

Shop Manual

D68E-1

D68P-1

BULLDOZER

SERIAL NUMBERS	D68E-1	1001 and up
	D68E-1A (BRAZILIAN)	B1001 and up
	D68P-1	45590 and up
	D68P-1A (BRAZILIAN)	B1001 and up

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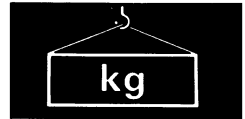
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


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HOISTING INSTRUCTIONS



 Heavy parts (25 kg or more) must be lifted with a hoist etc. In the **Disassembly and Assembly** section, every part weighing 25 kg or more is indicated clearly with the symbol 

1. If a part cannot be smoothly removed from the machine by hoisting, the following checks should be made:
 - Check for removal of all bolts fastening the part to the relative parts.
 - Check for existence of another part causing interference with the part to be removed.

2. Wire ropes

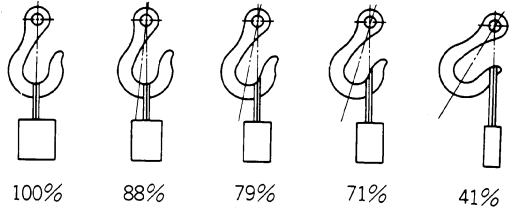
- 1) Use adequate ropes depending on the weight of parts to be hoisted, referring to the table below:

Wire ropes (Standard "Z" or "S" twist ropes without galvanizing)	
Rope diameter (mm)	Allowable load (tons)
10	1.0
11.2	1.4
12.5	1.6
14	2.2
16	2.8
18	3.6
20	4.4
22.4	5.6
30	10.0
40	18.0
50	28.0
60	40.0

The allowable load value is estimated to be one-sixth or one-seventh of the breaking strength of the rope used.


- 2) Sling wire ropes from the middle portion of the hook.

Slings near the edge of the hook may cause the rope to slip off the hook during hoisting, and a serious accident can result. Hooks have maximum strength at the middle portion.



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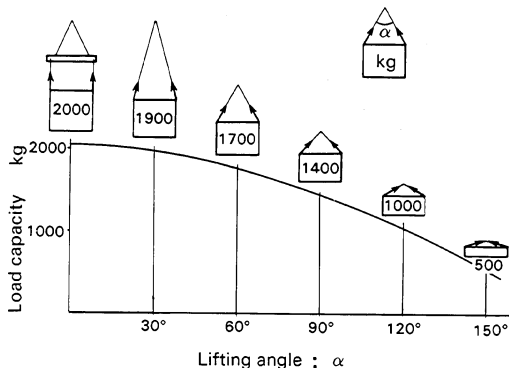
- 3) Do not sling a heavy load with one rope alone, but sling with two or more ropes symmetrically wound on to the load.

 Slings with one rope may cause turning of the load during hoisting, untwisting of the rope, or slipping of the rope from its original winding position on the load, which can result in a dangerous accident.

- 4) Do not sling a heavy load with ropes forming a wide hanging angle from the hook.

When hoisting a load with two or more ropes, the force subjected to each rope will increase with the hanging angles. The table below shows the variation of allowable load (kg) when hoisting is made with two ropes, each of which is allowed to sling up to 1000 kg vertically, at various hanging angles.

When two ropes sling a load vertically, up to 2000 kg of total weight can be suspended. This weight becomes 1000 kg when two ropes make a 120° hanging angle. On the other hand, two ropes are subjected to an excessive force as large as 4000 kg if they sling a 2000 kg load at a lifting angle of 150°.

