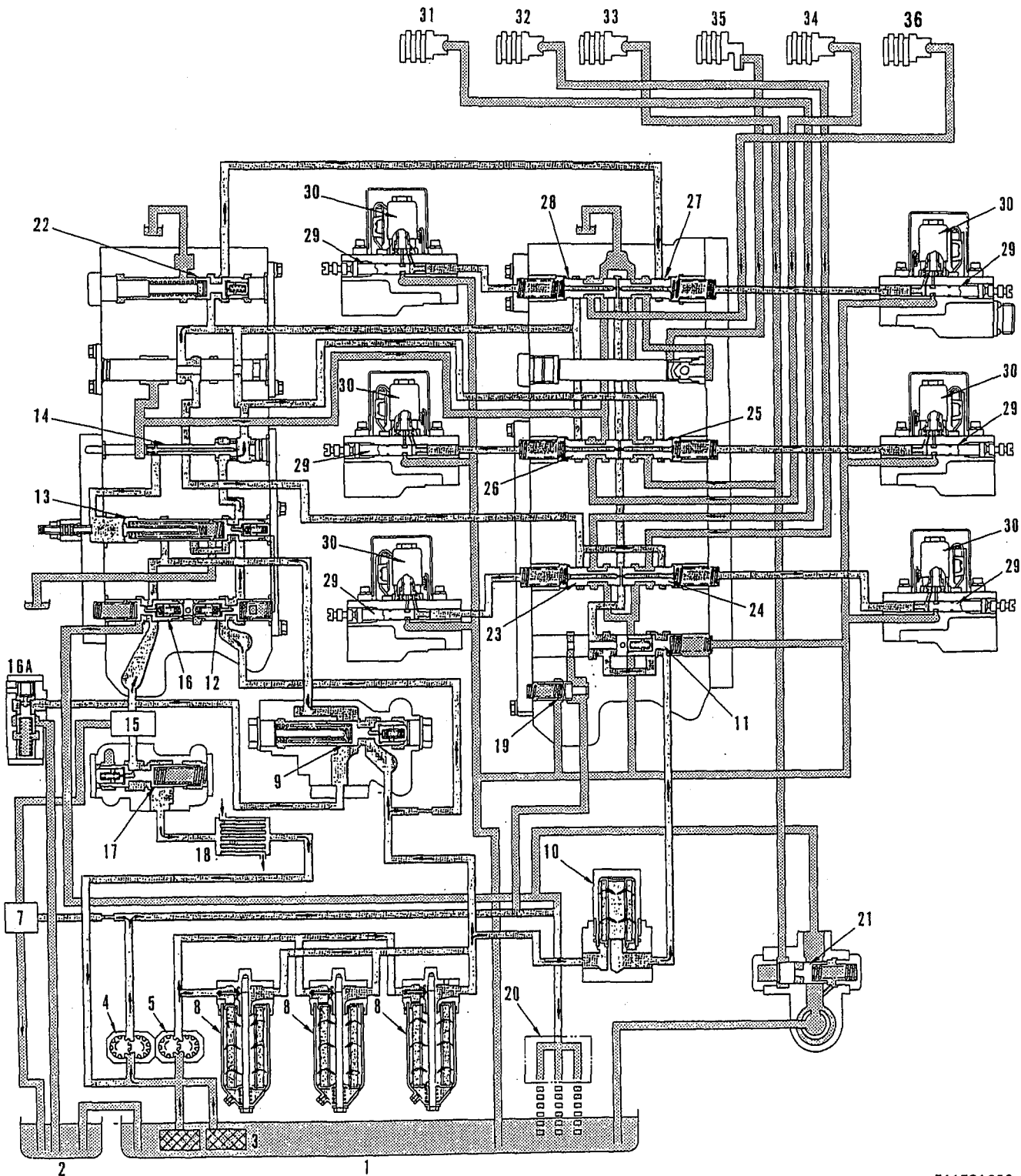


MACHINE SHOWN WITH OPTIONAL EQUIPMENTS.

• HYDRAULIC CIRCUIT SCHEMATICS FOR POWER TRAIN

Engine running, gear shift levers at Neutral.

(For cold area)



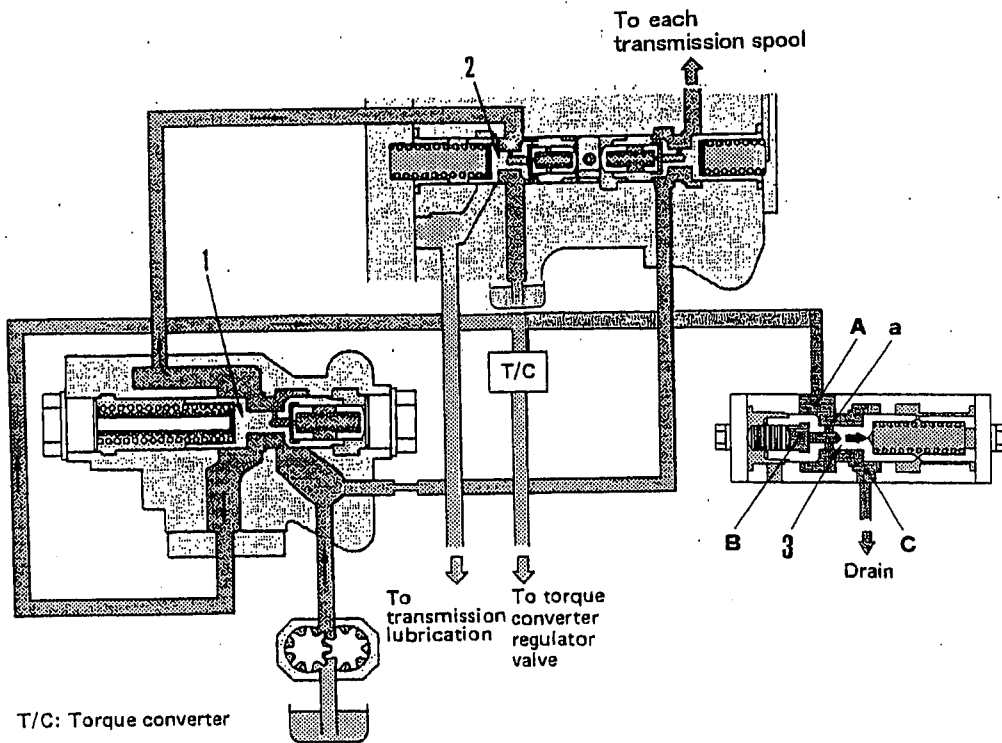
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• Torque converter inlet oil pressure below specified pressure.

when the torque converter inlet oil pressure goes above the specified pressure, the oil enters port B from orifice a of relief valve (3).

The pressure of the oil entering port B moves relief valve (3) to the right in the direction of the arrow.

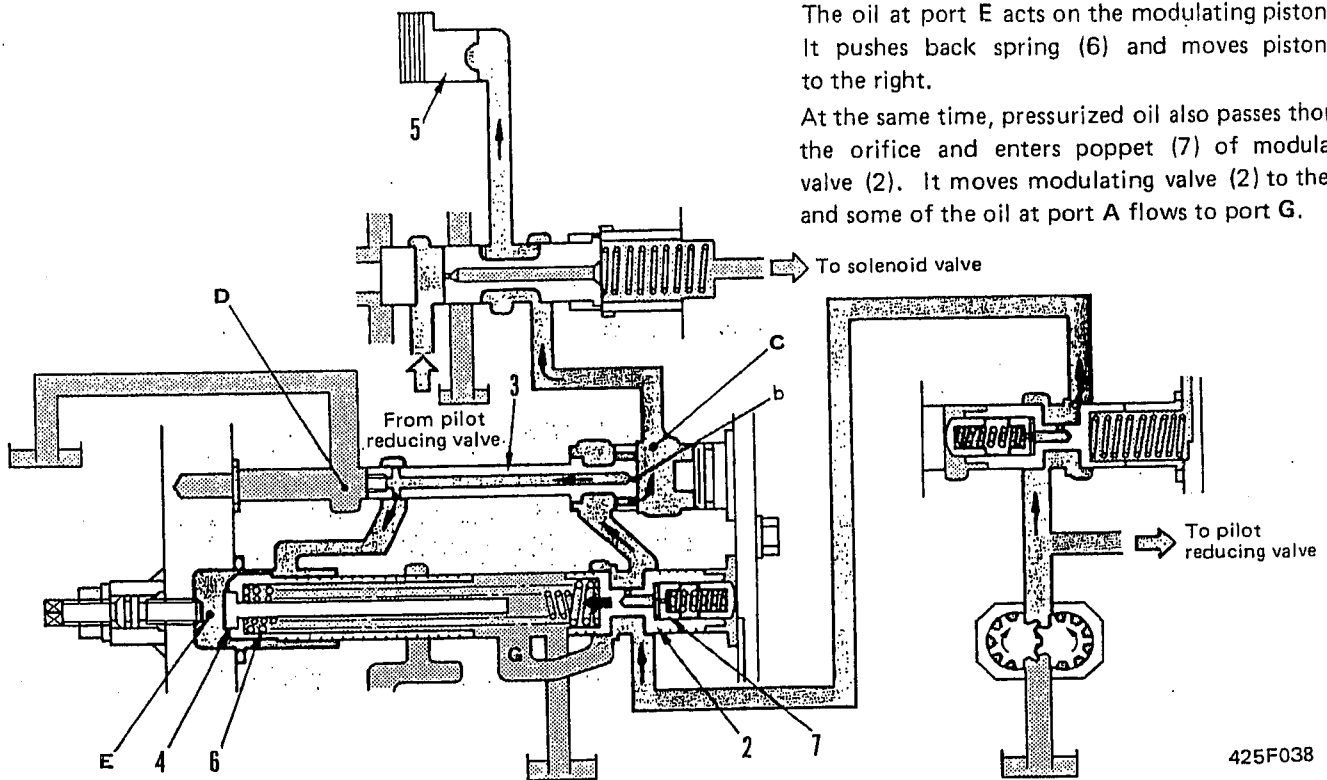
As a result, the oil at port A is drained to the transmission case from port C.



2) Clutch pressure rising (Point B on Fig. 426F029)

Operation

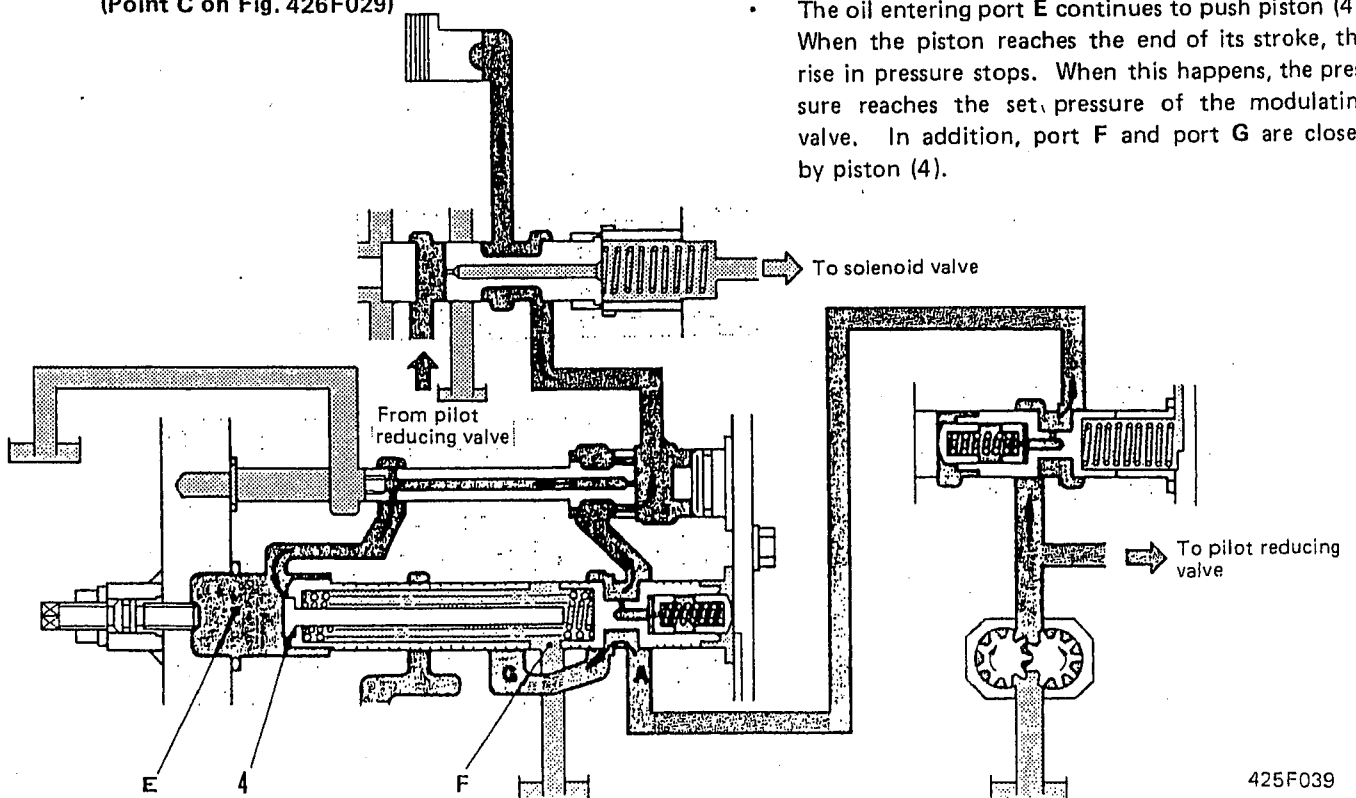
- As the pressure at the clutch piston rises, the pressure at port C also rises. Quick return valve (3) is pushed back to the left and drain port D is closed. The oil from the pump flows from port C to the clutch piston and at the same time it flows from orifice "b" through quick return valve (3) and enters port E.
- The oil at port E acts on the modulating piston (4). It pushes back spring (6) and moves piston (4) to the right.
- At the same time, pressurized oil also passes through the orifice and enters poppet (7) of modulating valve (2). It moves modulating valve (2) to the left and some of the oil at port A flows to port G.



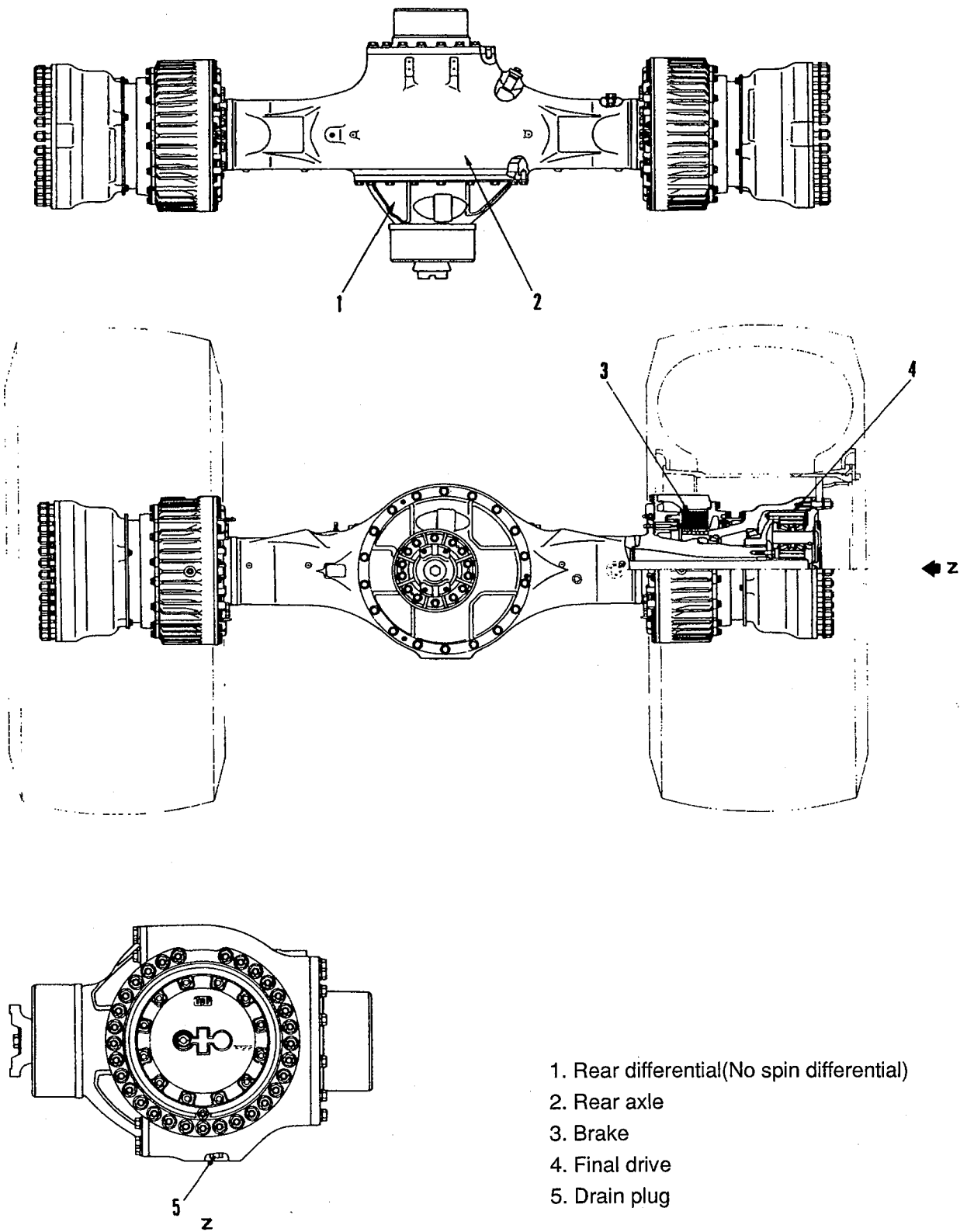
3) Completion of rise in clutch pressure (Point C on Fig. 426F029)

Operation

- The oil entering port E continues to push piston (4). When the piston reaches the end of its stroke, the rise in pressure stops. When this happens, the pressure reaches the set pressure of the modulating valve. In addition, port F and port G are closed by piston (4).

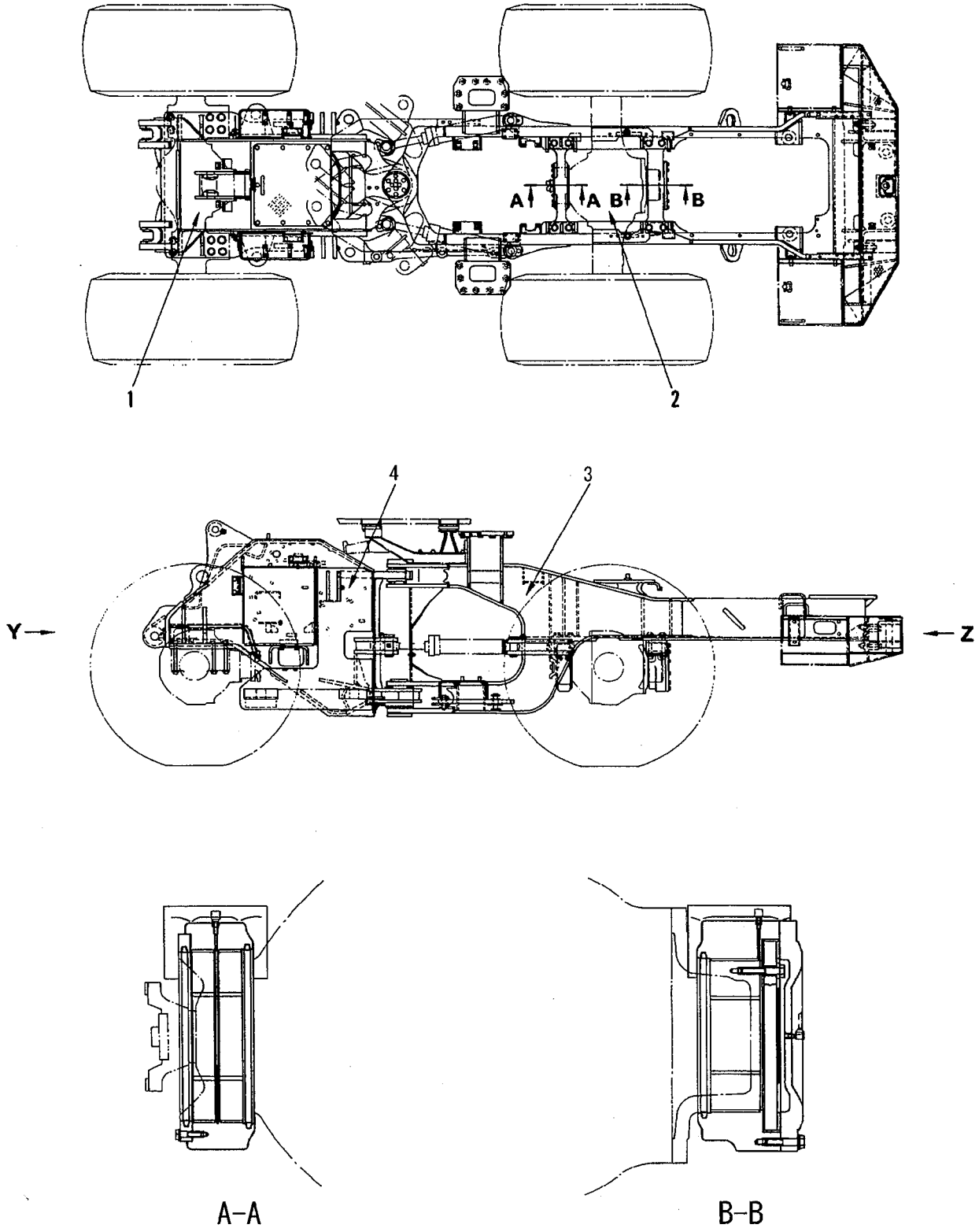


REAR AXLE

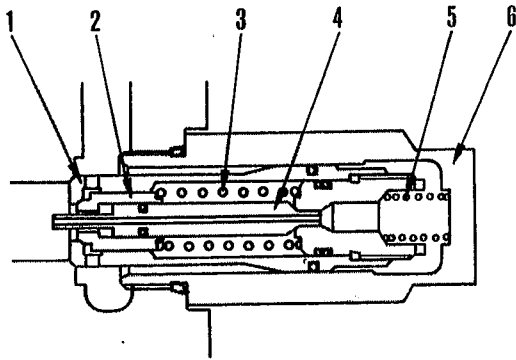


- 1. Rear differential(No spin differential)
- 2. Rear axle
- 3. Brake
- 4. Final drive
- 5. Drain plug

AXLE MOUNT



SAFETY VALVE (with suction valve)



- 1. Suction valve
- 2. Main valve
- 3. Main valve spring
- 4. Pilot piston
- 5. Suction valve spring
- 6. Valve body

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Function

- The safety valve (with suction valve) is in the main valve. If shock causes any abnormally high pressure in the cylinder when the main valve is at neutral the safety valve (with suction valve) releases the abnormal pressure and protects the cylinder from damage.

Operation

As a safety valve

- Port **A** is the cylinder circuit and port **B** is the drain circuit.

The pressure oil in port **A** flows to port **D** through a hole in the pilot piston. It also flows to port **C** through an orifice consisting of the main valve (2) and the pilot piston (4).

The pilot piston is secured to the safety valve by a lock nut. The diameter of the cross section (cross-sectional area) gives a relationship of $d_2 > d_1 > d_3 > d_4$.

- If abnormally high oil pressure occurs in port **A**, the suction valve (1) is not actuated because of the relationship $d_2 > d_1$.

However, because of the relationship $d_3 > d_4$ in port **A** and **C**, the hydraulic pressure on the main valve (2) is equivalent to the area difference between d_3 and d_4 . If this pressure goes up to the poppet spring force (set pressure), the poppet is actuated, and the oil in port **A** flows into port **B**.

As a suction valve

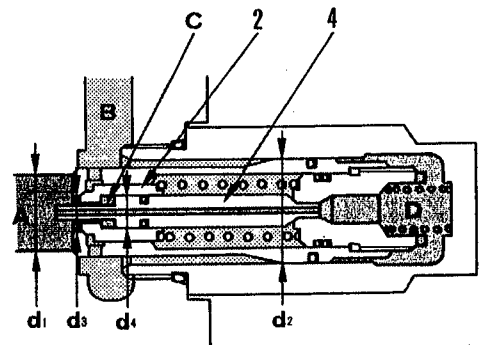
- If negative pressure is generated in port **A**, port **D** also has negative pressure, because port **D** and **A** are connected with each other. The tank pressure in port **B** is applied to port **E**.

Hydraulic pressure "a" equivalent to the area difference between d_2 and d_1 is applied to the safety valve because of the tank pressure in port **E**.

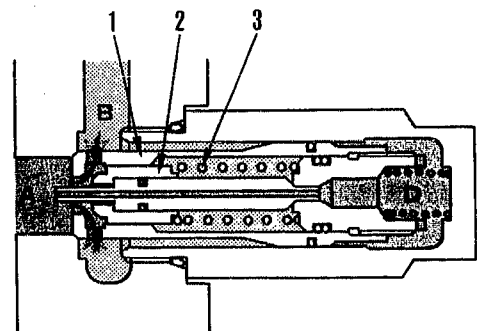
Therefore, hydraulic pressure "e" acts to open the valve and hydraulic pressure "a" acts to close the suction valve (1).

- If the pressure in port **A** drops, (approaching negative pressure) hydraulic pressure "a" becomes smaller than oil pressure "e".

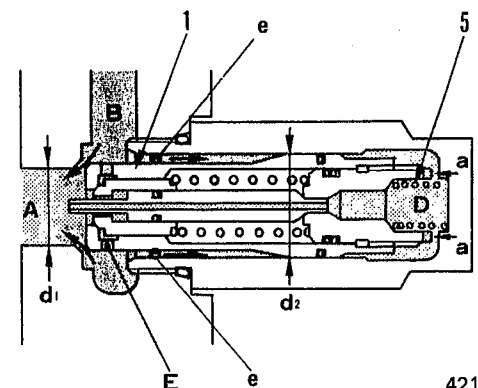
When oil pressure "e" becomes larger than oil pressure "a" + valve spring (5) force, the suction valve (1) opens, causing the oil to flow from port **B** into port **A**. This prevents negative pressure from building up in port **A**.



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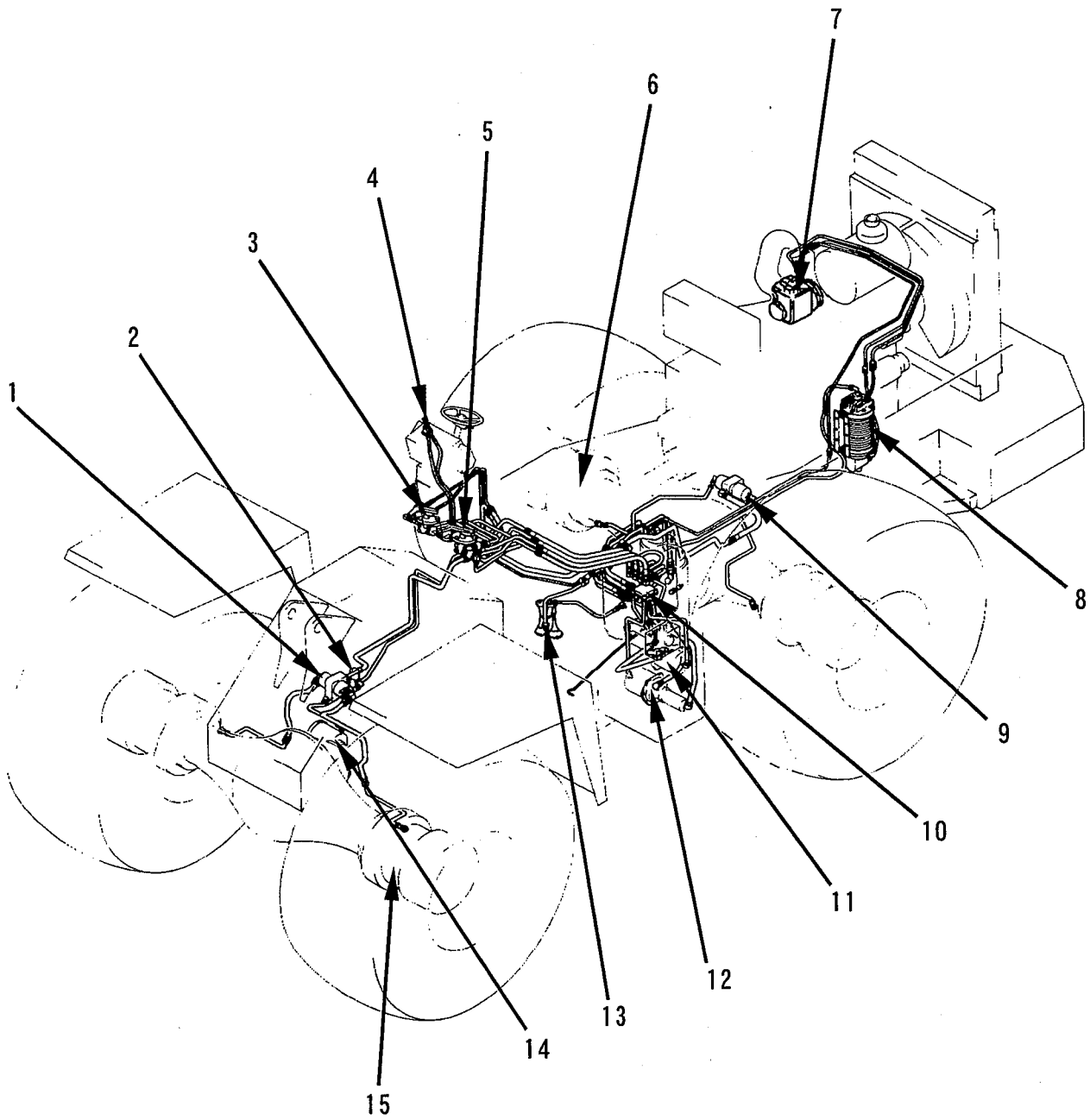


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BRAKE AND AIR PIPING

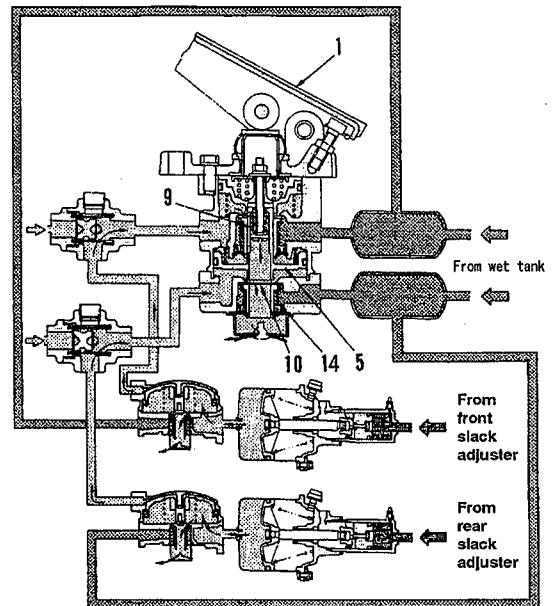


BRAKE RELEASED**Upper part**

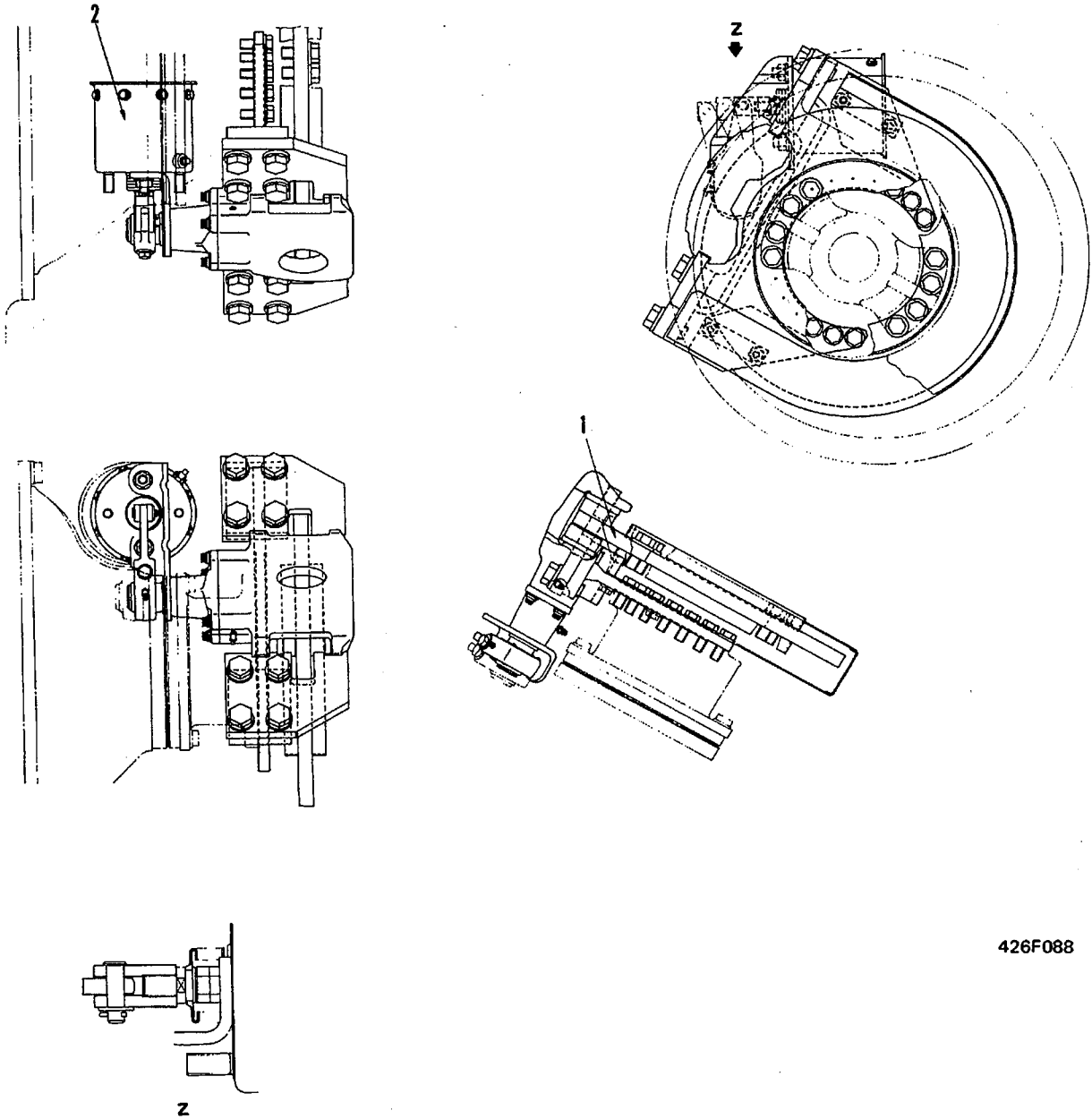
- When pedal (1) is released and the operating pressure is removed from the top of the piston, the air at the bottom of the piston, and the piston return spring move the piston up. Exhaust port (9) is opened and the air pressure in the brake chamber is released to the atmosphere.

Lower part

- When the pedal is released and the air at the top of piston (5) is let out, the air at the bottom of piston (5) and spring (14) pull the piston up. Exhaust port (10) opens and the air pressure in brake chamber is released to the atmosphere.



PARKING BRAKE



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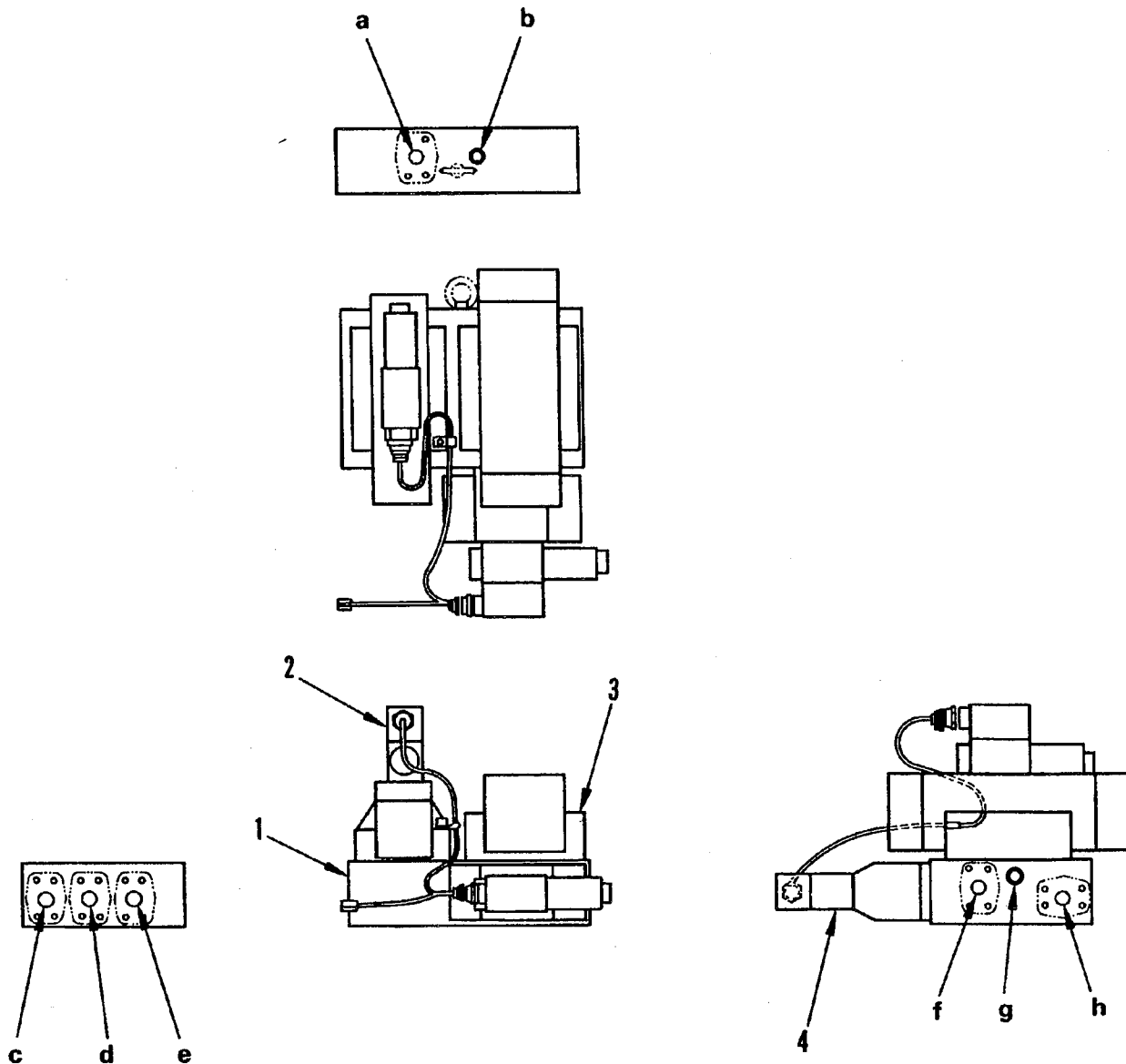
1. Parking brake disc
2. Spring cylinder

OUTLINE

- The parking brake is a disc type and is installed on the front axle.
- The force of the spring inside the spring cylinder (2) is used to apply the brake mechanically: it is released by air pressure.
- The parking brake caliper is fixed to the front differential case.

The disc is installed to the differential yoke and rotates together with the coupling.

DECO VALVE



F41EUR073

1. Manifold
2. Solenoid valve (sol a)
3. Merge/divider valve
4. Solenoid valve (sol b)

- a. Port B (to solenoid valve)
- b. Port P (from hydraulic pump)
- c. Port D (to left tilt, pitch cylinder head)
- d. Port F (to right tilt, pitch cylinder head)
- e. Port E (to right tilt, pitch cylinder bottom)
- f. Port C (to left tilt, pitch cylinder bottom)
- g. Port T (to hydraulic tank)
- h. Port A (from main control valve)

OPERATION OF PITCH

1. Operation of forward pitch

- The pressure oil supplied from main control valve port A1 flows from port A and enters the merge/divider valve. Part of the pressure oil which is divided passes through port G, flows to port C, and then flows to the bottom end of left/pitch cylinder (3).

The other flow of pressure oil passes through port H. Solenoid valve a is actuated, so pilot spool (1) is also actuated, and the pressure oil flows to port J. From port J, it passes through ports M and E and flows to the bottom end of pitch cylinder (4).

When this happens, the solenoid valve is actuated so pilot spool (2) is actuated and the passages between ports N and P and ports Q and R are opened.

- At the same time, the oil at the rod end of left tilt/pitch cylinder (3) flows from port D to port B, while the oil at the rod end of right pitch cylinder (4) flows from port F through solenoid valve (a). It is then merged, passes through port B and returns to the tank.

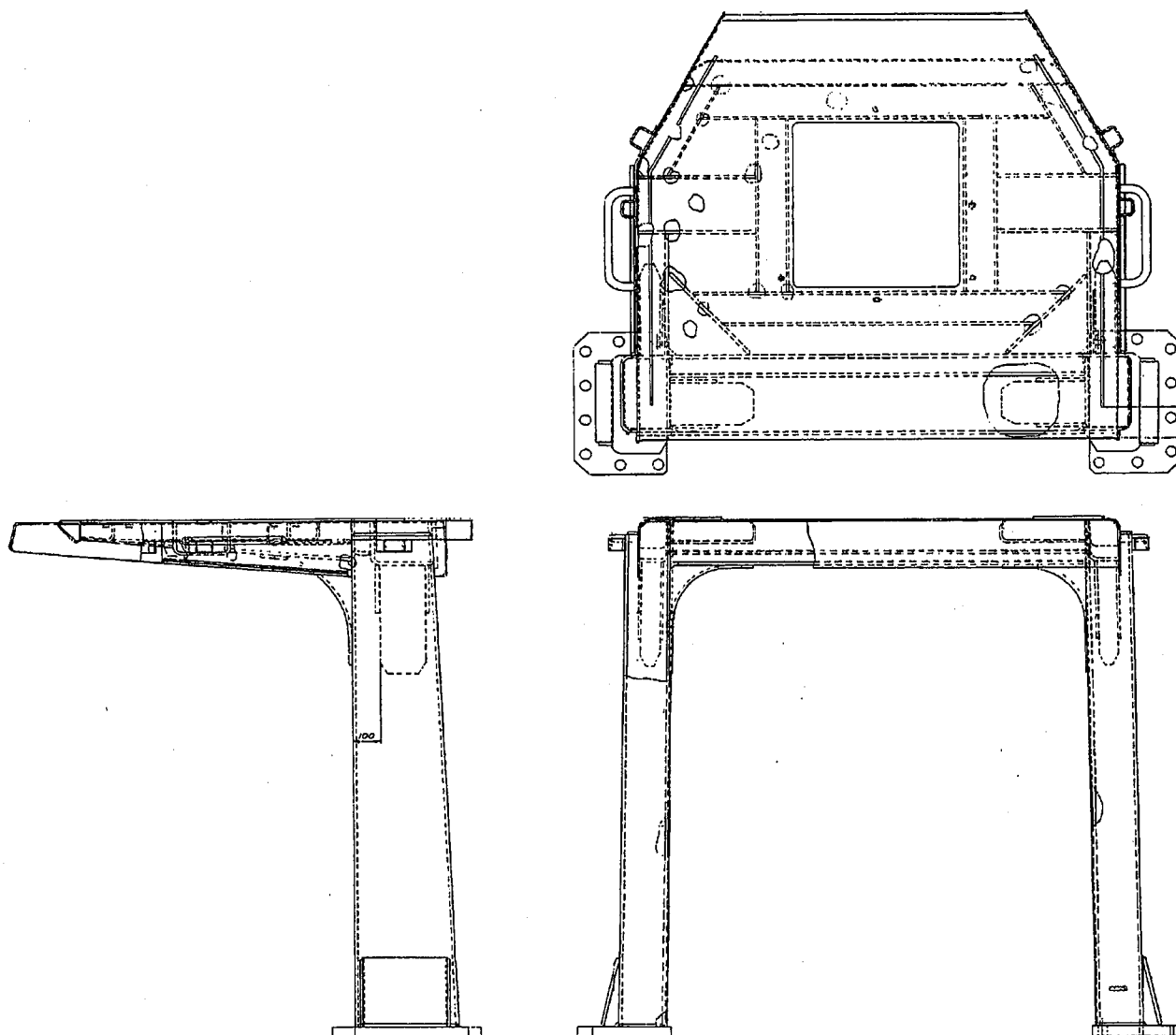
2. Operation of rear pitch

- The pressure oil supplied from main control valve port B1 flows from port B. Some of the pressure oil flows to port D, and then flows to the rod end of left tilt/pitch cylinder (3). With the other flow of pressure oil, solenoid valve (a) is actuated, so pilot spool (1) is also actuated, and the oil flows to port L. It then flows from port L, passes through ports K and F and flows to the rod end of pitch cylinder (4).

- At the same time, the oil at the bottom end of left tilt/pitch cylinder (3) flows from port C to Port G, while the oil at the bottom end of right pitch cylinder (4) flows from port E to port H. It is then merged at the merged/divider valve, passes through port A and returns to the tank.

When this happens, solenoid valve (b) is actuated so pilot spool (2) is actuated and the passages between ports N and P and ports Q and R are opened. Therefore, the work equipment is pitched to the rear.

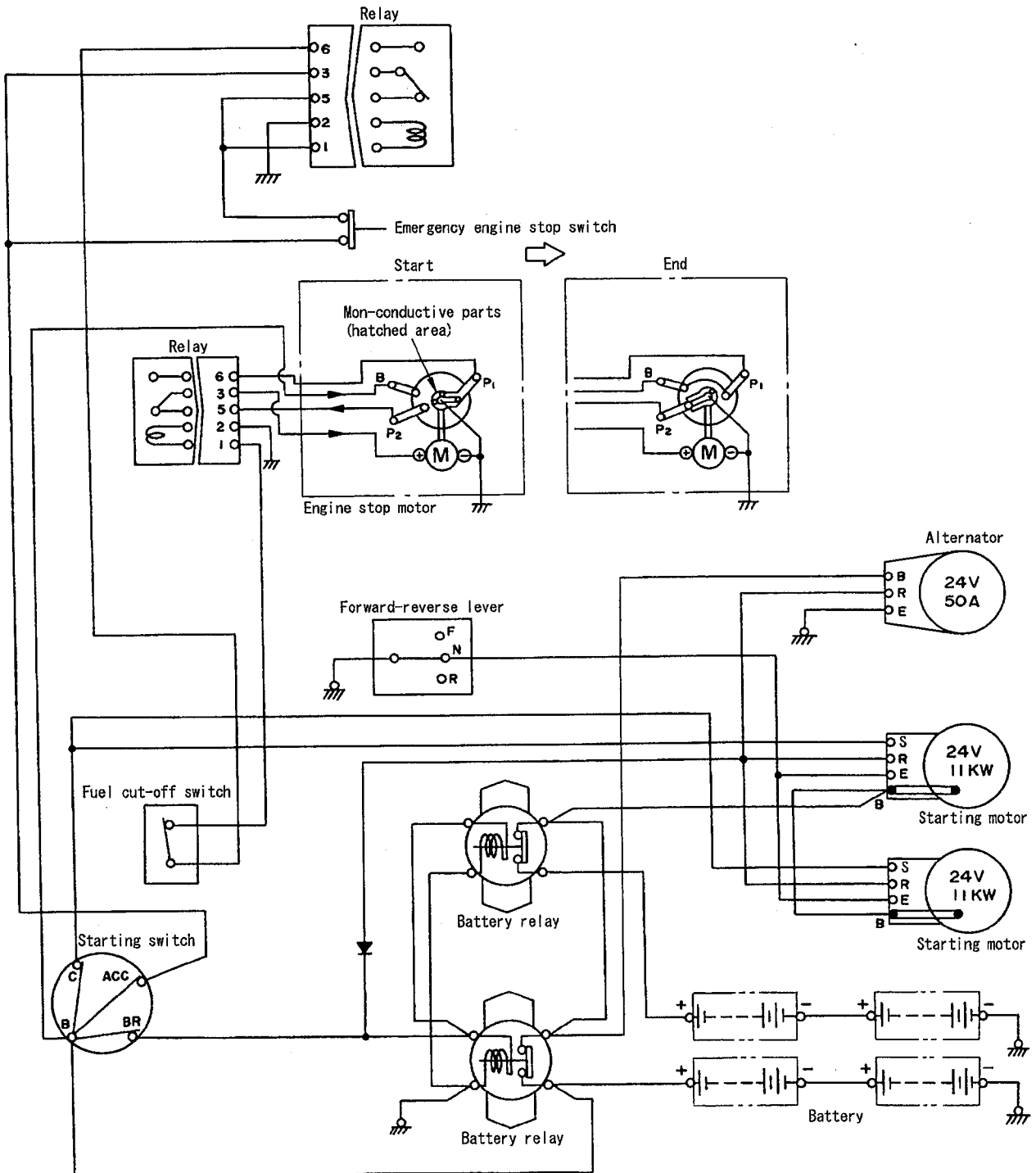
ROPS CANOPY



FUNCTION

- The engine can be stopped and started by turning the starting switch ON-OFF. An electrically operated fuel-cut system (engine stop motor) is used to improve ease of operation.

EMERGENCY ENGINE STOP



- If the starting switch is turned to the START position after the preheating pilot lamp goes out, electric current flows to neutral relay terminals 5 – 3, and the starting motor turns. At the same time, electric current flows to the circuit of APS controller terminal C and actuates the controller.

The APS fuel injection nozzle inside the intake manifold is switched ON/OFF to inject fuel intermittently (10 times/sec) to glow plugs 1 and 2. (When electric power is applied and the start signal is input, the APS controller sends the intermittent injection signal to the APS fuel injection nozzle.)

The fuel injected to glow plugs 1 and 2 is burned inside the intake manifold and heats the intake air.

After the engine starts, the signal from the preheating switch – APS water temperature sensor actuates the fuel injection nozzle and carries out afterheating.