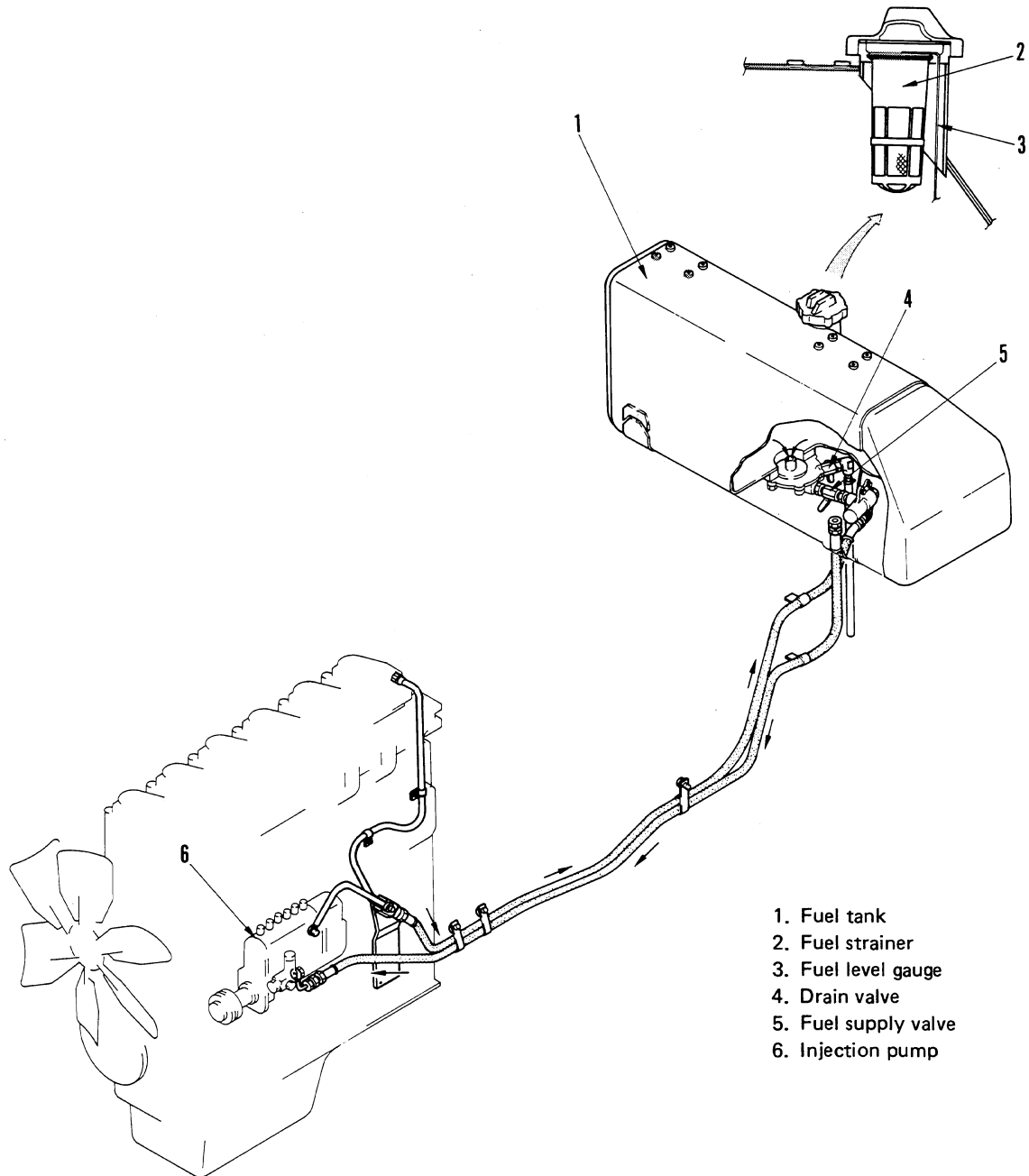


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FUEL TANK

The fuel tank is on the rear part of the machine body. The fuel tank is filled with fuel through the strainer. The fuel level gauge can be found by removing the filler cap. The fuel from the fuel tank flows into the injection pump through the fuel filters.

There are the fuel supply valve and the water drain valve on the back side of the fuel tank.