After the engine starts and the warming-up operation raises the engine cooling water temperature to 20°C or above, the APS water temperature sensor opens (OFF). As a result, the water temperature sensor signal to the APS controller is turned OFF. The output signal to glow plugs 1 and 2 is cut off, and at the same time the afterheating pilot lamp flashes. When starting work when the engine is run-

MEASURING ENGINE SPEED

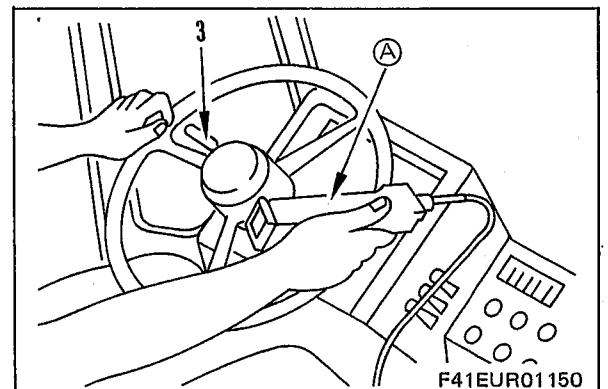
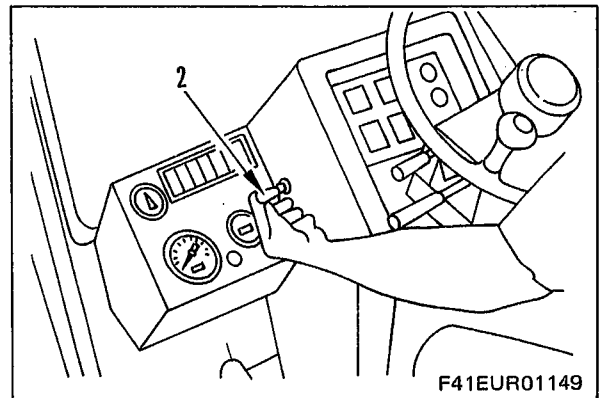
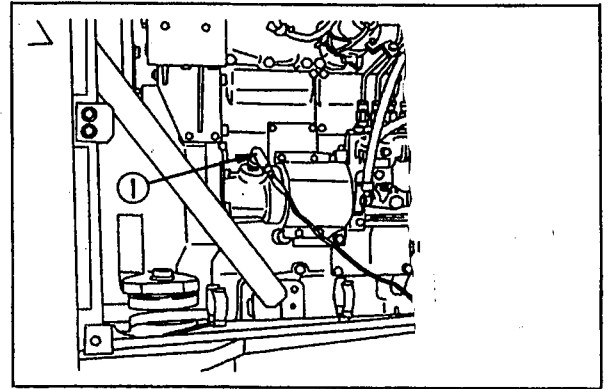
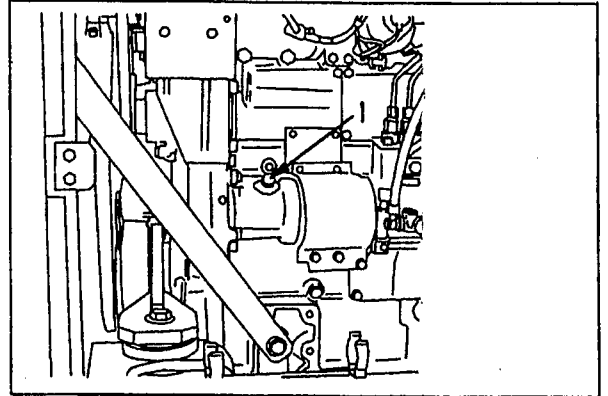
- ⚠ Put blocks securely under the tires.
- ⚠ When removing or installing the measuring equipment, be careful not to touch any high temperature parts.
- ⚠ Before starting measurement, check that there is no one in the surrounding area.
- ★ Measure the engine speed under the following conditions.
 - Coolant temperature: Within green range
 - Hydraulic temperature: 45 – 55°C
 - Power train oil temperature: 70 – 90°C

1. Measuring engine speed (low idling and high idling)

- 1) Install sensor (1) of multtachometer **A** to the engine speed pick-up port (1, {7/8-18NS}), then connect to tachometer **A**.
- 2) Start the engine and measure the engine speed at high idling and low idling.

2. Measuring torque converter stall speed

- 1) Install the sensor of multtachometer **A** to the speed pick-up port, then connect to tachometer **A**.
 - 2) Start the engine.
 - 3) Turn the transmission cut-off selector switch (2) OFF and depress the left brake securely. (Check that the transmission cut-off selector pilot lamp is OFF.)
 - 4) Place the gearshift lever (3) at **F4** or **R4**.
 - For machines equipped with automatic transmission, turn the main monitor manual switch ON and place the speed lever at **F4** or **R4**.
 - 5) Release the parking brake.
 - 6) Depress the accelerator pedal gradually to raise the engine speed to high idling, then measure the engine speed when the torque converter stalls.
- ★ Avoid stalling more than 20 seconds and prevent the torque converter oil temperature from going above 120°C.



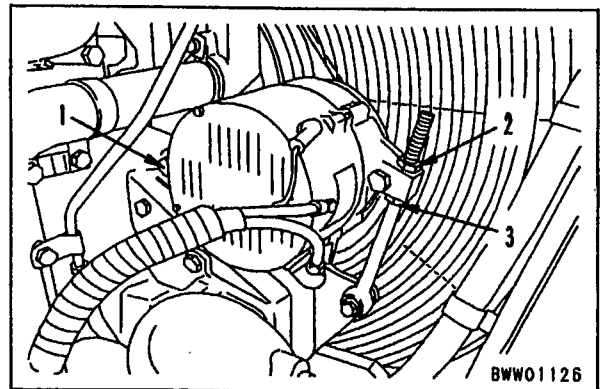
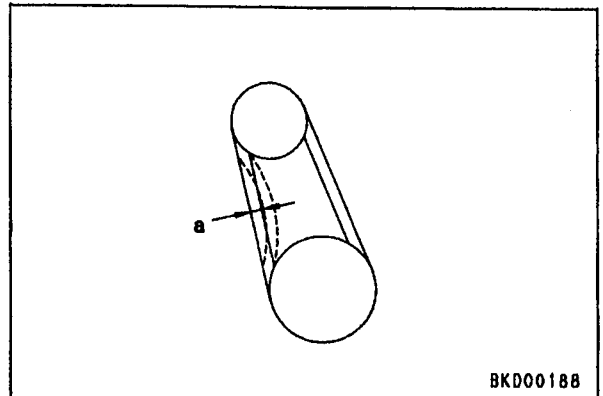
TESTING AND ADJUSTING ALTERNATOR BELT TENSION

1. Testing

- Measure deflection **a** of the belt when it is pushed with a finger force of approx. 58.8 N (approx. 6 kg) at a point midway between the alternator pulley and the drive pulley.
★ Deflection **a** of V-belt (standard value):
10 – 15 mm

2. Adjusting

- 1) Loosen the alternator mount bolt (1).
- 2) Loosen locknut (2), then turn adjustment nut (3) to adjust the tension of belt.
- 3) After adjusting the belt tension to the standard value, tighten locknut (2), then tighten alternator mount bolt (1).



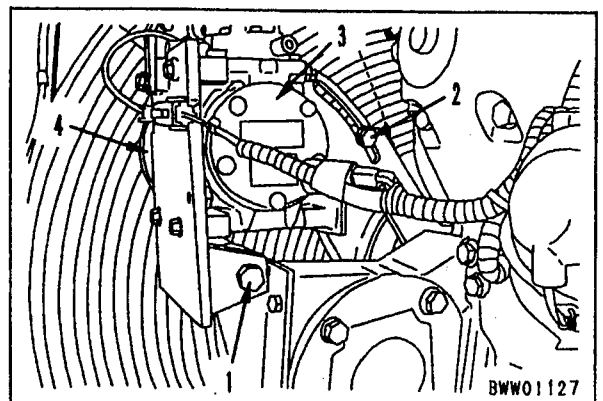
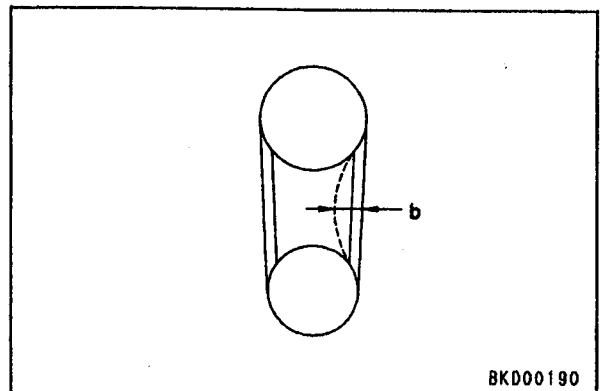
TESTING AND ADJUSTING BELT TENSION FOR AIR CONDITIONER COMPRESSOR

1. Testing

- Measure deflection **b** of the belt when it is pushed with a finger force of approx. 58.8 N (approx. 6 kg) at a point midway between the compressor pulley and the engine drive pulley.
★ Deflection **b** of V-belt (standard value):
10 – 15 mm

2. Adjusting

- 1) Loosen compressor mount bolt (1) and adjustment bolt (2).
- 2) Move the position of compressor (3) to adjust the tension of belt (4).
- 3) After adjusting the belt tension to the standard value, tighten adjustment bolt (2) and mount bolt (1).

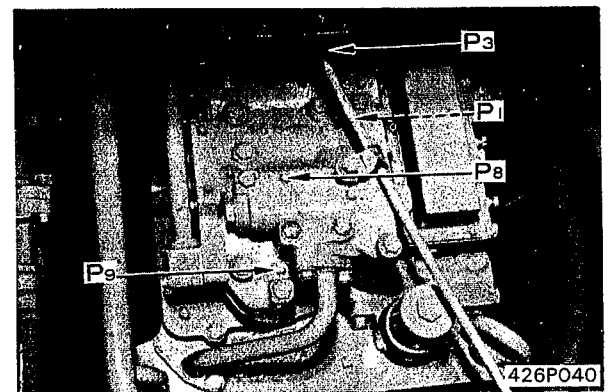
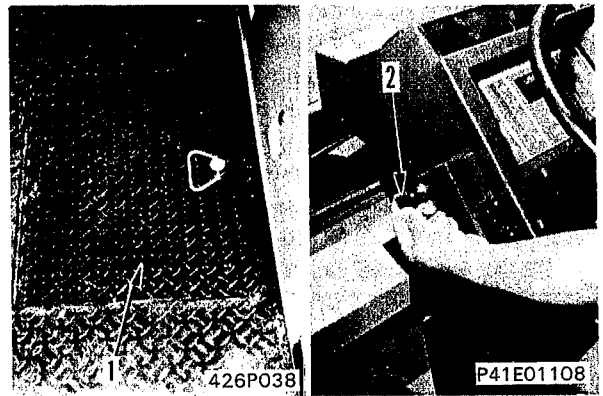


MEASURING OIL PRESSURE OF TORQUE CONVERTER AND TRANSMISSION

- ★ Measurement conditions
 - Coolant temperature: Inside operating range
 - Torque converter oil temperature: 60 to 80°C

Unit : MPa (kg/cm²)

Item	Standard value	Permissible value
Pilot reducing pressure	0.96 - 1.16 {9.8 - 11.8}	0.96 - 1.16 {9.8 - 11.8}
Modulating pressure (except F ₂ , R ₂)	At low idling: 3.04 - 3.33 {31 - 34} At high idling: 3.24 - 3.53 {33 - 36}	At low idling: 3.04 - 3.33 {31 - 34} At high idling: 3.24 - 3.53 {33 - 36}
Torque converter relief pressure	0.69 - 0.88 {7 - 9}	0.69 - 0.88 {7 - 9}
Lubrication oil pressure	0.20 - 0.39 {2 - 4}	0.20 - 0.39 {2 - 4}
Reducing valve oil pressure (for F ₂ , R ₂)	At low idling: 1.77 - 1.96 {18 - 20} At high idling: 1.86 - 2.06 {19 - 21}	At low idling: 1.77 - 1.96 {18 - 20} At high idling: 1.86 - 2.06 {19 - 21}
Torque converter outlet pressure	0.34 - 0.42 {3.5 - 4.3}	0.34 - 0.42 {3.5 - 4.3}



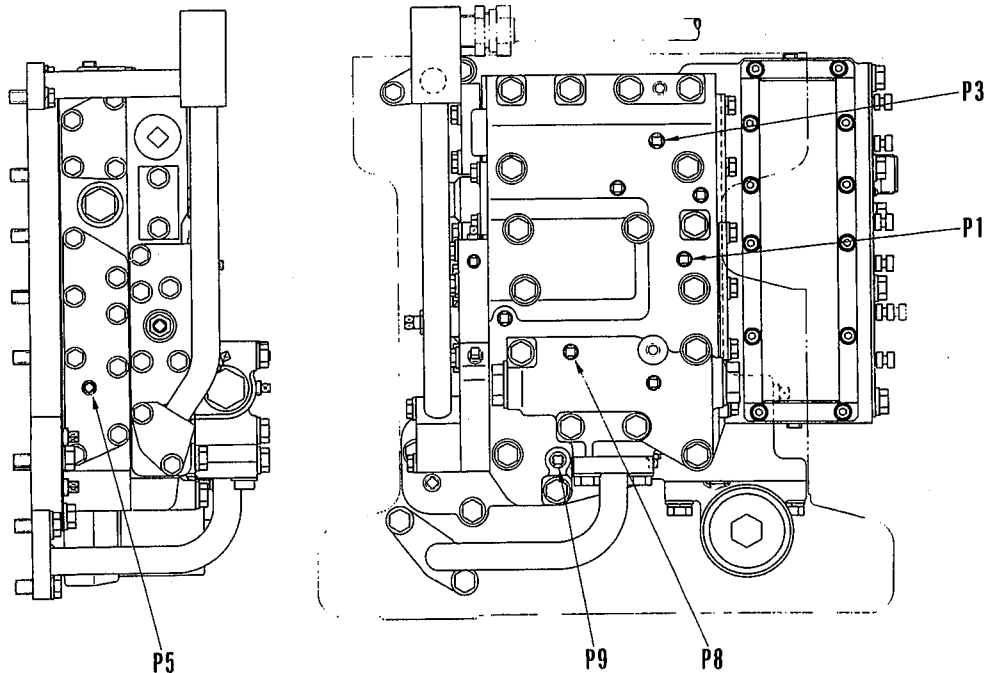
Special tool

	Part No.	Part Name	Q'ty
B	799-101-5000	Hydraulic tester	1

⚠ Apply the parking brake and block the tires.

Measuring procedure

- ★ The following preparatory work is necessary before measuring any oil pressure.
 - Remove cover (1) on rear side of the cab.
 - Turn the transmission cut-off selector switch (2) to OFF and use the left brake. (Check that the pilot lamp is OFF.)
- Remove the plug from the measuring port of the transmission valve.
- Install hydraulic tester A to the measuring port, pull the gauge to the operator's compartment, then start the engine and measure the pressure.
- ★ Check that there is no leakage of oil from any joints.



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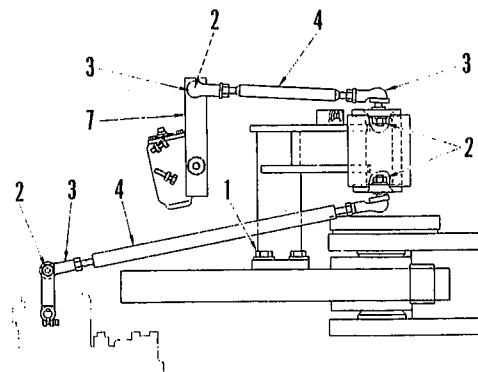
TESTING STEERING LINKAGE

★ Measurement condition

- Hydraulic oil temperature: 45 to 55°C
- Road surface: Flat, horizontal, dry, paved surface
- Tire inflation pressure: Specified pressure
- Engine speed: 1200 rpm
- Center lever: Right angle with the machine center line.
- Pitman arm: Perpendicular to the machine rear frame.

Unit: sec.

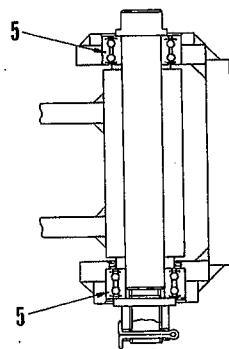
Item	Standard value	Permissible value
Clearance between front frame and rear frame	23 – 27	—



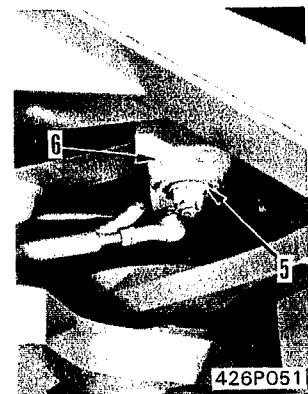
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Measuring procedure

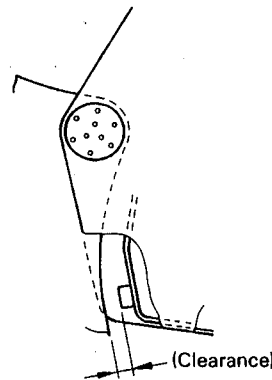
1. Start the engine and operate the steering wheel to set the front and rear frames in a straight line.
2. Check looseness of mounting bolt (1) and nut (2) of linkage and play of ball joint (3), rod (4), and center lever bearing (5).
3. Check that the center lever (6) is at right angles to the center line of the machine.
 - ★ The steering spool should be at neutral.
4. Check that the pitman arm (7) is perpendicular.
5. Start the engine and turn the steering wheel to the left and right to the full lock position. Measure clearance "a" between the front frame and rear frame stoppers.
 - ★ When measuring the clearance to the right, adjustment screw (8) should be in contact with pitman arm.
 - When measuring the clearance to the left, adjustment screw (9) should be in contact with pitman arm.
 - ★ When measuring the clearance, adjustment screws (10) and (11) do not in contact with center lever (6) respectively.



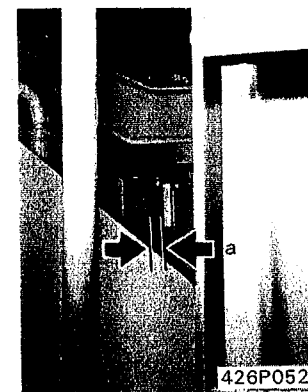
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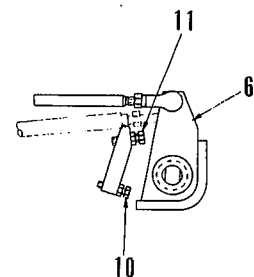
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TESTING BRAKE PERFORMANCE

- ★ Measurement condition
- Time lag when pressing the pedal: 0.1 sec.
- Air pressure: 6.0 kg/cm²
- Road surface:
Flat, horizontal, straight, dry, paved surface.
- Machine speed:
Speed when applying brakes: 20 km/h
- Tire inflation pressure: Specified pressure.

Unit: m

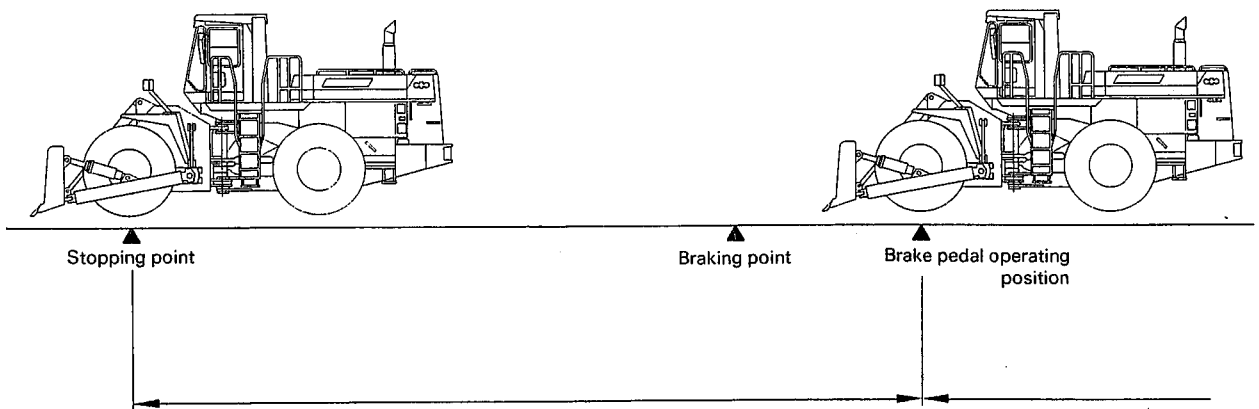
Item	Standard value	Permissible value
Brake performance	Max. 6.5	Max. 6.5

Special tool

	Part No.	Part Name	Q'ty
D	Commercially available	Tape measure	1

Conditions for measurement

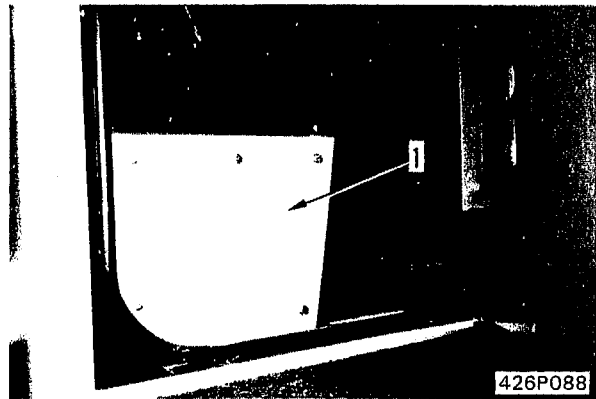
- 1) Start the engine and then start the machine.
 - 2) Place the speed control lever in the highest speed range and drive the machine.
 - 3) When the machine is traveling at 20 km/h, depress the left brake pedal with 38 kg.
 - ★ Decide the run-up road and point to apply the brakes, then apply the brakes when the braking point is reached.
 - 4) Measure the distance from the braking point to the point where the machine stops.
- ★ Carry out the test three times and take the average value.



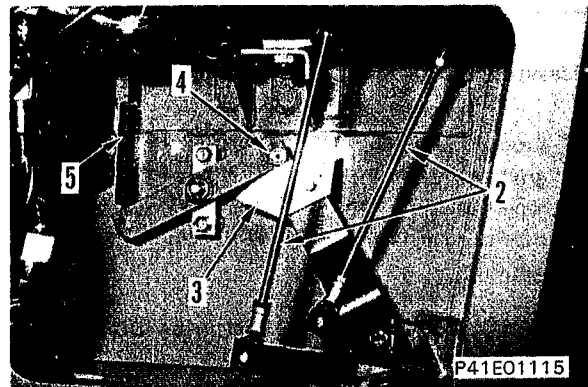
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ADJUSTING PITCH, TILT AND LIFT CONTROL LEVERS

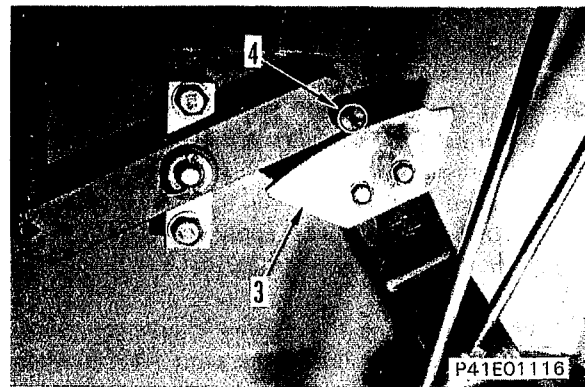
1. Remove cover (1).



2. Place the work equipment control lever at neutral, and apply the lever lock to hold it in position.



3. Loosen nut, then adjust length of rod (2) so that Main control valve is in HOLD.
★ If the cam (3), roller (4) and spring (5) are damaged, replace them.
4. Remove the lever lock, and adjust the position of the oblong hole of the cam so that roller (4) enters the notch in cam (3) when the lever is at the FLOAT position.
★ Operate the control lever and check that the lever is held at the FLOAT position.



- 1) Check that there is no oil, dirt, or water stuck to the connector pins (mating portion).
- 2) Check that there is no deformation, defective contact, corrosion, or damage to the connector pins.
- 3) Check that there is no damage or breakage to the outside of the connector.
 - ★ If there is any oil, water, or dirt stuck to the connector, wipe it off with a dry cloth. If any water has got inside the connector, warm the inside of the wiring with a dryer, but be careful not to make it too hot as this will cause short circuits.
 - ★ If there is any damage or breakage, replace the connector.

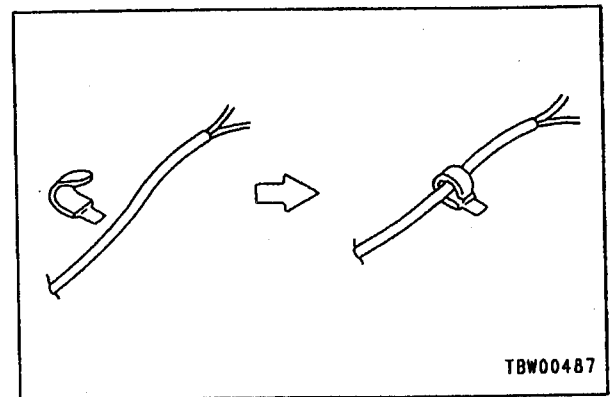
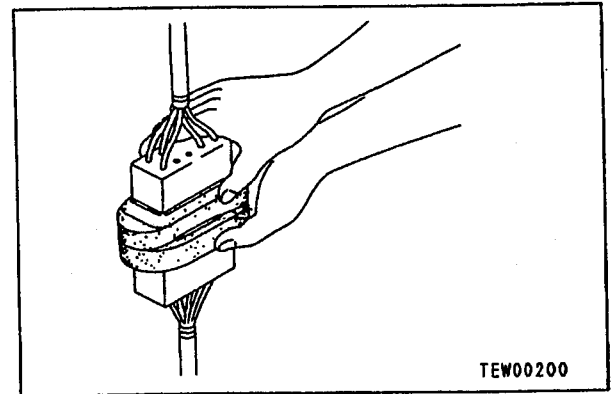
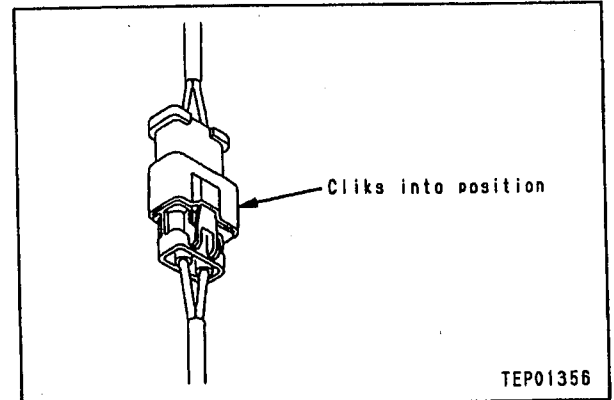
- ② Fix the connector securely.
Align the position of the connector correctly, then insert it securely.
For connectors with lock stopper, push in the connector until the stopper clicks into position.

- ③ Correct any protrusion of the boot and any misalignment of the wiring harness
For connectors fitted with boots, correct any protrusion of the boot. In addition, if the wiring harness is misaligned, or the clamp is out of position, adjust it to its correct position.
 - ★ If the connector cannot be corrected easily, remove the clamp and adjust the position.

- ④ If the connector clamp has been removed, be sure to return it to its original position. Check also that there are no loose clamps.

- **Drying wiring harness**

If there is any oil or dirt on the wiring harness,



TROUBLESHOOTING OF ENGINE SYSTEM

Method of using troubleshooting charts	20-302
S- 1 Starting performance is poor (starting always takes time)	20-306
S- 2 Engine does not start	
(1) Engine does not turn	20-308
(2) Engine turns but no exhaust smoke comes out (fuel is not being injected)	20-309
(3) Exhaust gas smoke comes out but engine does not start (fuel is being injected)	20-310
S- 3 Engine does not pick-up smoothly (follow-up is poor)	20-311
S- 4 Engine stops during operations	20-312
S- 5 Engine does not rotate smoothly (hunting)	20-313
S- 6 Engine lacks output (no power)	20-314
S- 7 Exhaust smoke is black (Incomplete combustion)	20-315
S- 8 Oil consumption is excessive (or exhaust smoke is blue)	20-316
S- 9 Oil becomes contaminated quickly	20-317
S-10 Fuel consumption is excessive	20-318
S-11 Oil is in cooling water, or water spurts back, or water level goes down	20-319
S-12 Oil pressure lamp lights up (drop in oil pressure)	20-320
S-13 Oil level rises	20-321
S-14 Water temperature becomes too high (overheating)	20-322
S-15 Abnormal noise is made	20-323
S-16 Vibration is excessive	20-324

S-13 Oil level rises

★ If there is oil in the cooling water, carry out troubleshooting for "Oil is in cooling water".

General causes why oil level rises

- Water in oil (cloudy white)
- Fuel in oil (diluted, and smells of diesel fuel)
- Entry of oil from other component

		Causes											
		Broken oil cooler core, O-ring	Defective nozzle holder sleeve	Broken cylinder head, head gasket precombustion chamber	Clogged water pump breather (including)	Worn, damaged rear seal surface	Defective rear seal surface	Leakage of fuel from nozzle holder equipment	Defect inside injection pump	Defective thermostat seat	Damaged cylinder liner O-ring	Cracks inside cylinder block	Broken after-cooler core
Questions	Confirm recent repair history												
	Degree of use												
	Operated for long period		△		△	△	△				△		
	There is oil in radiator cooling water	◎	○	○							○	○	
	Exhaust gas is white	◎						○		○			
	When engine is first started, drops of water come from muffler	◎											○
	Leave radiator cap open. When engine is run at idling, an abnormal number of bubbles appear, or water spurts back			◎							○		
	Water pump breather hole is clogged with mud				◎								
	When water pump breather hole is cleaned, water comes out				◎								
	Oil level does down in TORQFLOW transmission, or damper case					◎							
	Oil level does down in hydraulic tank						◎						
	Engine oil smells of diesel fuel							◎	◎	◎			
	Fuel is added more frequently							◎	◎	◎			
	Troubleshooting	Pressure-tightness test of oil cooler shows there is leakage	●										
Pressure-tightness test of cylinder head shows there is leakage			●										
When compression pressure is measured, it is found to be low				●									
Remove water pump and inspect directly					●								
Inspect rear seal directly						●							
When pump auxiliary equipment is removed, seal is found to be broken							●						
Remove nozzle holder and inspect directly								●					
Remove injection pump and inspect directly									●				
There is improper contact of thermostat seat valve										●			
Remove oil pan and inspect directly											●	●	
Pressure-tightness test of after-cooler core shows there is leakage													●
Legend		Remedy											
○ : Possible cause (judging from Questions and Check items)		Replace	Replace	Replace	Replace	Repair	Replace	Repair	Replace	Repair	Replace	Replace	Replace
◎ : Most probable causes (judging from Questions and Check items)													
△ : Possible causes due to length of use (used for a long period)													
● : Items confirm the cause													

4. Torque converter oil temperature too high

Ask the operator the following points.

- Does not torque converter oil temperature go up during torque converter stall, and down when the torque converter is not stalled?
Yes = Normal (Incorrect selection of gear speed)

Checking before troubleshooting

- Is oil level in transmission case correct?
- Is filter clogged?

Checking for abnormalities

- ★ If the oil temperature is normal but the oil temperature gauge is outside the operating range, the oil temperature gauge is defective.

Causes	Tank to pump		Torque converter	
	a	b	c	d
	Air sucking up at suction side of pump			
Pump defective				
Operation of torque converter relief valve defective				
Leakage of oil inside torque converter (seal ring defective, plug loose, pump or turbine cracked)				

No.	Problems	Remedy			
		a	b	c	d
		△ X	X	△ X	△ X
1	Pump makes abnormal noise when oil temperature is low.	○			
2	High idling and low idling speeds are too low.				○
3	Hydraulic pressure at inlet port of torque converter too low			○	
4	Transmission modulating pressure too low	○	○		

The following symbols are used to indicate the action to be taken when a cause of failure is located.

X : Replace △ : Repair
A : Adjust C : Clean

5. Parking brake does not release, or drags.

Checks before troubleshooting

- Is the pressure in the air circuit within the specified range? (if the air circuit pressure is 4.0 kg/cm² or less, the parking brake solenoid valve will automatically operate to engage the parking brake.)

No.	Problems	Remedy	Causes			
			a	b	c	d
			X	△ X	△ X	C △ X
1	When parking brake switch turned to OFF, air leaks from spring cylinder, and cylinder rod does not return fully.			○		
2	Parking brake not released even when parking brake switch is turned OFF.		○			
3	The spring cylinder operates normally and the rod and lever return, however the brake drags.				○	○

The following symbols are used to indicate the action to be taken when a cause of failure is located.

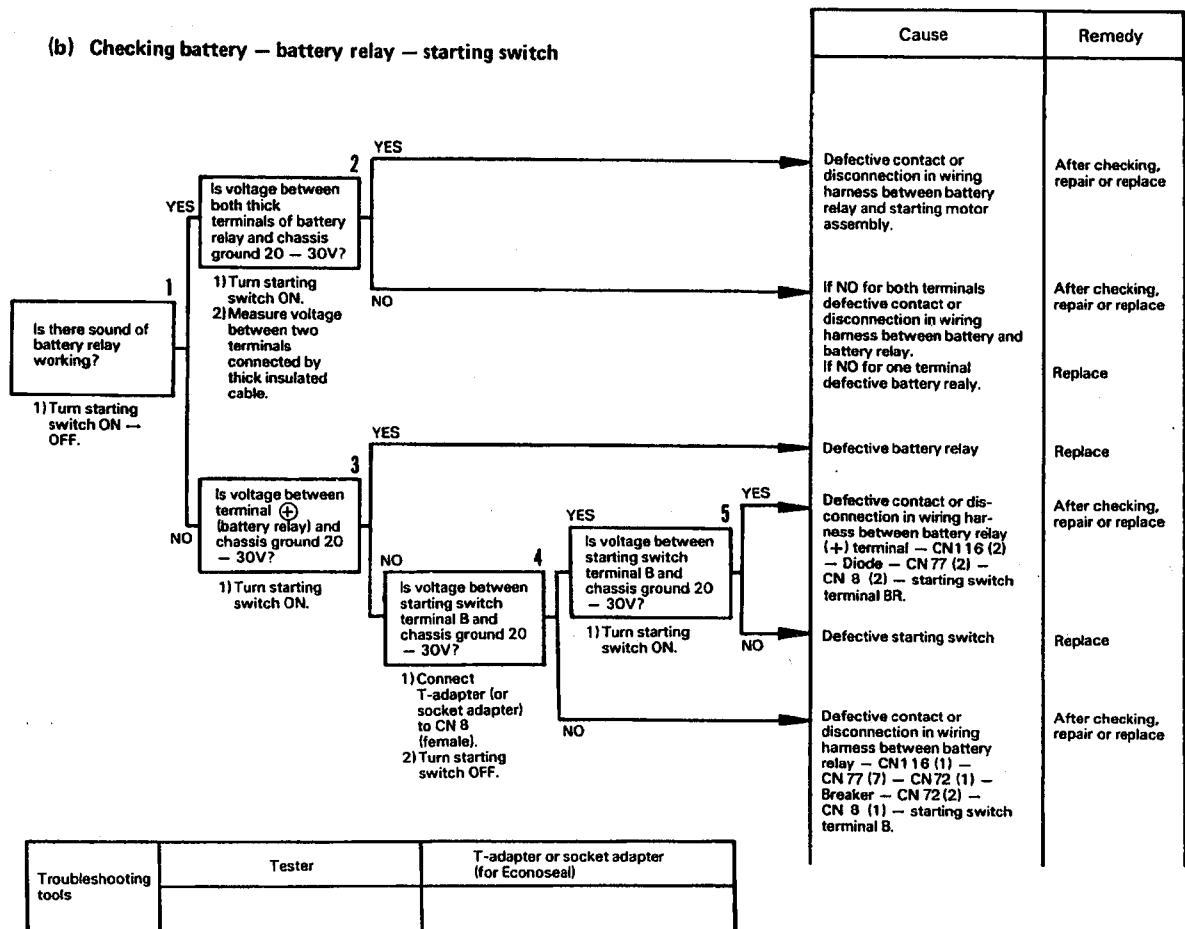
X : Replace △ : Repair
 A : Adjust C : Clean

Example

- ★ When disconnecting or connecting the T-adapter (or socket adapter) or short socket adapter, or when disconnecting the connector for checking, turn the starting switch OFF to prevent accidents.
- ★ When connecting the T-adapter (or socket adapter), connect to the connector specified. (CNxx())
- ★ When disconnecting connectors or connecting T-adapters, return them to the original condition immediately after checking, then go to the next check.

TROUBLESHOOTING CHART No. E-1.

Failure mode: ENGINE DOES NOT START.



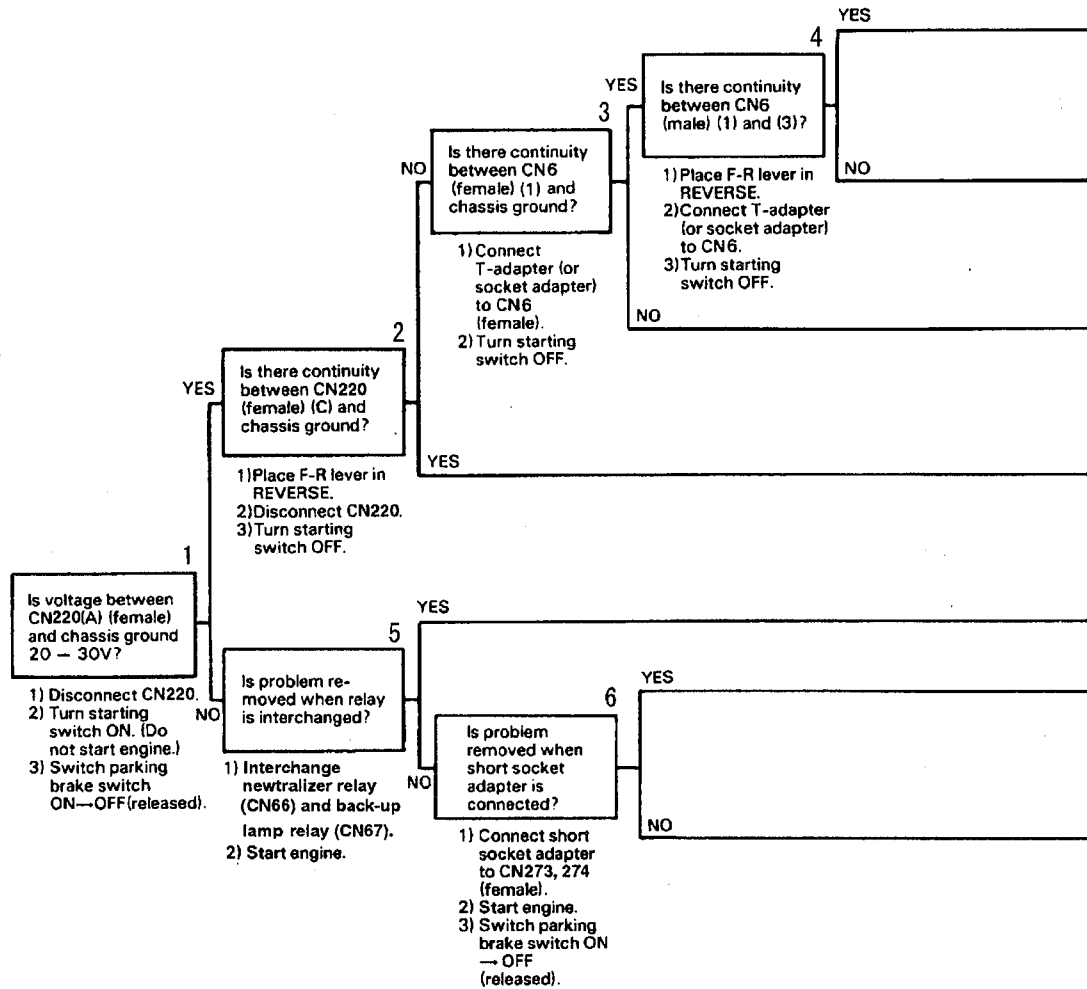
TROUBLESHOOTING CHART FOR ELECTRICAL SYSTEM

E-1	Engine does not start	20-818
E-2	Engine does not stop	20-822
E-3	Engine stops when traveling	20-823
E-4	Transmission is not returned to neutral when parking brake is applied	20-824
E-5	Machine does not travel forward	20-826
E-6	Machine does not travel reverse	20-828
E-7	Transmission does not shift gear (F-R direction normal)	20-830
E-8	Machine does not travel when transmission cut-off selector switch is on (machine travels when transmission cut-off selector switch is off)	20-831
E-9	Transmission cannot be cut-off (when transmission cut-off selector switch is on and depress left brake pedal)	20-831
E-10	Transmission does not return to neutral	20-832
E-11	Preheating does not display	20-834
	a) Preheating does not display when starting switch ON	20-834
	b) Preheating displays when turn preheating switch turn ON, but does not display when turn preheating switch AUTO	20-835

- ★ When disconnecting or connecting the T-adapter (or socket adapter) or short socket adapter, or when disconnecting the connector for checking, turn the starting switch OFF to prevent accidents.
- ★ When connecting the T-adapter (or socket adapter), connect to the connector specified. (CNxx ())
- ★ When disconnecting connectors or connecting T-adapter, return them to the original condition immediately after checking, then go to the next check.
- ★ If the head lamps and other electrical parts are not working normally, check battery – battery relay – starting switch first.

TROUBLESHOOTING CHART No. E-6.

Failure mode: MACHINE DOES NOT TRAVEL REVERSE.



Troubleshooting tools	Tester	T-adapter or socket adapter (for Econoseal) (for MS connector)
	Short socket adapter	

PRECAUTIONS WHEN CARRYING OUT OPERATION

[When carrying out removal or installation (disassembly or assembly) of units, be sure to follow the general precautions given below when carrying out the operation.]

1. Precautions when carrying out removal work

- If the coolant contains antifreeze, dispose of it correctly.
- After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- When draining oil, prepare a container of adequate size to catch the oil.
- Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors. Do not pull the wires.
- Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- Check the number and thickness of the shims, and keep in a safe place.
- When raising components, be sure to use lifting equipment of ample strength.
- When using forcing screws to remove any components, tighten the forcing screws uniformly in turn.
- Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.

★ Precautions when handling piping during disassembly

Fit the following blind plugs into the piping after disconnecting it during disassembly operations.

1) Hoses and tubes using sleeve nuts

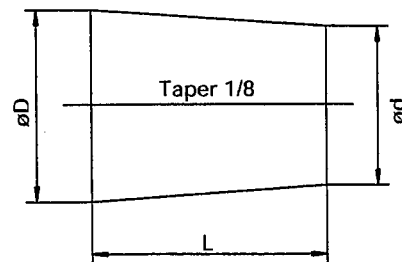
Nominal number	Plug (nut end)	Sleeve nut (elbow end) Use the two items below as a set
02	07376-50210	07221-20210 (Nut), 07222-00210 (Plug)
03	07376-50315	07221-20315 (Nut), 07222-00312 (Plug)
04	07376-50422	07221-20422 (Nut), 07222-00414 (Plug)
05	07376-50522	07221-20522 (Nut), 07222-00515 (Plug)
06	07376-50628	07221-20628 (Nut), 07222-00616 (Plug)
10	07376-51034	07221-21034 (Nut), 07222-01018 (Plug)
12	07376-51234	07221-21234 (Nut), 07222-01219 (Plug)

2) Split flange type hoses and tubes

Nominal number	Flange (hose end)	Sleeve head (tube end)	Split flange
04	07379-00400	07378-10400	07371-30400
05	07379-00500	07378-10500	07371-30500

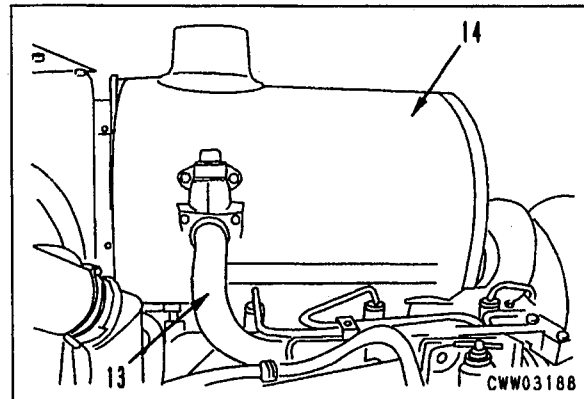
3) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Part Number	Dimensions		
		D	d	L
06	07049-00608	6	5	8
08	07049-00811	8	6.5	11
10	07049-01012	10	8.5	12
12	07049-01215	12	10	15
14	07049-01418	14	11.5	18
16	07049-01620	16	13.5	20
18	07049-01822	18	15	22
20	07049-02025	20	17	25
22	07049-02228	22	18.5	28
24	07049-02430	24	20	30
27	07049-02734	27	22.5	34



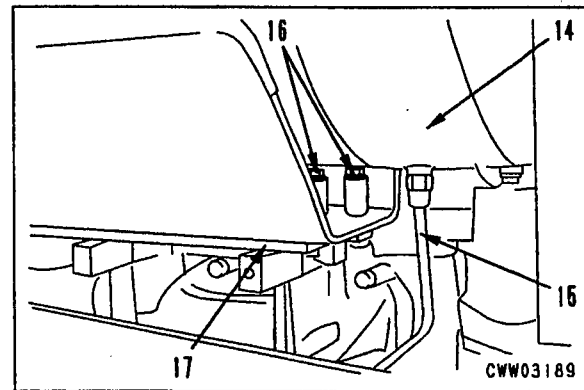
DEW00401

9. Disconnect Komaclone (air cleaner) tube (13) from muffler (14).



10. Remove muffler drain tube (15).

11. Remove 2 rear mounting bolts (16) of the muffler, then remove the 2 bracket mounting bolts.
- ★ The bracket mounting bolts are installed inside the muffler mounting bolts.
 - ★ Install the muffler mounting bolts again temporarily to prevent bracket (17) from falling.
 - ★ Similarly, remove the front bracket mounting bolts.



12. Move muffler (14) horizontally toward the radiator, then remove it together with bracket (17).



Muffler: 50kg

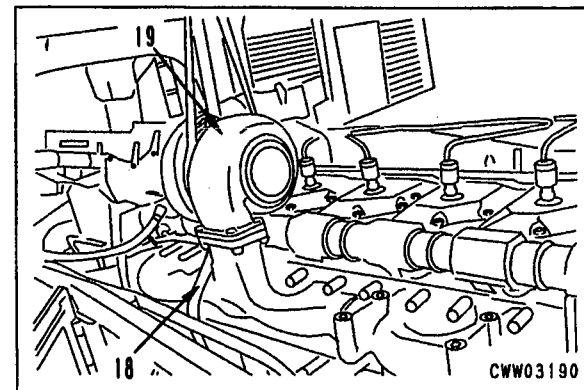
- ★ Move the muffler toward the radiator until it and connector comes off.

13. Disconnect turbocharger lubrication oil outlet tube (18).

14. Remove the mounting bolts, then remove turbocharger (19).



Turbocharger: 20kg



INSTALLATION OF TURBOCHARGER

- Carry out installation in the reverse order to removal.

※ 1



Connector mounting bolt:

29.4 – 34.3Nm (3.0 – 3.5kgm)

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INSTALLATION OF CYLINDER HEAD


- Carry out installation in the reverse order to removal.

※ 1

 Intake connector mounting bolt:
29.4 – 34.3Nm {3.0 – 3.5kgm}


※ 2

 Exhaust manifold mounting bolt:
Lubricant (LM-P)

 Exhaust manifold mounting bolt:
98.1 – 122.6Nm {10.0 – 12.5kgm}

- ★ Tighten the mounting bolts in the order shown in the diagram on the right.


※ 3

 Intake manifold mounting bolt:
1st step: 19.6 – 29.4Nm {2.0 – 3.0kgm}

2nd step: 58.8 – 73.5Nm {6.0 – 7.5kgm}


- ★ Tighten the mounting bolts in the order shown in the diagram on the right.

※ 4

 Head cover mounting bolt:
29.4 – 34.3Nm {3.0 – 3.5kgm}

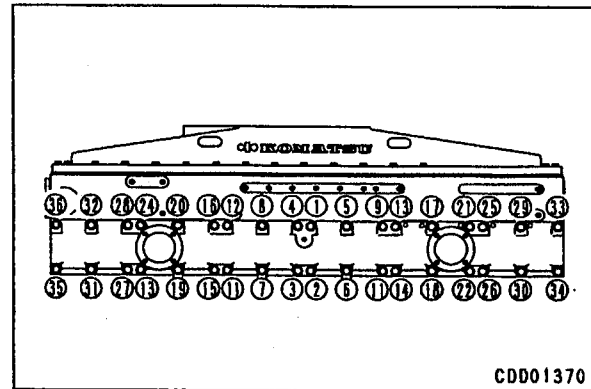
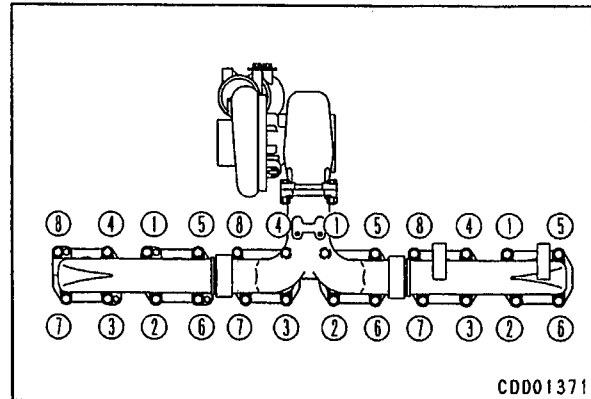
※ 5

- ★ Check that the push rod is fitted securely in the bowls of the cam follower and adjustment screw.

 Rocker arm mounting bolt:
93.1 – 102.9Nm {9.5 – 10.5kgm}

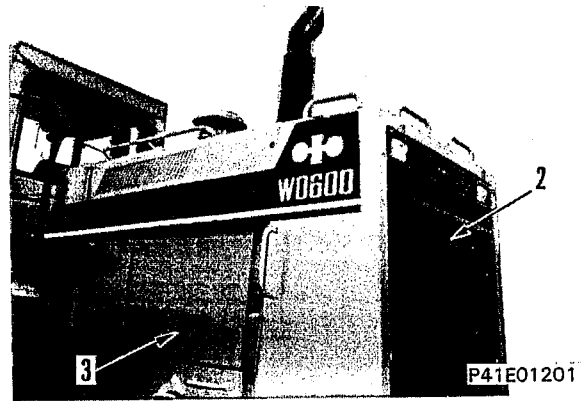
※ 6

- ★ Adjust the crosshead as follows.
 - Loosen locknut, then turn adjustment screw back.
 - Press top of crosshead lightly and tighten adjustment screw.
 - When adjustment screw contacts valve stem, screw in a further 20°. Tighten locknut at this position.



6. Radiator grill

Install radiator grill (2), then close engine inspection panel (3).



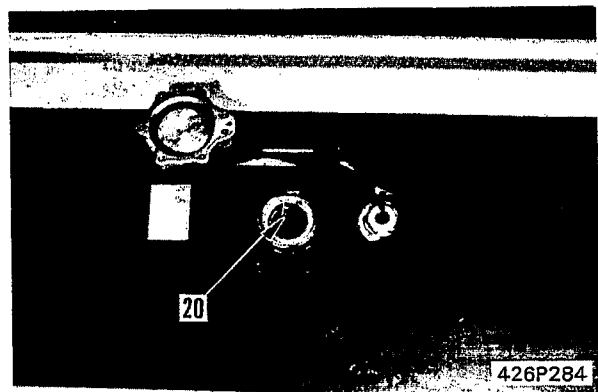
7. Refilling with water

Tighten drain valve, then add water through water filler (20) to specified level.

★ Run engine to circulate water through system. Then check oil level again.



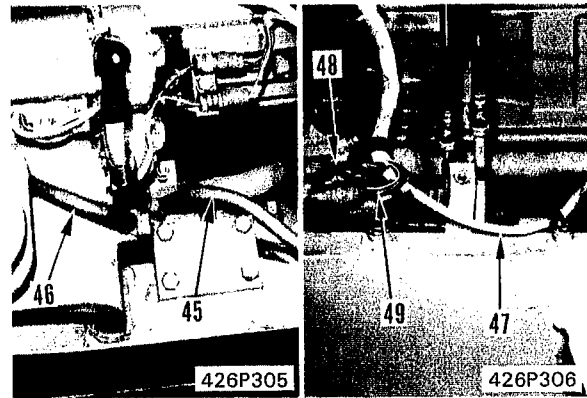
Coolant: 135 ℓ



6. Electric wiring

Connect following wirings.