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TESTING AND ADJUSTING VALVE CLEARANCE

Special tools

	Part number	Part name	Q'ty
A	795-125-1360	Feeler gauge	1

- ★ Adjust clearance between rocker lever and top of crosshead to following value.


mm

	Intake valve	Exhaust valve
Cold	0.33	0.71

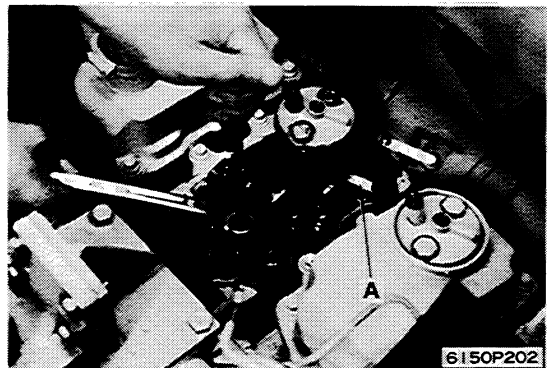
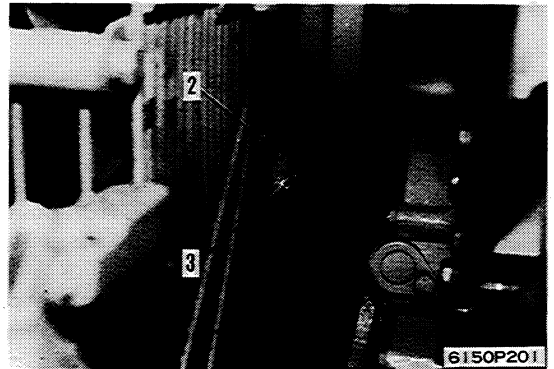
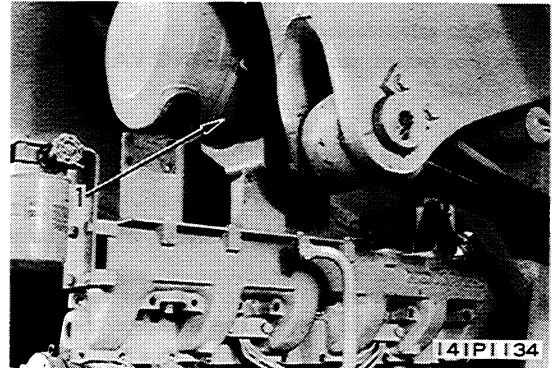
- When adjusting the valve clearances for cylinders No.3 to 6, remove air cleaner (1).
- Remove cylinder head cover.
- Rotate the crankshaft in the normal direction to align pointer (3) with the 1.6 TOP mark or crankshaft damper (2). When rotating, check the movement of the intake valves of No.1 cylinder and No.6 cylinder. Set with No.1 cylinder at compression top dead center.
 - ★ When No.1 cylinder is at compression top dead center, the intake valve of No.6 cylinder opens.
- When No.1 cylinder is at compression top dead center, adjust the valves marked ●. Then rotate the crankshaft one turn in the normal direction, set No.6 cylinder to compression top dead center, and adjust the valves marked ○.

Cylinder No.	1	2	3	4	5	6
Intake valve	●	●	○	●	○	○
Exhaust valve	●	○	●	○	●	○

- To adjust, insert tool A between rocker lever and crosshead and turn adjustment screw until clearance is a sliding fit. Then tighten locknut to hold adjustment screw in position.

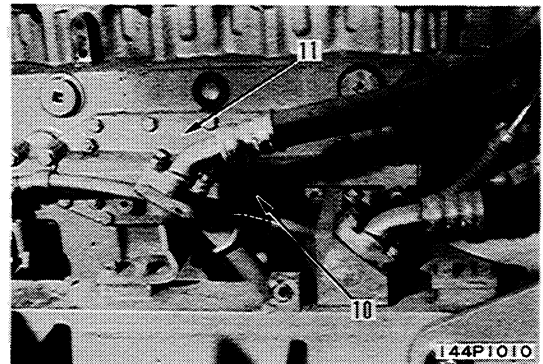
 Locknut: 6.7 ± 0.7 kgm

- ★ After adjusting No.1 cylinder at compression top dead center, it is also possible to turn the crankshaft 120° each time and adjust the valve clearance of each cylinder according to the firing order.
 - Firing order : 1-5-3-6-2-4
- ★ After tightening the locknut, check the clearance again.

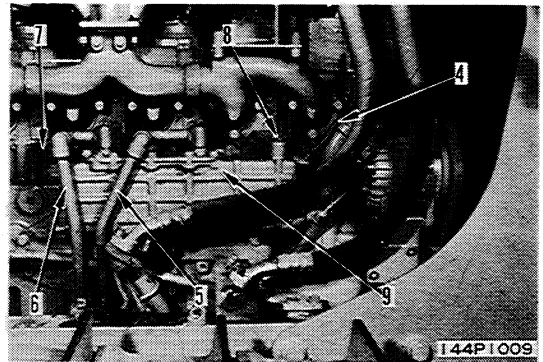


MOUNTING ENGINE OIL COOLER AND STEERING OIL COOLER ASSEMBLY

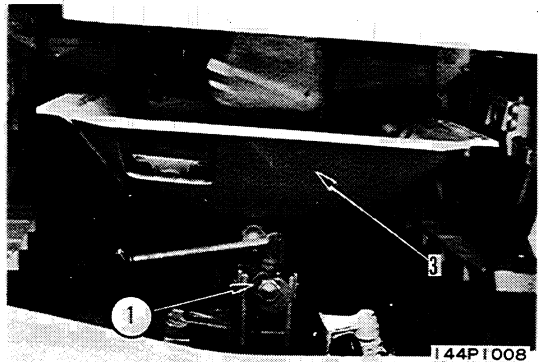
1. Fit gasket and install engine oil cooler assembly (11), then install with bracket (10).



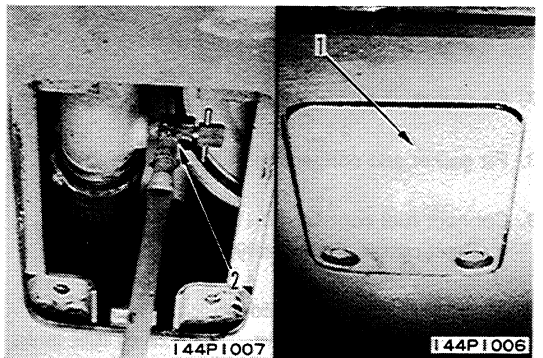
2. Fit gasket and install steering cooler assembly (9).
3. Install bracket (8) and (7), and secure steering cooler assembly (9).
4. Fit O-ring and install tubes (6) and (5), then secure with clamp.
5. Install air bleed tube (4).



6. Install R.H. engine side cover.
7. Using transmission jack (1), install underguard (3).

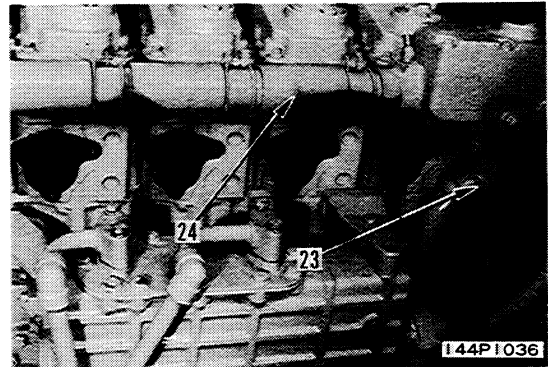


8. Tighten drain valve (2) and add water through water filler to the specified level.
 - ★ Run the engine to circulate the water through the system. Then check the water level again.
9. Install inspection cover (1).