- Wirings (48) and (49) for engine.
- Main breaker wiring (47).
 - ★ Install clamp for wiring.
- Wiring (46) for chassis ground.
- Wiring (45) for starting motor.

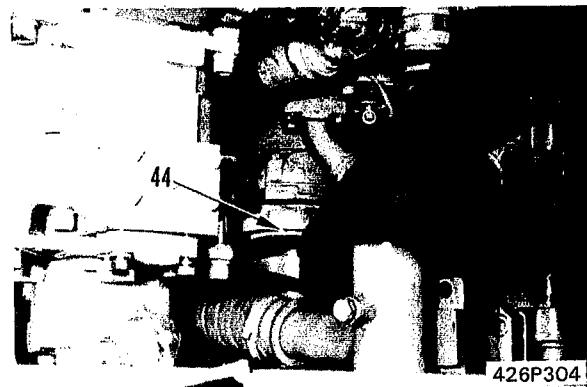


7. Drive shaft

Align match marks, install drive shaft (44).

- ★ When connecting drive shaft, clean contact surface of spider and coupling.

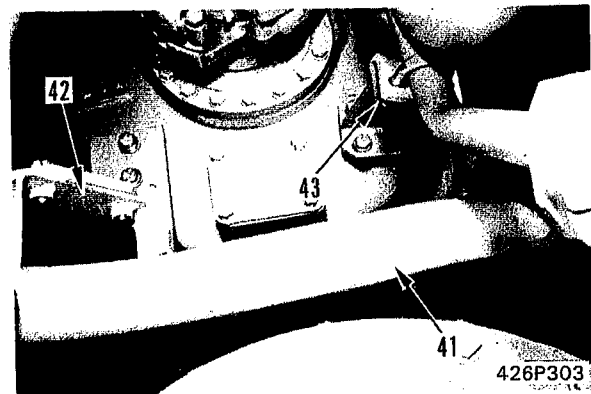
 Mounting bolt: 113.0 ± 9.81
 $\{11.5 \pm 1.0 \text{kgm}\}$



8. Torque converter piping

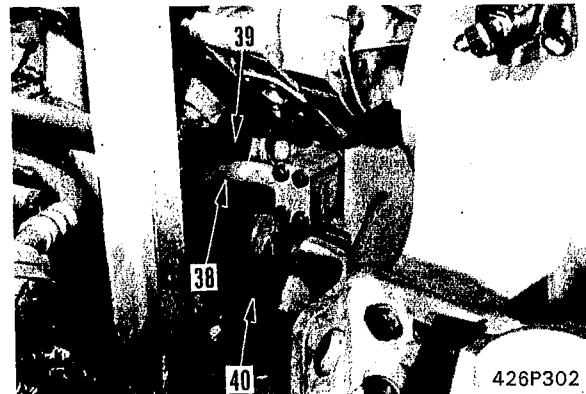
1) Connect tube (41) between transmission and torque converter to torque converter.

- ★ Install brackets (42) and (43).




2) Connect hoses (39) and (40) between transmission and torque converter to torque converter.


3) Connect tube (38) between torque converter oil cooler and torque converter to torque converter.



REMOVAL OF HYDRAULIC PUMP ASSEMBLY

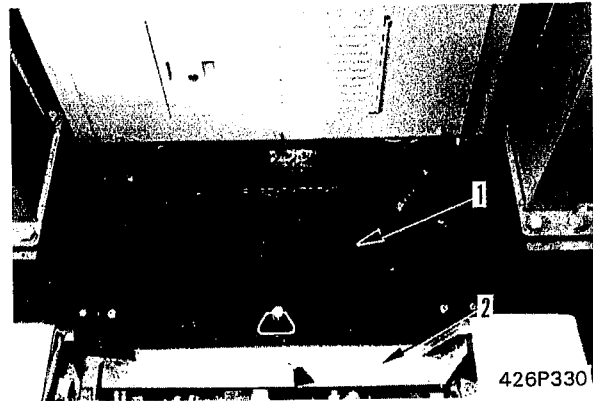
(Transmission lubricating + Torque converter charging + Switch pump)

 Stop the machine on level ground and install the safety bar on the frame. Lower the blade to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

 Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then operate the steering wheel and the control levers several times to release the remaining pressure in the hydraulic piping.

1. Cover

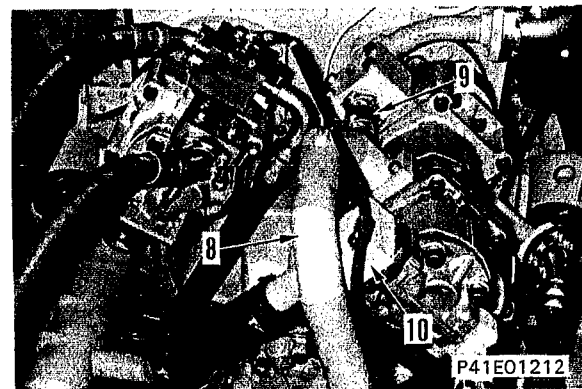
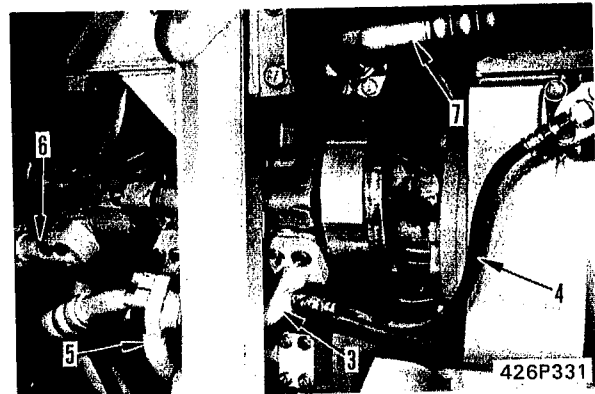
Open bulkhead inspection cover, then remove cover (1) and support (2).



2. Hydraulic piping

Disconnect following pipings from hydraulic pump.


- Tube (3) between hydraulic pump and transmission.
- ★ Disconnect hose (4) from torque converter PTO case.
- Tube (5) between hydraulic pump and torque converter filter.
- ★ Loosen clamp of tube.
- Tube (6) between hydraulic pump and steering valve.
- Hose (7) between torque converter oil cooler and hydraulic pump.
- Tube (8) between transmission and hydraulic pump.
- ★ Loosen clamp of hose (9) at tube (8) end, then pull out to forward.
- ★ Loosen clamp of tube (8).
- ★ Be careful not to damage O-ring.
- Tube (10) between hydraulic tank and hydraulic pump.



3. Hydraulic pump

Sling hydraulic pump (11), remove mounting bolts, then lift off.

- ★ When removing hydraulic pump, be careful not to damage O-ring.

 Hydraulic pump: 49.7 kg



DISASSEMBLY OF TORQUE CONVERTER ASSEMBLY

Special tools

	Part number	Part name	Q'ty
A	790-501-5000	Unit repair stand	1
A ₁	790-901-4110	Bracket	1
A ₂	793-310-2190	Plate	1
B	790-310-1020	Wrench	1

Preparatory work

- Using eyebolts, raise torque converter (1) and set on tool A.



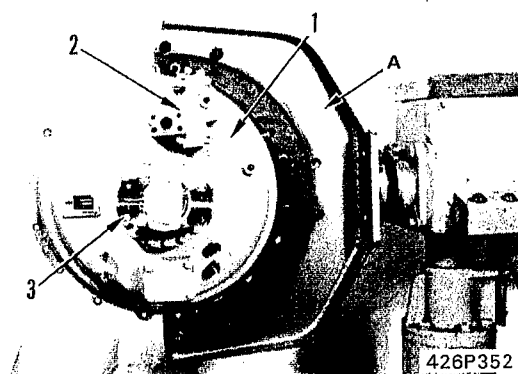
Torque converter: 175 kg

1. Torque converter valve assembly

Remove torque converter valve assembly (2).

2. Flange

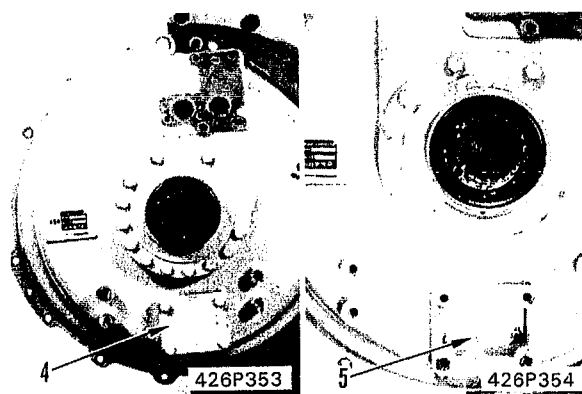
Remove flange (3).



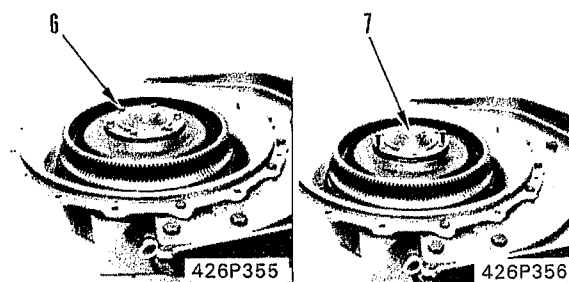
3. Drive case, turbine assembly

★ Come out remain oil, so prepare oil pan.

- Remove inspection cover (4).
- Leave 2 bolts on diagonally, remove mounting bolts (5).
- Turn over tool A to set drive case facing upper. Remove 2 remain bolts (5).

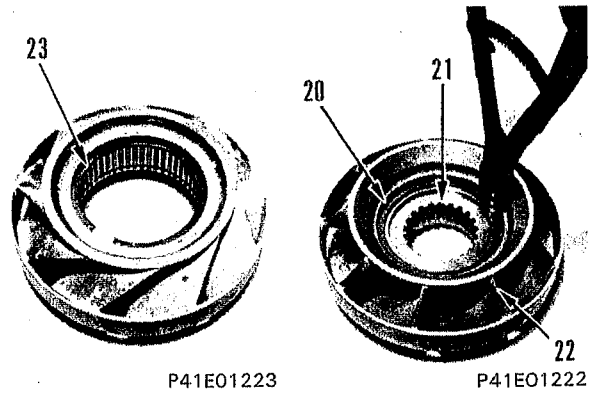
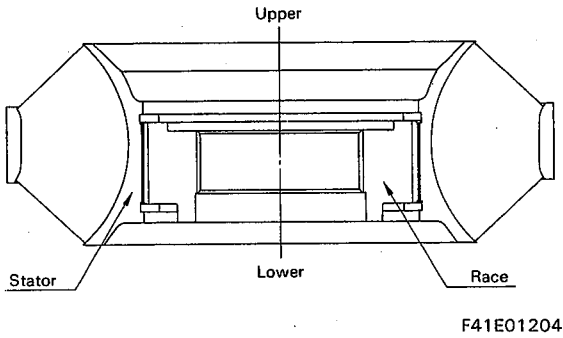


- Remove 6 mounting bolts (6), using forcing screw, remove cover (7).

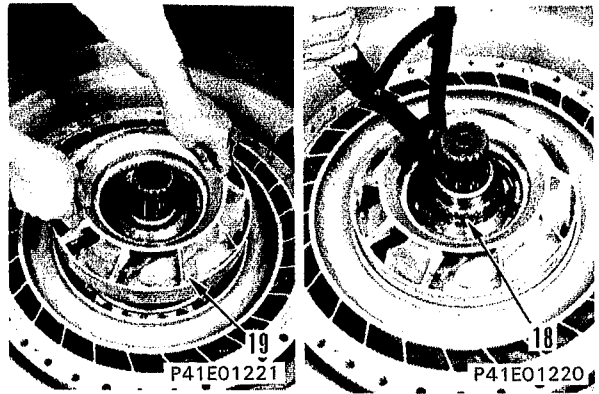


7. Stator

- 1) Assemble stator assembly as follows.
 - i) Install snap ring (23) to stator.
 - ii) Install race (21) to stator.
 - ★ Install rase (21) in the direction shown in the figure below.
 - iii) Install snap ring (20).

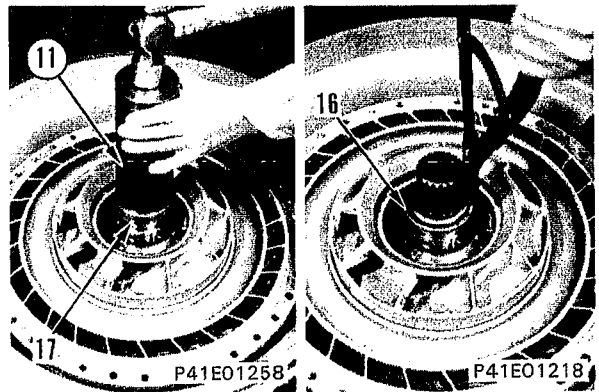


- 2) Install stator assembly (19) the align with spline of stator shaft.
- 3) Install snap ring (18).



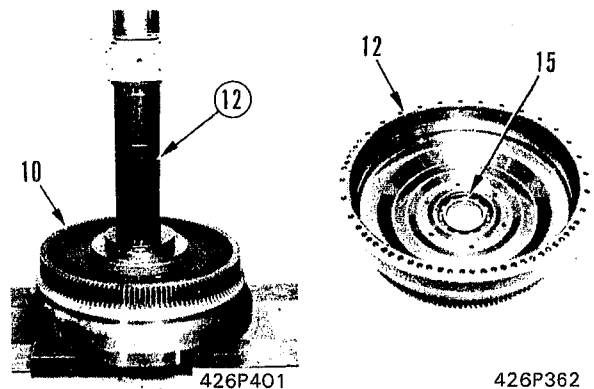
8. Inner race

- 1) Using push tool (11) (inner dia. = 75 mm), press fit inner race (17).
- 2) Install snap ring (16).

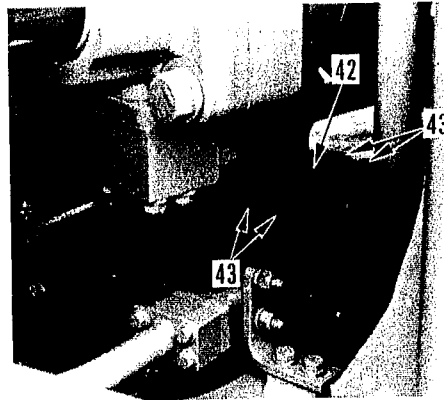


9. Drive case, turbine assembly

- 1) Assemble drive case, turbine assembly as follows.
 - i) Using push tool (12), (outer dia. = 130 mm), press fit bearing (15) to drive case (12).



- 2) Tighten front mount bracket (42) mounting bolts (43) temporarily.





426P426

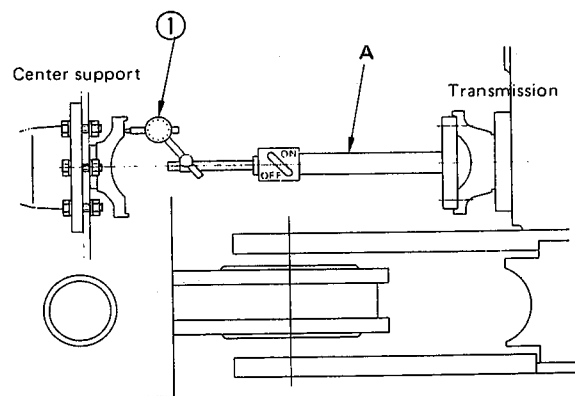
3. Adjusting position

Install tool A and dial gauge ① to transmission, rotating transmission end coupling, measure runout, then adjust position with shim.

- ★ Adjust runout with shim inserting between trunnion and frame.
- ★ After adjusting shims, tighten mounting bolts fully.
- ★ Standard face runout: Max. 0.1 mm
- ★ Remove lifting tool after decided position.

 Trunnion mounting bolt: $177 \pm 19.6 \text{ Nm}$
 $\{18.0 \pm 2.0 \text{ kgm}\}$

 Front bracket mounting bolt:
 $279 \pm 29.4 \text{ Nm}$
 $\{28.5 \pm 3.0 \text{ kgm}\}$

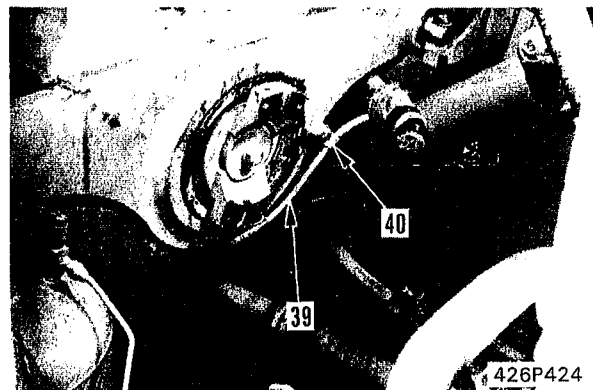


426F361

4. Gréase hose

Connect trunnion lubricating hose (39) to trunnion.

- ★ Install clamp (40).



426P424

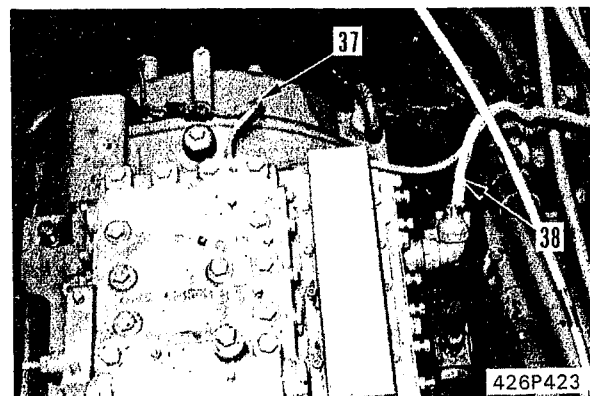
5. Electric wiring

1) Connect wiring (38) for transmission solenoid valve to connector.

- ★ Be careful not to deform thread part case when connecting.

2) Connect wiring (37) for speedometer sensor.

- ★ Install clamp to transmission.



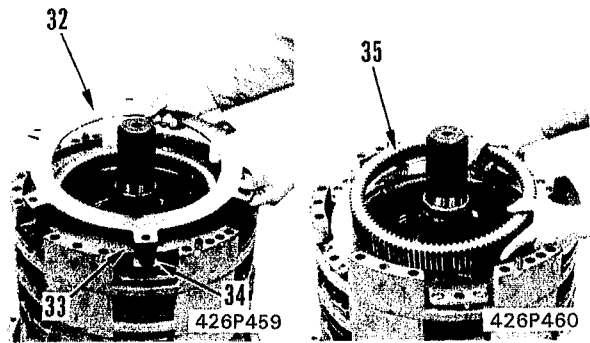
426P423

11. Plate, disc, spring

Remove plate (32), disc (33) and spring (34).

12. Ring gear

Remove ring gear (35).



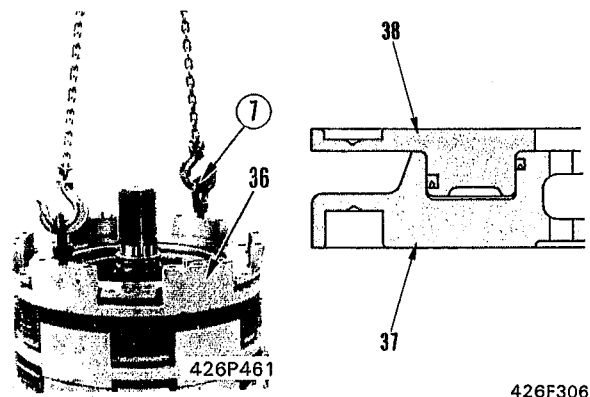
13. No.1 piston, housing

1) Using eyebolts (7) (thread dia. = 14 mm, pitch = 2.0 mm), lift off piston, housing (36).



Piston, housing: 30 kg

2) Remove piston (38) from housing (37).

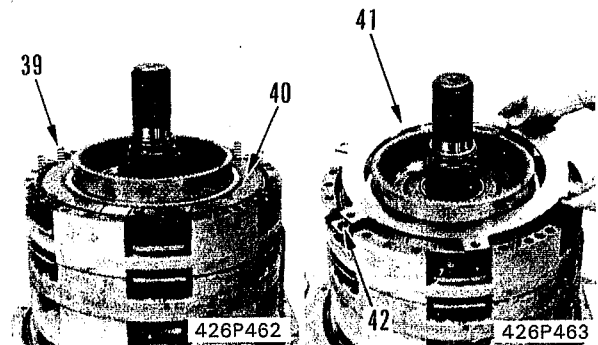


14. Spring

Remove spring (39).

15. Disc, plate, spring

Remove disc (40), plate (41) and spring (42).



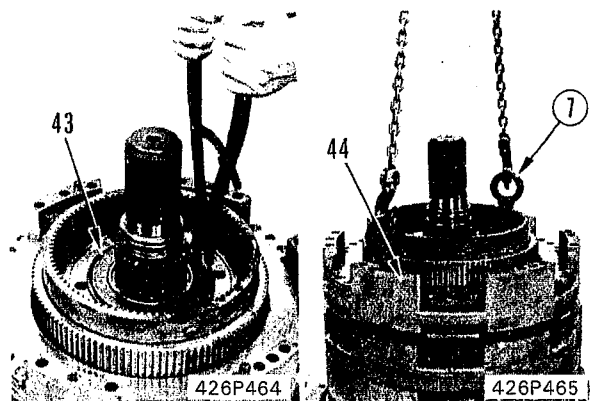
16. No.2 piston, housing, No.3 piston

1) Remove snap ring (43).

2) Using eyebolts (7) (thread dia. = 14 mm, pitch = 2.0 mm), lift off No.2 piston, housing, No.3 piston assembly (44) together with ring gear, plate.



No.2 piston, housing, No.3 piston ring gear, plate: 65 kg



ASSEMBLY OF TRANSMISSION

Special tool

	Part number	Part name	Q'ty
A	799-301-1500	Leak tester	1

★ Caution for assembling

- Coat rotating and sliding surface of each parts with engine oil (EO10-CD) before assembling.
- Coat seal ring with grease (G2-LI), assemble seal ring uniformly without inclination.
- Coat outer and inner install surface of bearing with adhesive (Threebond 1373B) before assembling.
- Align notch of discs.
- Check that snap ring is inserted in groove securely.

Preparatory work

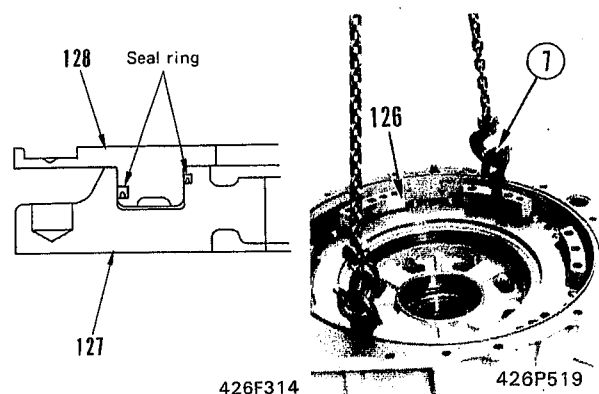
Clean all parts and check for dirt or damage before assembling.

1. No.6 piston, housing

1) Fit seal ring, install piston (128) in housing.

★ Install seal ring with seal ring groove facing housing end as shown in diagram.

2) Fit O-ring to transfer case, using eyebolts ⑦ (thread dia. = 14 mm, pitch = 2.0 mm), align dowel pin, then install No.6 piston, housing assembly (126).



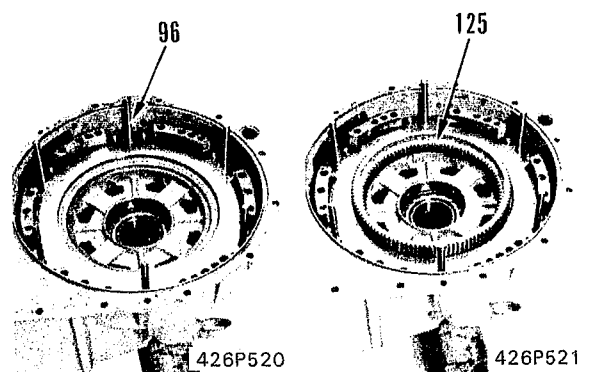
2. Guide pin

Install guide pin (96).

★ Length of guide pin: 150 mm

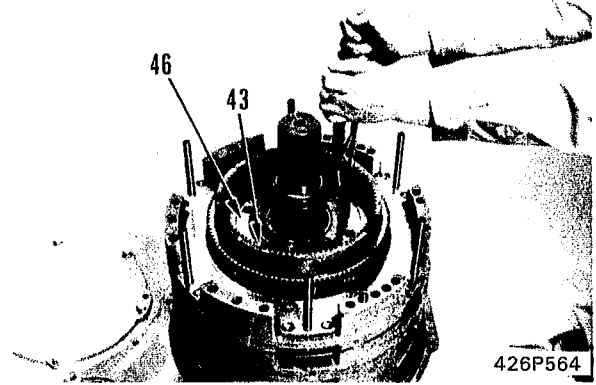
3. Ring gear

Install ring gear (125).



22. Plate

Aligning roll pin, assemble plate (46), then install snap ring (43).

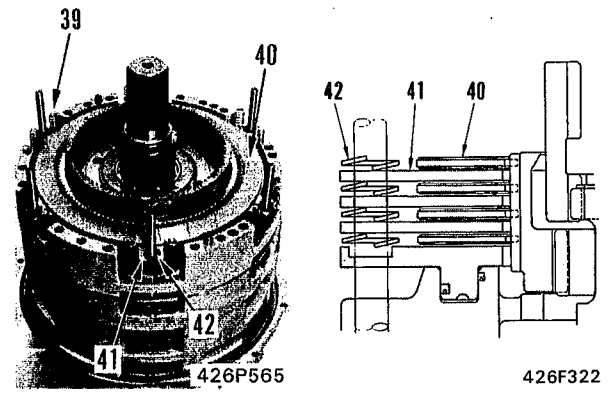


23. Disc, plate, snap ring

Install disc (40), plate (41) and spring (42).

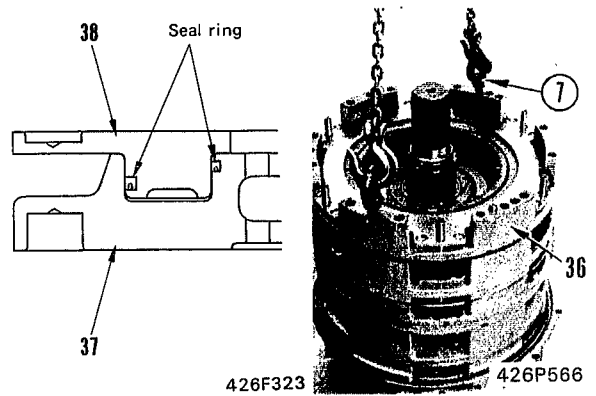
24. Spring

Install spring (39).



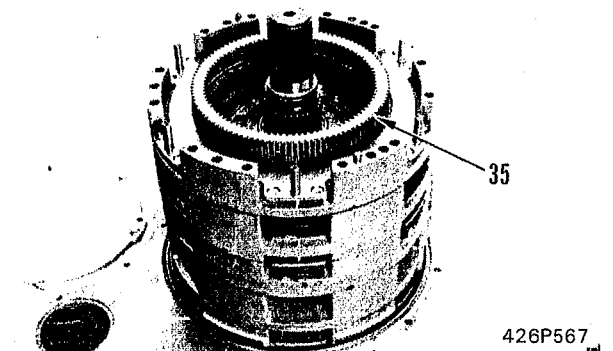
25. No.1 piston, housing

- 1) Fit seal ring, install piston (38) in housing.
★ Referring to Step 1-1), install seal ring.
- 2) Using eyebolts ⑦ (thread dia. = 14 mm, pitch = 2,0 mm), install No.1 piston, housing (36).

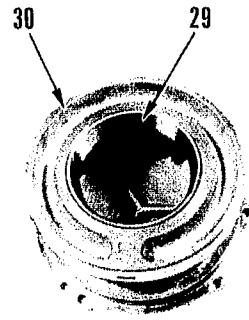


26. Ring gear

Install ring gear (35).



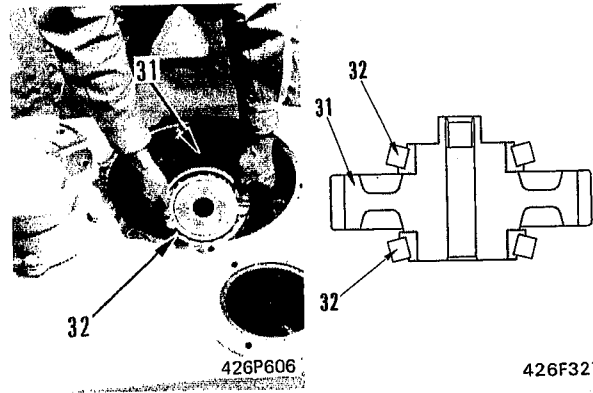
3) Remove outer race (29) from cage (30).



426P605

15. No.3 gear assembly

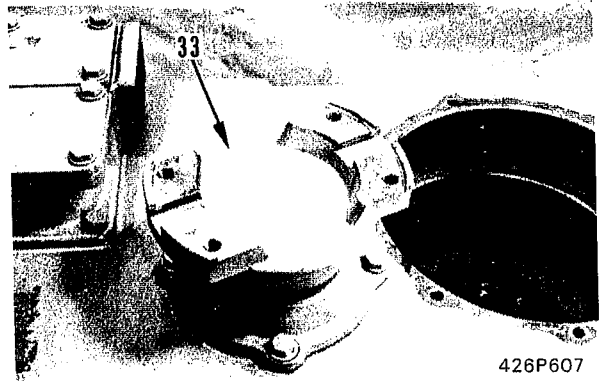
- 1) Remove No.3 gear assembly (31).
- 2) Using puller, remove bearing (32) from gear.



426F327

16. Coupling

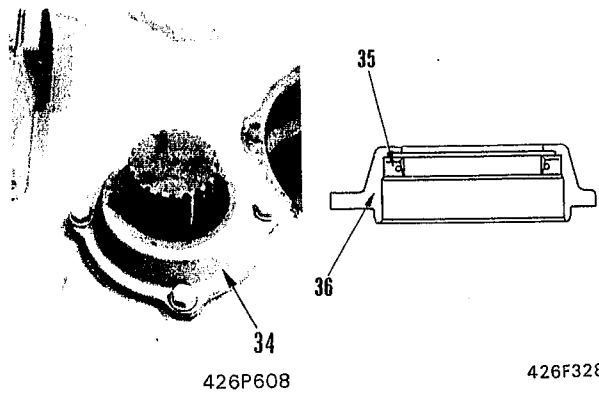
Remove coupling (33).



426P607

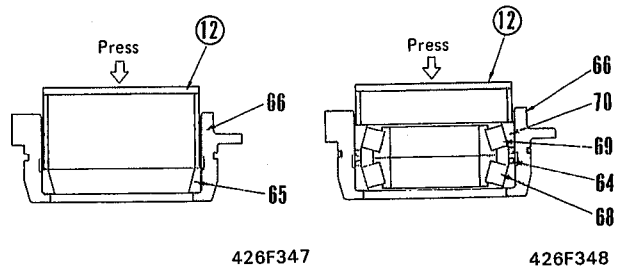
17. Cage assembly

- 1) Remove cage assembly (34).
- 2) Remove oil seal (35) from cage (36).



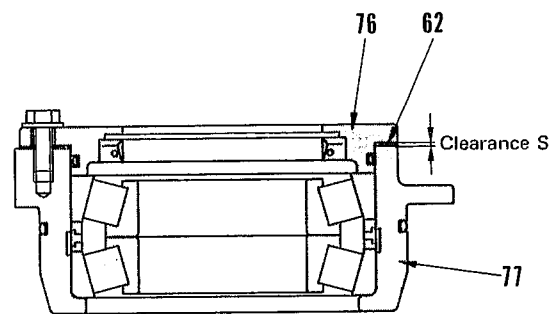
426F328

- ii) Using push tool ⑫ (outside diameter: 185 mm), press fit outer race (65) in cage (66).
- iii) Assemble bearing (68), collar (64) and bearing (69), then using push tool ⑫ (outside diameter: 185 mm), press fit outer race (70) in cage (66).



- iv) Fit O-ring and install cage assembly (76) to cage assembly (77), then using feeler gauge, measure clearance S.
- v) Install shim (62).

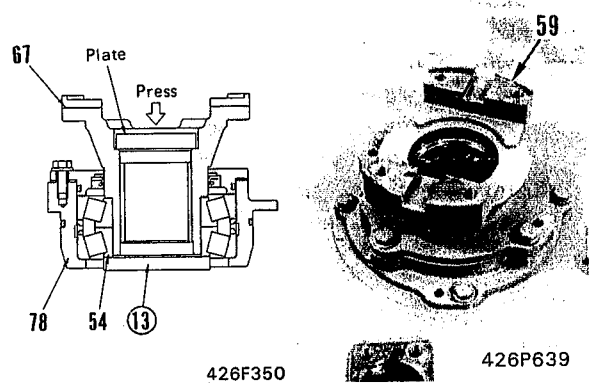
Standard shim thickness =
 Clearance S + (0.05 – 0.10 mm)



426F349

- vi) Using push tool ⑬ (outside diameter: 125 mm), press fit coupling (67) in cage assembly (78).

- 2) Fit O-ring and install cage and coupling assembly (59) to transfer case.

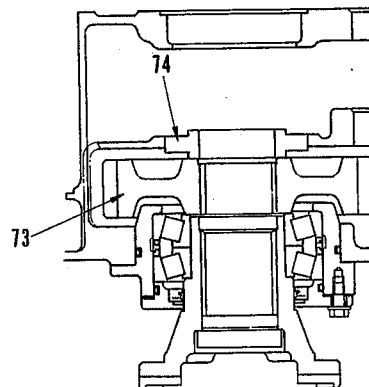


426F350

426P639

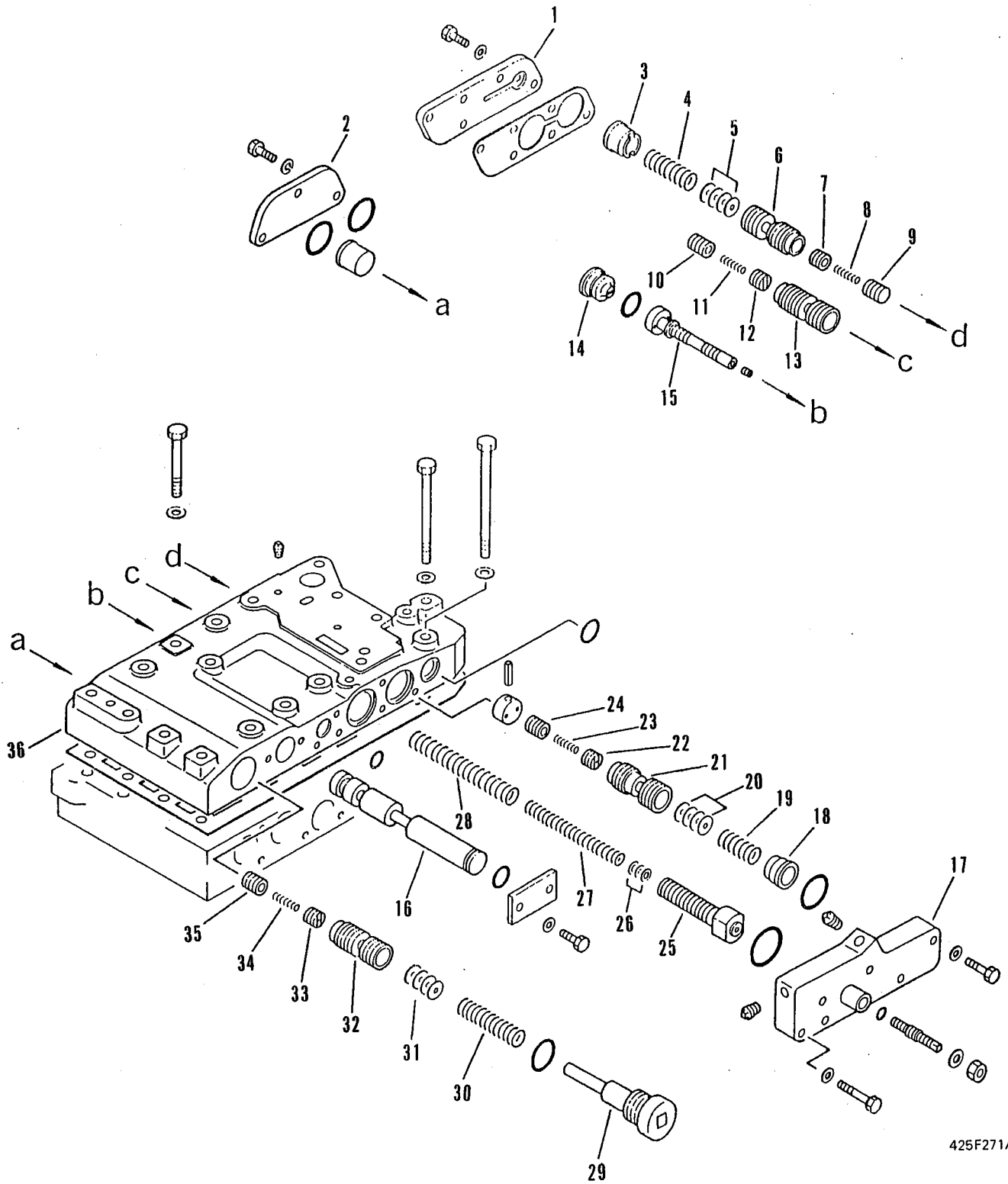
15. No.4 gear, collar

Turn over transfer case, and set No.4 gear (73) and collar (74) in position.



426F351


DISASSEMBLY AND ASSEMBLY OF MODULATING VALVE ASSEMBLY



425F271A

4. Rear axle, support

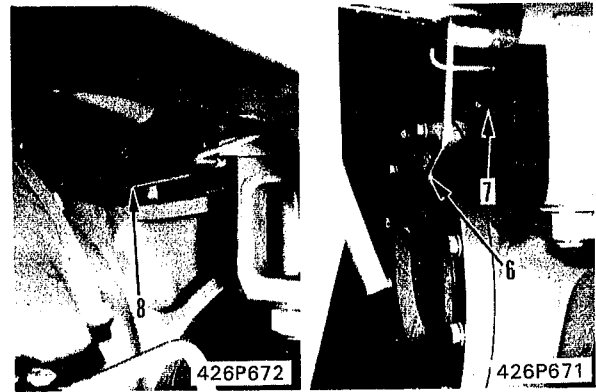
- 1) Pull rear axle and support (11) under machine.
 - ★ Secure the rear axle and axle support with a chain.
- 2) Using hoist and jack to maintain balance, set in mounting position, then tighten mounting bolts of axle support.
 - ★ Always tighten the mounting bolts for the front support on opposite sides in turn.

 **kgm** Mounting bolt: $2450 \pm 294 \text{ Nm}$
{ $250 \pm 30 \text{ kgm}$ }
(Width across flats: 55 mm)



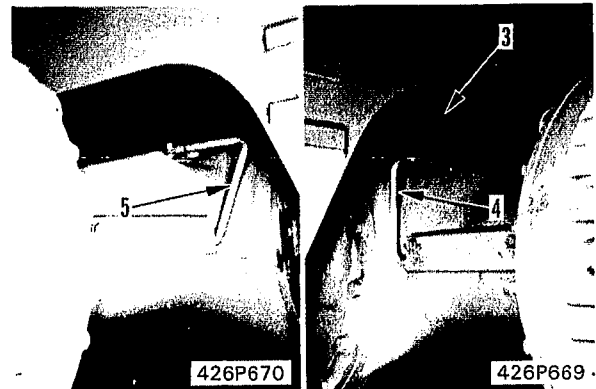
5. Grease tube

- 1) Connect grease tube (8) to front axle support position.
- 2) Connect grease tubes (6) and (7) to rear axle support.




6. Brake piping

- 1) Install tubes (4) and (5) between slack adjuster and right and left wheel cylinder.
- 2) Connect tube (3) between brake chamber and slack adjuster to slack adjuster.



7. Drive shaft

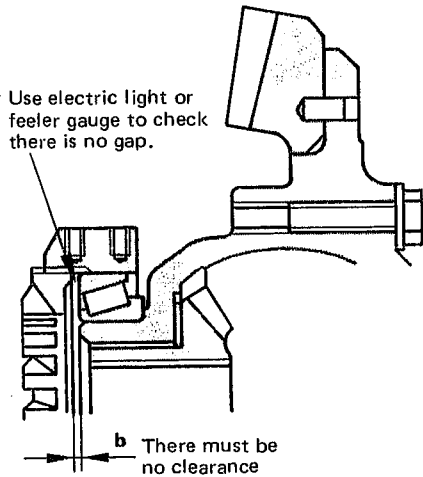
- Connect rear drive shaft (2) to rear axle.
- ★ When connecting the drive shaft, clean the contact surfaces before installing.

 **kgm** Mounting bolt: $177 \pm 19.6 \text{ Nm}$
{ $18 \pm 2 \text{ kgm}$ }



★ **Caution for pre-load adjustment**

When adjusting nut is overtightened, in case the amount of increased bending surpasses the standard measurement, return adjusting nut to position before adjusting. Then, while rotating bevel gear, lightly tap bearing cap and bevel gear with plastic hammer, and check that there is no clearance in portion **b**.



426F355

13. Adjusting tooth contact, backlash

Adjust the backlash, and at the same time adjust tooth contact.

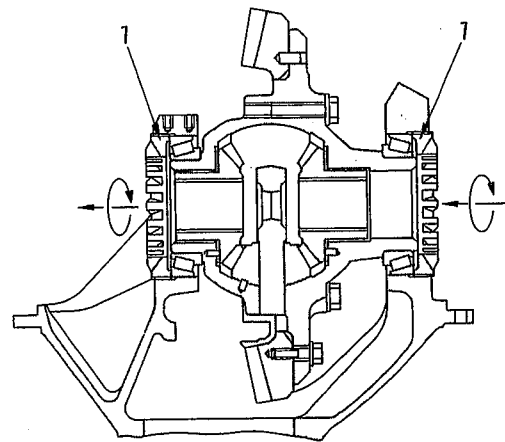
1) Adjust backlash as follows:

- i) Movement of bevel gear is done with adjusting nut (7). At this time, so as not to change pre-load pressurization of bearing, turn nuts on both sides, the same amount each, in same direction.
- ii) Put dial gauge ⑦ in vertical contact with forward and reverse sides of outer edge of bevel gear tooth face, and while turning adjusting nut, adjust until gauge meter fluctuation becomes 0.33 to 0.46 mm.

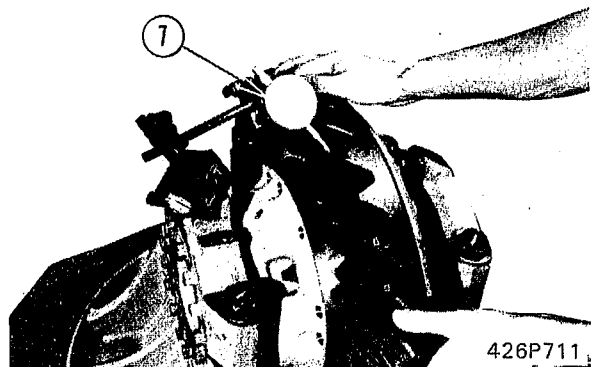
★ Measure at 3 or 4 places, and keep the pinion gear fixed when measuring.

2) Adjust tooth contact as follows:

- i) Adjust bevel pinion by adjusting shims between differential case and bearing cage.
- ii) Adjusting tooth contact
For details, see ADJUSTING TOOTH CONTACT.



426F356




426P711

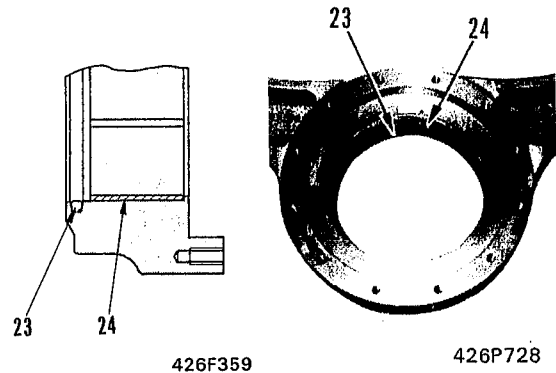
INSTALLATION OF REAR AXLE

1. Rear support

1) Install bushing (24) and O-ring (23) to rear support.


- ★ Assemble with the chamfered side of the bushing on the thrust plate side.
- ★ Fit the O-ring securely in the groove, and be careful not to get it caught when assembling.

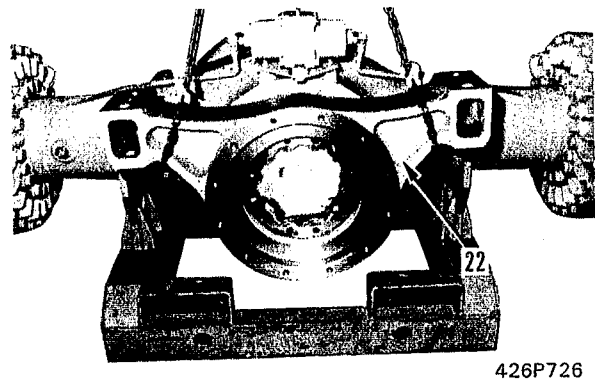
 Bushing, O-ring: Grease (G2-L1)



2) Raise rear support (22), and set on rear axle mount.


- ★ Check that the O-ring side is on the axle housing side.

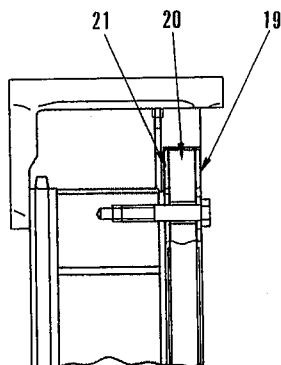
 Rear axle mount: Grease (G2-L1)



3) Install thrust washer (19), thrust plate (20) and thrust washer (21).


 Thrust washer: Grease (G2-L1)

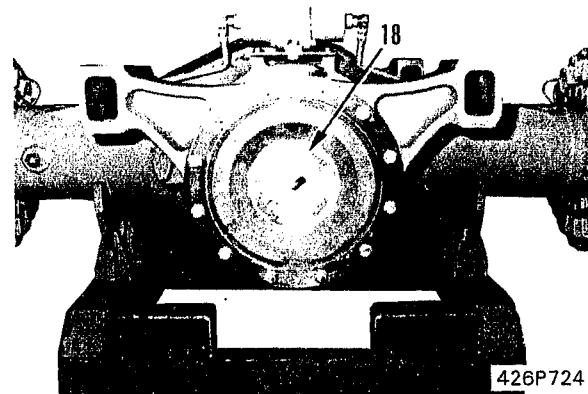
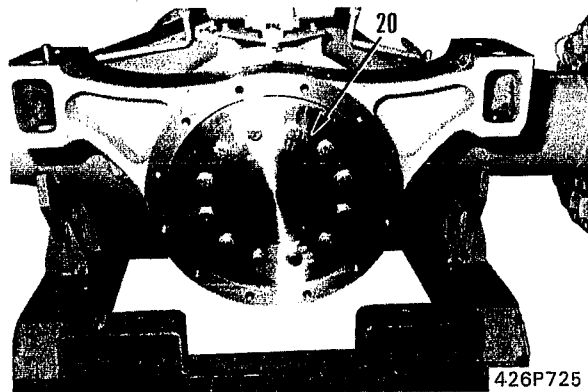
 Mounting bolt: 28.5 ± 3.0 kgm



426F360

4) Install thrust cap (18).

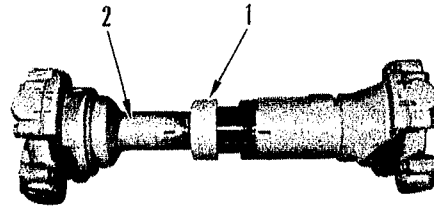
 Mounting bolt: 279 ± 29.4 Nm
{ 28.5 ± 3.0 kgm}



DISASSEMBLY OF DRIVE SHAFT

1. Splined yoke

Loosen retainer (1) and remove splined yoke (2).

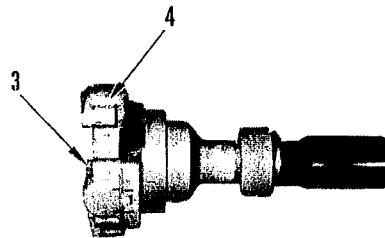


425P616

2. Bearing assembly

Remove mounting bolts (3), then remove bearing assembly (4).

★ Make match marks on yoke and bearing.

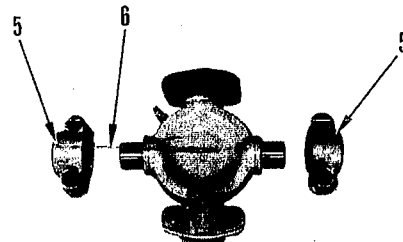


425P617

3. Bearing cap

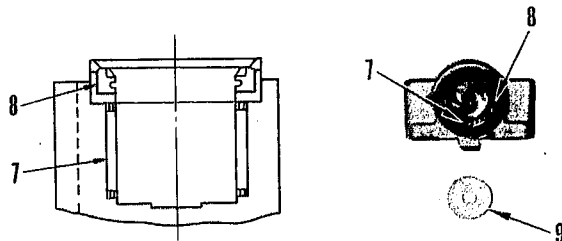
1) Remove bearing cap (5) from bearing assembly.

★ Remove strap (6) of cap.



425P618

2) Remove bearing (7), seal (8), and Delrin washer (9) from bearing cap.



425F280

425P619

DISASSEMBLY AND ASSEMBLY OF STEERING SYSTEM

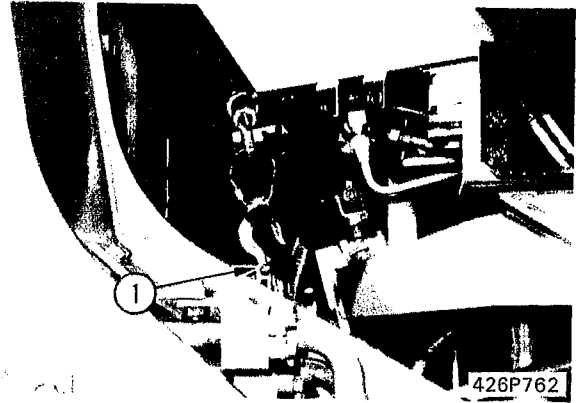
STEERING GEAR	
Removal	30-302
Installation	30-304
STEERING GEAR BOX	
Disassembly	30-306
Assembly	30-307
STEERING VALVE	
Removal	30-309
Installation	30-311
Disassembly and assembly	30-314
STEERING CYLINDER ASSEMBLY	
Removal	30-316
Installation	30-317
Disassembly	30-319
Assembly	30-321
CENTER HINGE PIN	
Removal	30-324
Installation	30-332

INSTALLATION OF STEERING VALVE

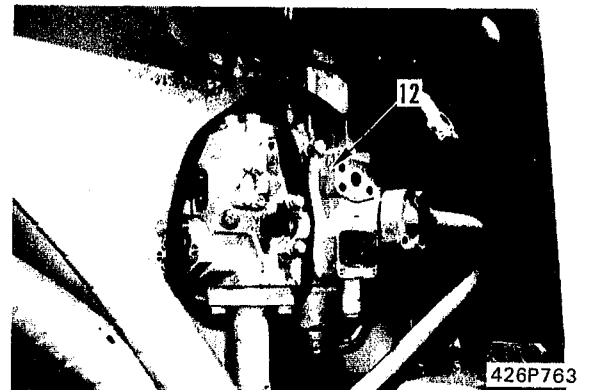
1. Steering valve

1) Pull steering valve (12) under machine, screw in eyebolts into mounting bolt hole of cover under cab, then using lever block (1), raise steering valve.

★ Be careful of the center of gravity when setting the lifting tool in position.



2) Set steering valve (12) in mounting position, and tighten mounting bolts.




2. Linkage

Install steering valve linkage (11) to steering valve.

★ Check that the steering valve is in neutral.

★ Align the key groove correctly.

 Mounting bolt: $31.4 \pm 2.94 \text{Nm}$
 $[3.2 \pm 0.3 \text{Kgm}]$



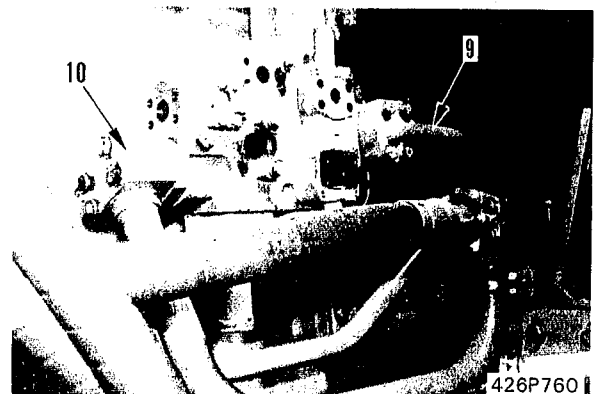
3. Hydraulic piping

Connect the following hydraulic hoses.

• Connect tube (9) between steering valve and cooler at steering valve end.


• Connect tube (10) between hydraulic pump and steering valve at steering valve end.

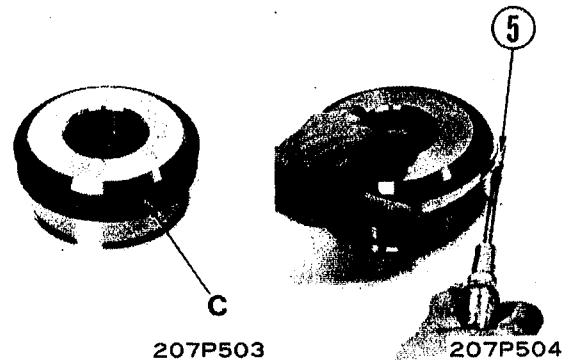
★ Install the tube clamp.



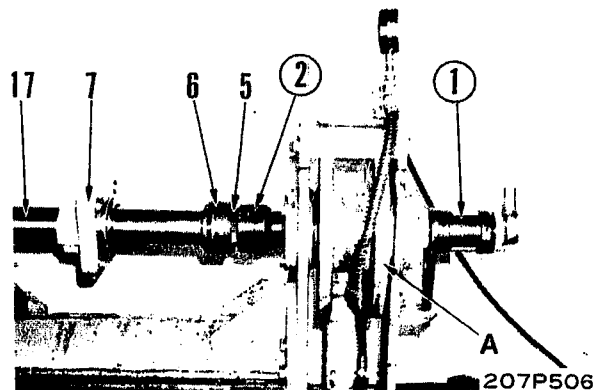
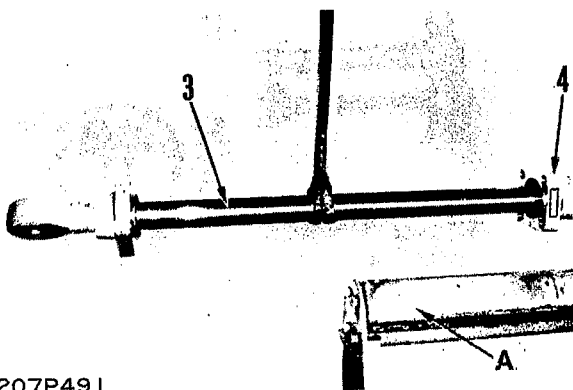
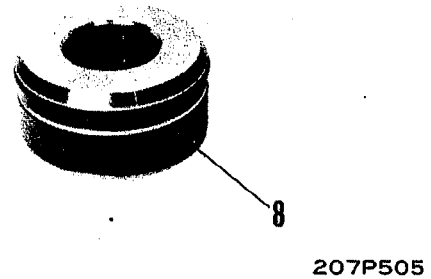
3. Set piston rod (17) in tool A.
4. Assemble cylinder head assembly (7) and piston assembly (6).
5. Using power wrench (1) and socket (2), tighten nut (5).

★ Width across flats of socket: 80 mm


 Nut: $3970.0 \pm 397.0 \text{ Nm}$
 $\{405 \pm 40.5 \text{ Kgm}\}$



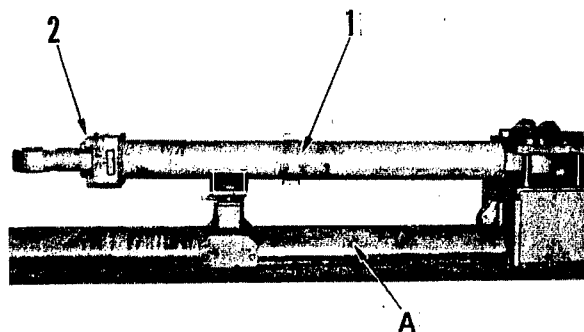
6. Set cylinder (4) in tool A, then raise cylinder head and piston rod assembly (3) and install in cylinder (4).



7. Tighten mounting bolt (2) of cylinder head.


 Cylinder head mounting bolt: $731.0 \pm 98.1 \text{ Nm}$
 $\{74.5 \pm 10.0 \text{ Kgm}\}$


8. Fit O-ring and install piping.
9. Remove cylinder assembly (1) from tool A.

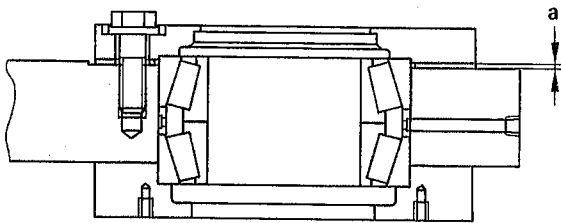


3) Tighten retainer (53) with mounting bolts, then measure clearance "a" between retainer and hinge at four places around the circumference. Select shim of 0.08 – 0.18 mm less than measured value.

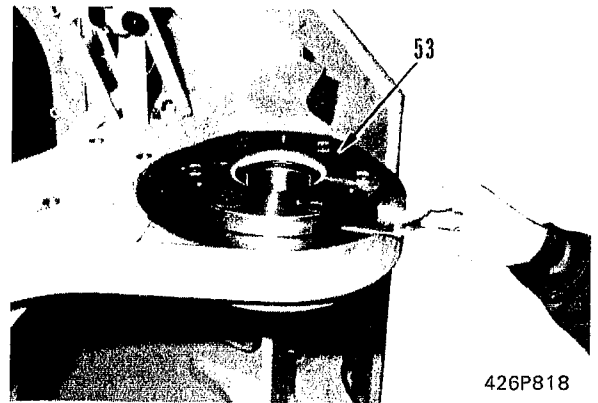
- ★ Do not select a shim which is thicker than the clearance at the four measured places.
- ★ After selecting the shim, tighten the retainer to the specified tightening torque.

 **kgm** Mounting bolt (when adjusting shim):
 $34.3 \pm 2.94 \text{ Nm}$
 $\{3.5 \pm 0.3 \text{ Kgm}\}$

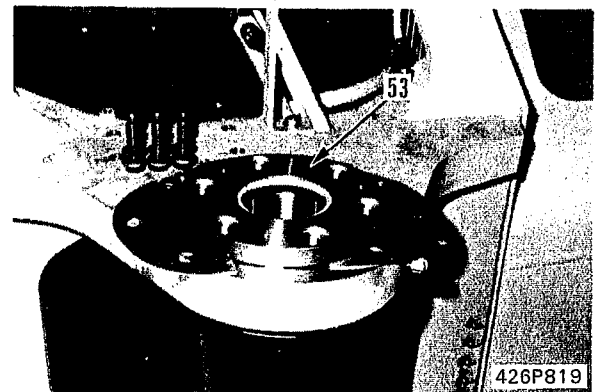
 **kgm** Mounting bolt:
 $279.0 \pm 29.4 \text{ Nm}$
 $\{28.5 \pm 3.0 \text{ Kgm}\}$



426F369




426P818

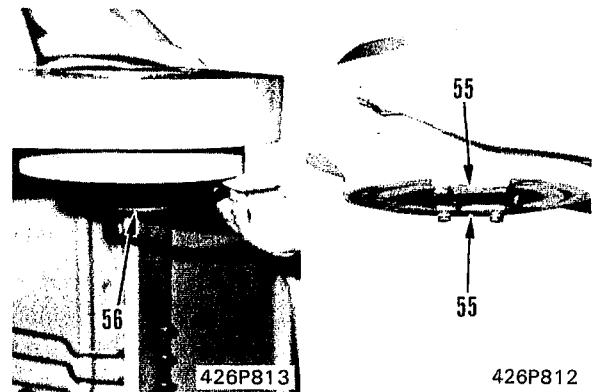


426P819

4) Install dust seal (56) on hinge, then install plate (55).

- ★ When press fitting the dust seal, fit with the lip on the outside.

 **kgm** Seal lip: Grease (G2-L1)



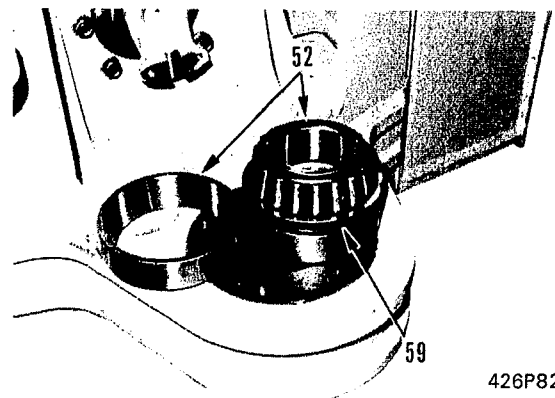
426P813

426P812

2. Lower hinge

1) Using tools A, B, C, D, D₁, D₃ and D₄, press fit bearing (52) and spacer (59) on front frame.

- ★ When press fitting, use tool D₂ as a guide.
- ★ Be careful not to fit the bearing at an angle.
- ★ Fill the inside of the bearing with grease.



426P820

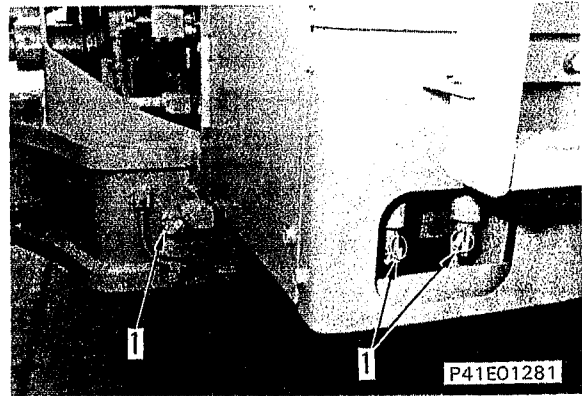
REMOVAL OF BRAKE VALVE



Stop the machine on level ground and install the safety bar on the frame. Lower the work equipment to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

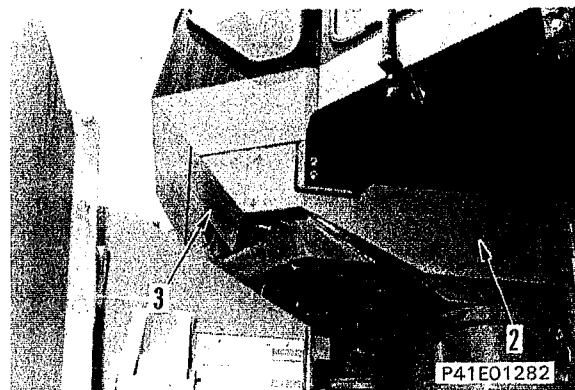
1. Draining air

Open drain valve (1) and drain air from air tank.



2. Covers

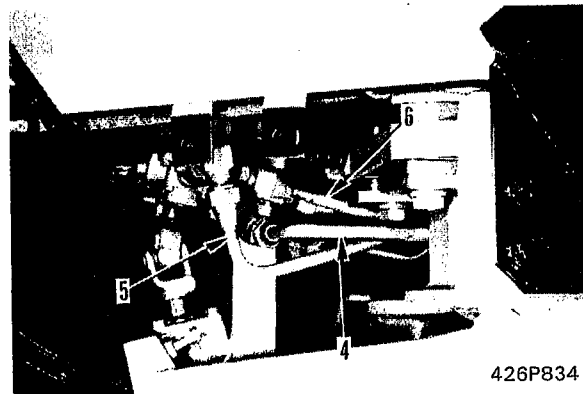
Remove covers (2) and (3) under cab.



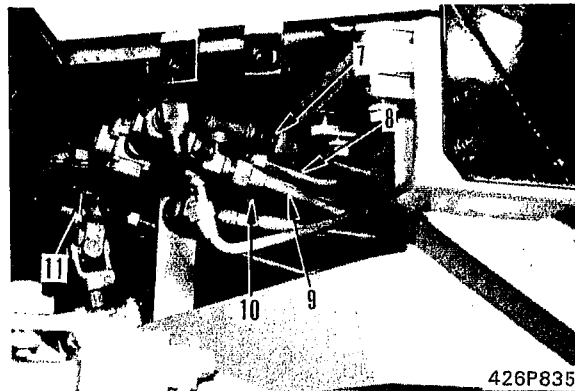
3. Air piping

Disconnect the following air piping from brake valve.

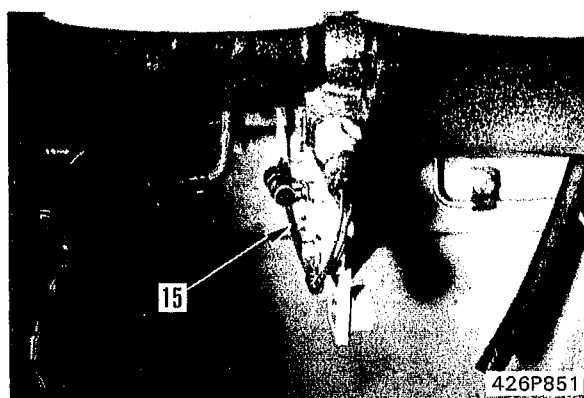
- Tube (4) between brake valve and dry tank
- Tube (5) between right brake valves
- Tube (6) between brake valve and relay valve



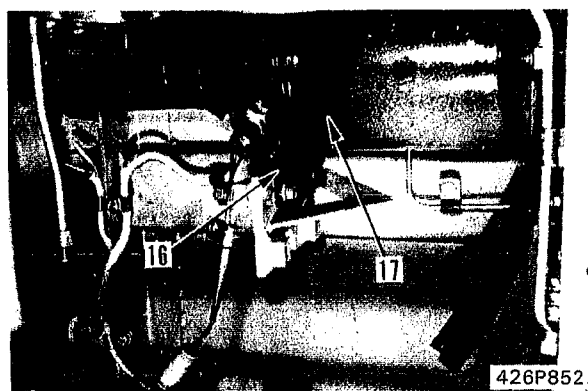
- Tubes (7), (8) and (9) between right brake valves
- Tube (10) between brake valve and dry tank
- ★ Disconnect electric wiring (11) from connector, and remove clamp.



- 4) Disconnect electrical wiring (15) from connector.
★ Always remove the clamp of electrical wiring.



- 5) Remove bracket (16), then remove front brake chamber (17).
★ Remove only the lower bracket.



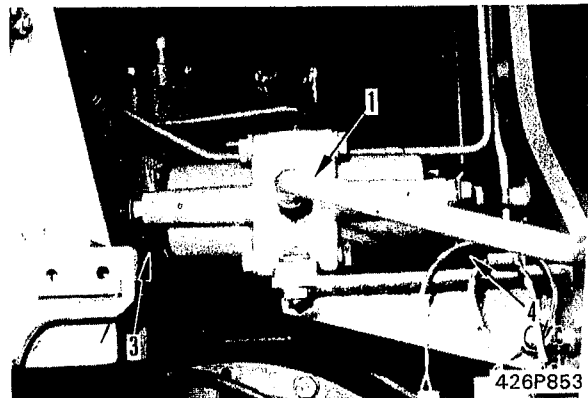
REMOVAL OF SLACK ADJUSTER



Stop the machine on level ground and install the safety bar on the frame. Lower the bucket to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

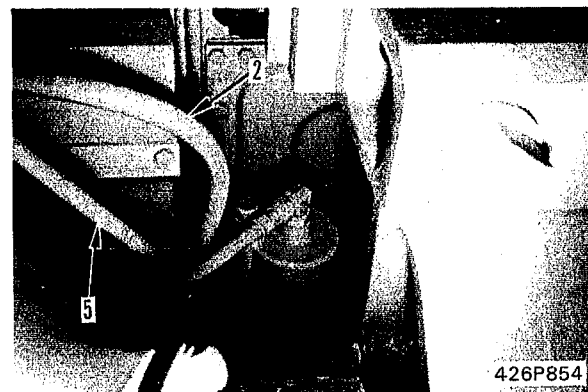
1. Brake piping

- 1) Disconnect tube (1) between slack adjuster and brake chamber at slack adjuster end.
 - ★ Disconnect hose (2) at the rear.
- 2) Disconnect hoses (3) and (4) between slack adjuster and left and right brake pistons at slack adjuster end.
 - ★ Disconnect tubes (5) and (6) at the rear.



2. Slack adjuster

- Remove mounting bolts, then remove slack adjuster (5).
- ★ There is little space, so be careful when working.



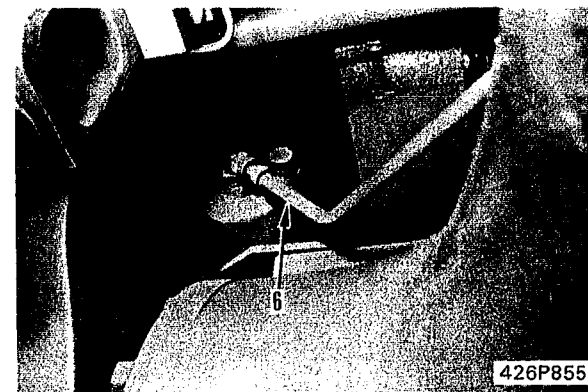
INSTALLATION OF SLACK ADJUSTER

1. Slack adjuster

- Set slack adjuster (7) in mounting position, then tighten mounting bolts.
- ★ Tighten the mounting bolts partially, then tighten fully after connecting the piping.

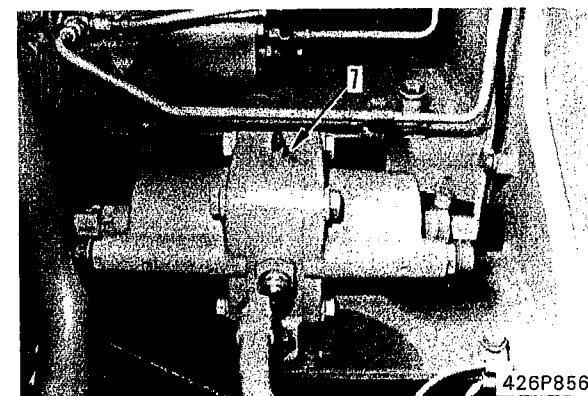
2. Brake piping

- 1) Connect hoses (3) and (4) between slack adjuster and left and right brake pistons at slack adjuster end.
 - ★ Connect tubes (5) and (6) at the rear.
- 2) Connect tube (2) between slack adjuster and brake chamber at slack adjuster end.
 - ★ Connect hose (1) at the rear.



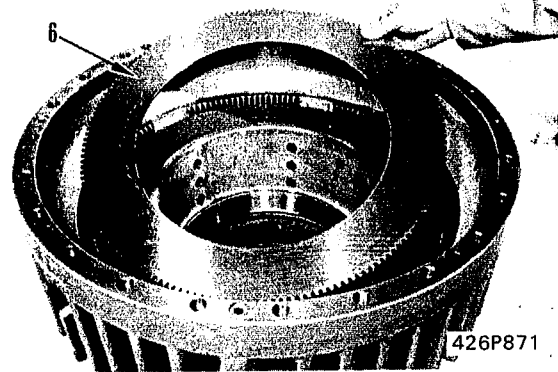
3. Bleeding air

- Bleed air from brake system, and check that there is no leakage of oil from connections.
- ★ For details of bleeding air, see **TESTING AND ADJUSTING**.
 - ★ Bleed the air from the brake end and slack adjuster end.



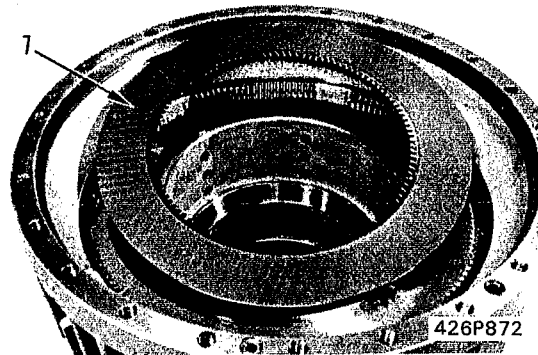
2. Plate, disc

1) Remove plate (6).



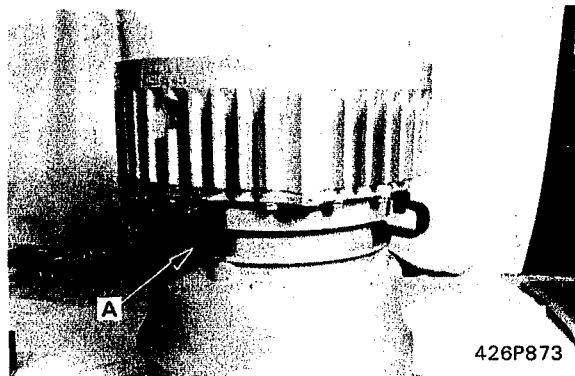
2) Remove disc (7).

- ★ Remove discs and plates alternately.
- ★ When removing the discs, make match marks on the inner gear and discs, and on the outer gear and plates.
- ★ The plates are made of a soft material, so be careful not to damage them when removing.

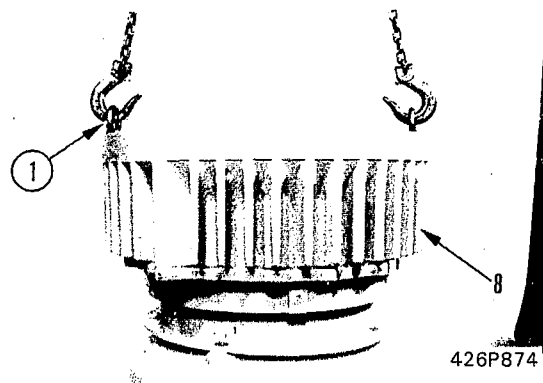


3. Outer drum

- ★ Remove tool A.



1) Using eyebolts ① (thread dia. = 16 mm, pitch = 2.0 mm), lift out outer drum (8).

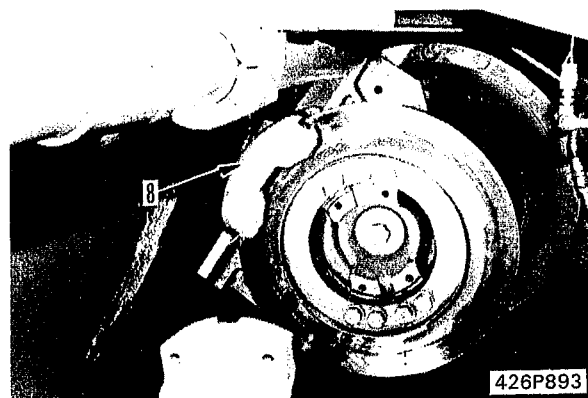


2) Remove caliper (8).

★ Use two men to remove caliper.



Caliper: 32 kg

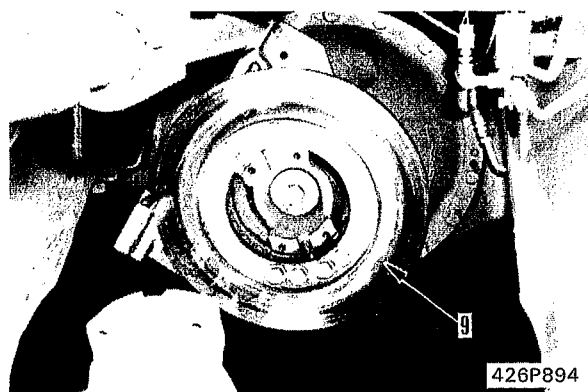


6. Disc

Remove disc (9).

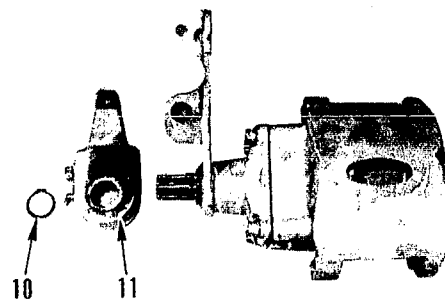


Disc: 31 kg

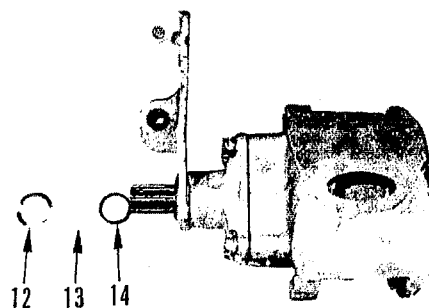


7. Disassembly of caliper

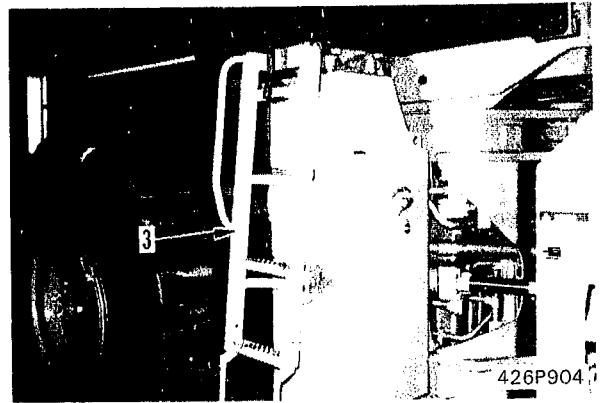
1) Remove snap ring (10) and pull out adjuster (11).



2) Remove washer (12) and (13) and seal (14).



- 2) Raise ladder (3) and set in mounting position, then tighten mounting bolts.



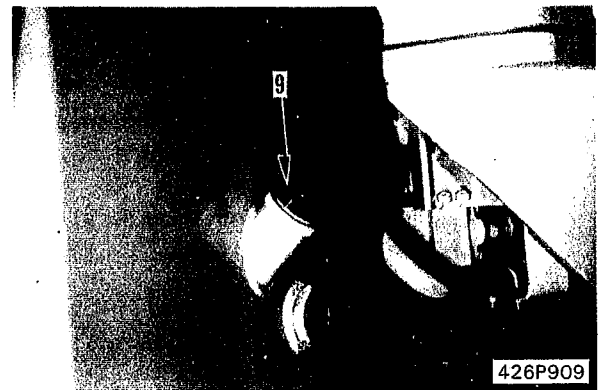
4. Refilling with oil

Tighten drain plug and add engine oil through oil filler (9) to the specified level.


- ★ Run the engine to circulate the oil through the system. Then check the oil level again.




Hydraulic oil: Approx. 40 ℓ



REMOVAL OF LIFT CYLINDER

 Stop the machine on level ground and install the safety bar on the frame. Lower the blade to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

 Loosen the oil filler cap slowly to release the pressure inside the hydraulic tank. Then operate the control levers several times to release the remaining pressure in the hydraulic piping.

1. Hydraulic piping

Disconnect hoses (2) and (3) from lift cylinder.

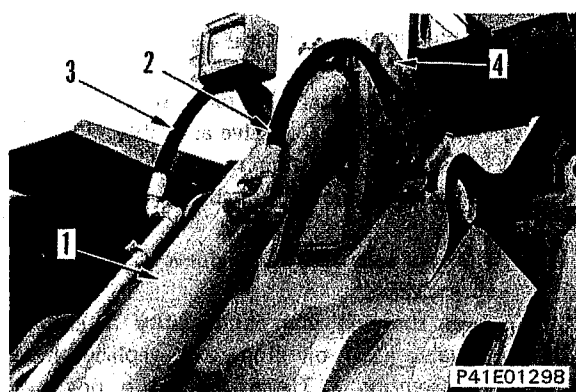
2. Lift cylinder

Sling lift cylinder (1), and remove lock bolts, and pull out pins (4), (5) then lift off lift cylinder (1).

★ If there are shims at the bottom end, check the number and thickness of the shims, and keep in a safe place.

★ When slinging, lift at two points and be careful about the center of gravity.

 Lift cylinder: 204 kg




INSTALLATION OF LIFT CYLINDER

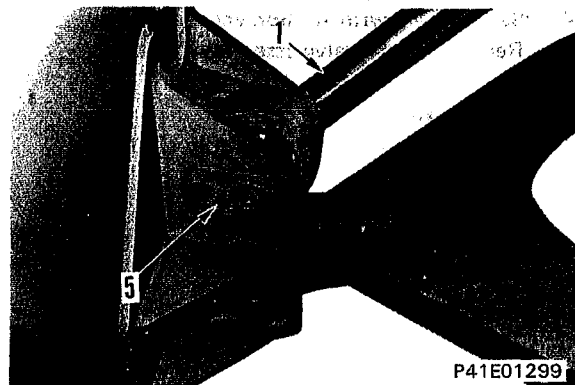
1. Lift cylinder

1) Raise lift cylinder (1) and set in mounting position.

2) Insert mounting pins (4), (5).

 Use a bar to align the pin holes. Never use your fingers.

 Mounting pin: Grease (LM-G)



2. Hydraulic piping


Connect hoses (2) and (3) to lift cylinder (1).


★ Fit the O-ring securely in the groove.

INSTALLATION OF WORK EQUIPMENT


1. Trunnion support


- 1) Raise trunnion support (21) and set in mounting position, then install with mounting pin.

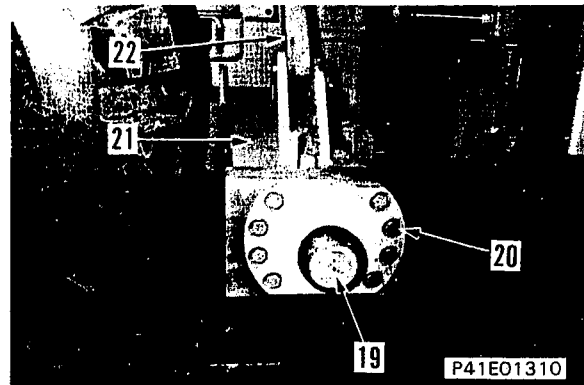
 When aligning the hole of the pin, use a bar. Never put your fingers in the pin holes.

 Mounting pin: Molybdenum disulphide grease (LM-G)


- 2) Raise bar (22) and set in mounting position, then install with mounting pin.

 When aligning the hole of the pin, use a bar. Never put your fingers in the pin holes.

 Mounting pin: Molybdenum disulphide grease (LM-G)




- 3) Install trunnion (19) to trunnion support (21) with mounting bolts (20).

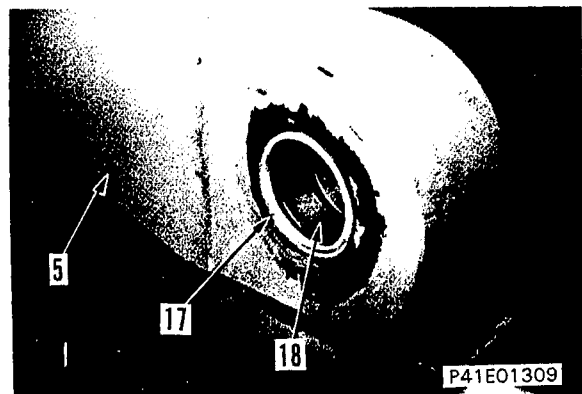
 Mounting bolt: $809 \pm 221\text{Nm}$
{ $82.5 \pm 22.5\text{Kg}$ }

2. H-type link

- 1) Press fit bushing (18) to H-type link (5) with press, then assemble dust seal (17).

★ Assemble the dust seal with seal lip facing the outside.

 Outer circumference of bushing before press fitting: Thread tightener (Loctite bearing mount or equivalent)



REMOVAL OF REAR BUMPER

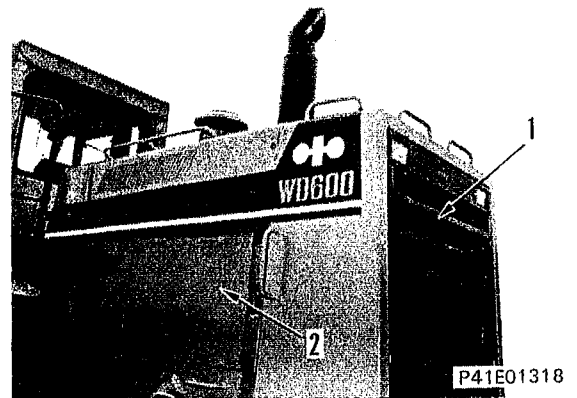


Stop the machine on level ground and install the safety bar on the frame. Lower the work equipment to the ground and stop the engine. Then apply the parking brake and put blocks under the wheels to prevent the machine from moving.

1. Radiator grille

Remove radiator grille (1), and open engine inspection panel (2).

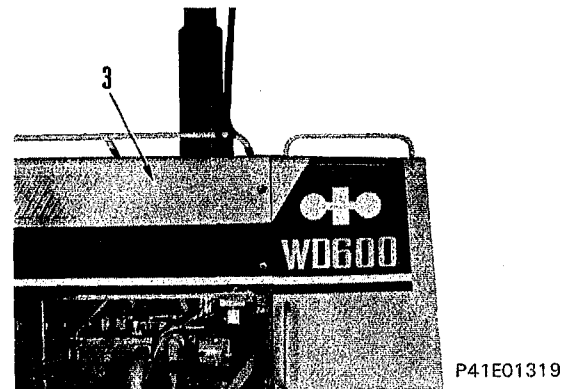
- ★ Open both left and right covers.



2. Radiator guard

1) Sling engine hood (3), and remove mounting bolts holding it to radiator guard.

- ★ Remove the door catch of the engine inspection panel.
- ★ Be careful not to raise the engine hood too far.

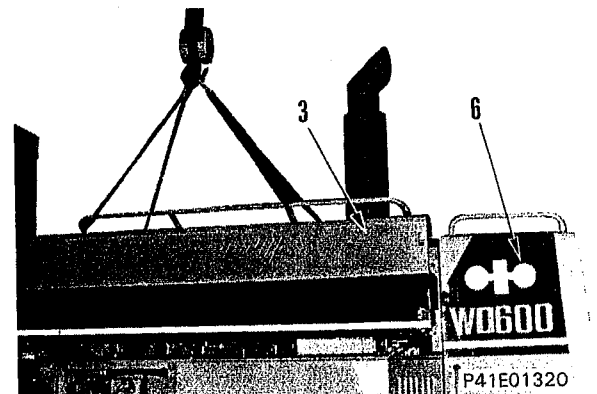


2) Disconnect electric wiring (4) and (5) from connector.

- ★ After disconnecting the radiator water level sensor wiring, move the connector towards the radiator.



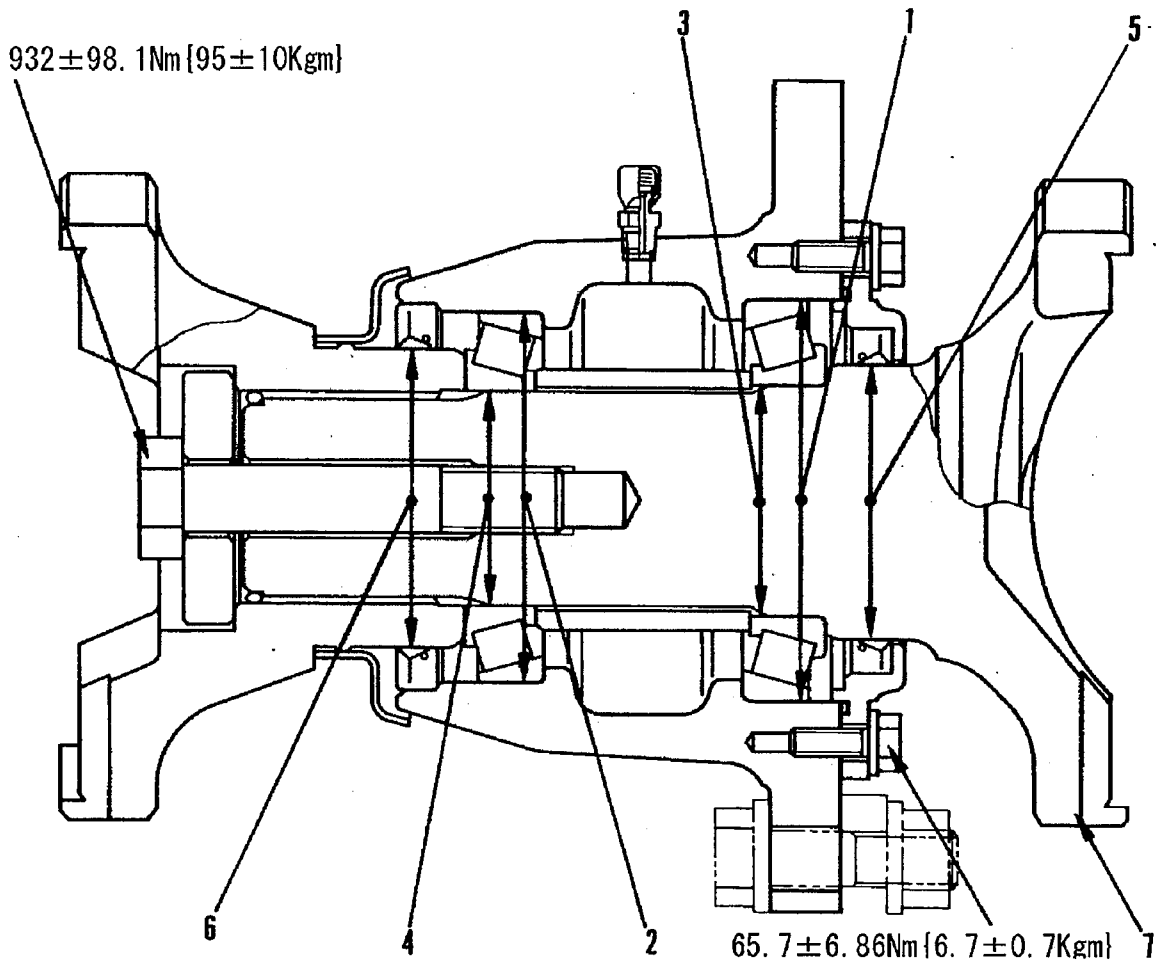
3) Remove mounting bolts of radiator guard (6), then move it towards rear of machine. (Approx. 50 mm)



Unit: mm

No.	Check item		Criteria			Remedy		
1	Reverse clutch springs (12 pieces)		Standard size		Repair limit			
			Free length	Installation length	Installation load	Free length		Installation load
			68	55	146 N {14.9 kg}	64		124 N {12.6 kg}
2	Forward clutch springs (12 pieces)		68	61	78.5 N {8.0 kg}	64	66.7 N {6.8 kg}	
3	4th clutch springs (12 pieces)		52	46	101 N {10.3 kg}	49	86.3 N {8.8 kg}	
4	3rd clutch springs (12 pieces)		52	47	84.3 N {8.6 kg}	49	71.6 N {7.3 kg}	
5	1st clutch springs (12 pieces)		52	42.8	155 N {15.8 kg}	49	131 N {13.4 kg}	
6	Thickness of assembled 4 discs and 3 plates for reverse clutch		Standard size	Tolerance		Repair limit		
			39	±0.35		36.9		
7	Thickness of assembled 4 discs and 3 plates for forward clutch		39	±0.35		36.9		
8	Thickness of assembled 3 discs and 2 plates for 4th clutch		27.8	±0.30		26.2		
9	Thickness of assembled 5 discs and 4 plates for 2nd clutch		45	±0.30		42.3		
10	Thickness of assembled 3 discs and 2 plates for 3rd clutch		27.8	±0.30		26.2		
11	Thickness of assembled 3 discs and 2 plates for 1st clutch		27.8	±0.30		26.2		
12	Thickness of 1 disc	Forward, Reverse, 1st, 3rd, 4th	5.4	±0.15		4.9		Replace
		2nd	5.0	±0.1		4.5		
13	Thickness of 1 plate	Forward, Reverse, 1st, 3rd, 4th	5.8	±0.1		5.2		
		2nd	5.0	±0.1		4.5		
14	Outside diameter of input shaft		170	+0.018 -0.007		←		
15	Outside diameter of input shaft		110	+0.016 -0.006		←		
16	Outside diameter of output shaft		130	+0.018 -0.007		←		
17	Outside diameter of output shaft		140	+0.018 -0.007		←		
18	Wear of seal ring for input shaft	Width	3.0	-0.01 -0.03		2.7		
		Thickness	3.7	±0.12		3.55		
19	Wear of seal ring for output shaft	Width	4.5	-0.01 -0.03		4.1		
		Thickness	5.4	±0.12		5.25		
20	Wear of seal ring for 2nd clutch	Width	6.0	-0.01 -0.03		5.5		
		Thickness	6.0	±0.15		5.85		
21	Wear of seal ring for output shaft	Width	4.5	-0.01 -0.03		4.1		
		Thickness	5.2	±0.12		5.05		

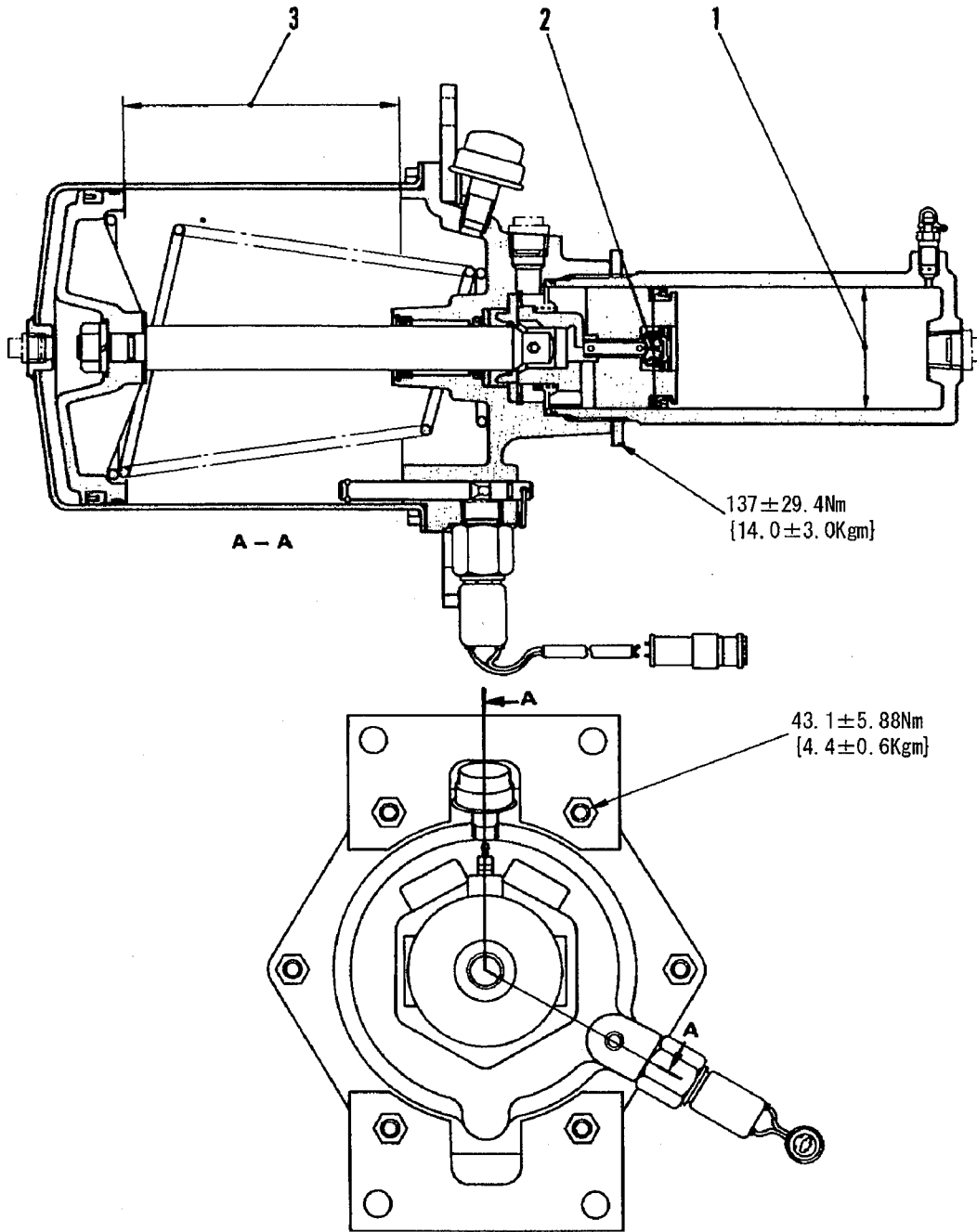
CENTER SUPPORT



Unit: mm

No.	Check item	Criteria				Remedy
		Standard size	Tolerance		Standard clearance	
Shaft	Hole					
1	Clearance between case and bearing	140	0 -0.018	-0.036 -0.061	-0.018 - -0.061	Replace
2	Clearance between case and bearing	130	0 -0.018	-0.036 -0.061	-0.018 - -0.061	
3	Clearance between coupling shaft and bearing	80	+0.051 +0.032	0 -0.015	-0.032 - -0.066	
4	Clearance between coupling shaft and bearing	75	+0.051 +0.032	0 -0.015	-0.032 - -0.066	
5	Wear of oil seal surface	Standard size	Tolerance		Repair limit	Repair chrome plating or replace
		95	0 -0.087		-0.18	
6	Wear of oil seal surface	105	0 -0.087		-0.18	
7	End play of coupling shaft	(Preload max. 0.4 kgm) max. 0.22				Replace

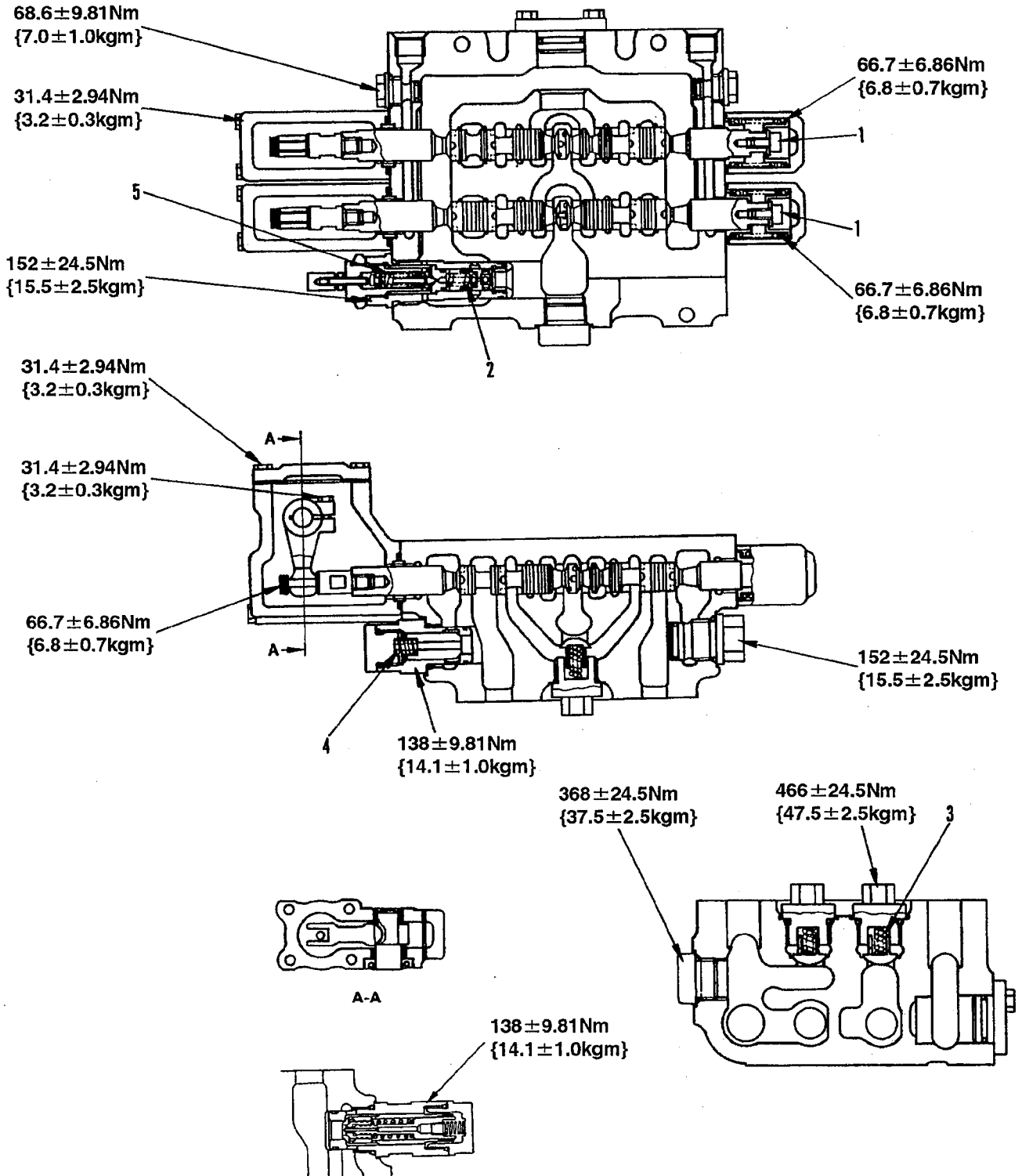
BRAKE CHAMBER



Unit: mm

No.	Check item	Criteria				Remedy	
		Standard size	Tolerance		Standard clearance		Clearance limit
Shaft	Hole						
1	Clearance between cylinder and piston	68	-0.030 -0.076	+0.046 0	0.030 - 0.122	0.15	Replace
2	Outside diameter of oil seal	69.6	+0.500 -0.300	+0.046 0	0.346 - 0.500	1.0	
3	Air piston stroke	Min. 133.5 (Normal pressure: Max. 9.5 kg/cm ²)				-	

MAIN CONTROL VALVE



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