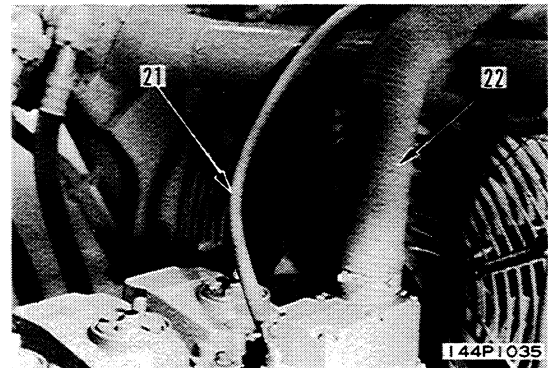


8. Water manifold assembly

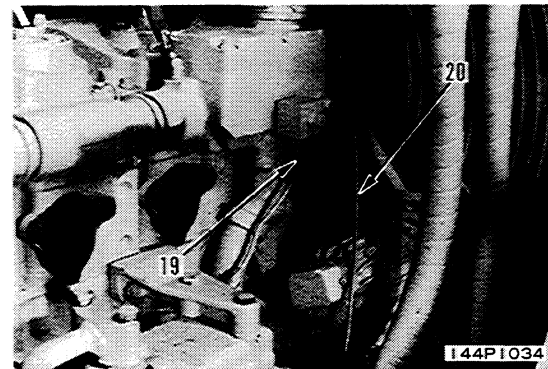
- 1) Fit O-ring and install water manifold assembly (24).
- 2) Fit O-ring and connect outlet tube (23) of water pump.

**9. Hoses**

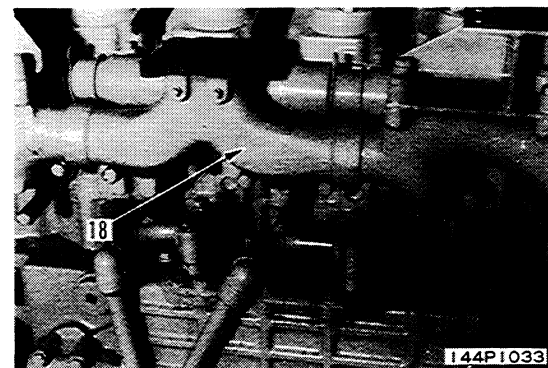
- 1) Connect radiator inlet hose (22).
- 2) Connect aeration hose (21).

**10. Air bleed tube, wiring of water temperature gauge**

- 1) Connect wire (20) of water temperature gauge.
- 2) Install air bleed tube (19).

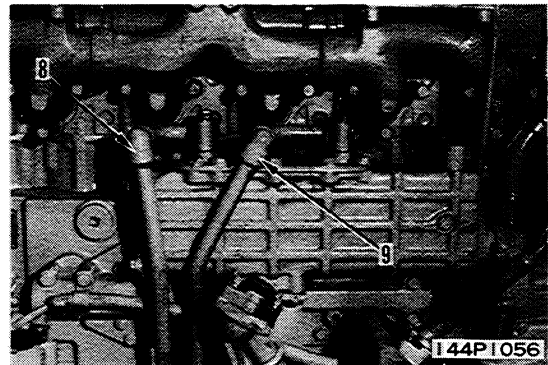
**11. Exhaust manifold, muffler assembly**

- Fit gasket and install exhaust manifold and muffler assembly (18).

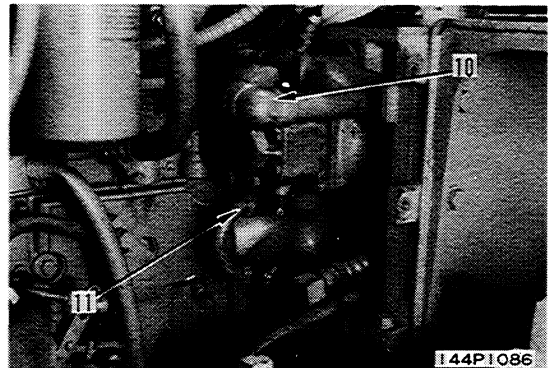


7. Piping

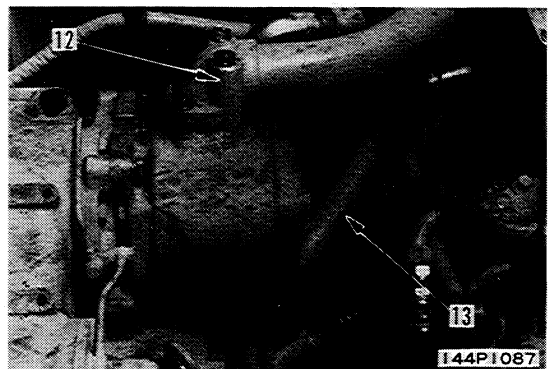
Remove clamp, then remove tubes (8) and (9) of steering cooler.

**8. Steering pump piping**

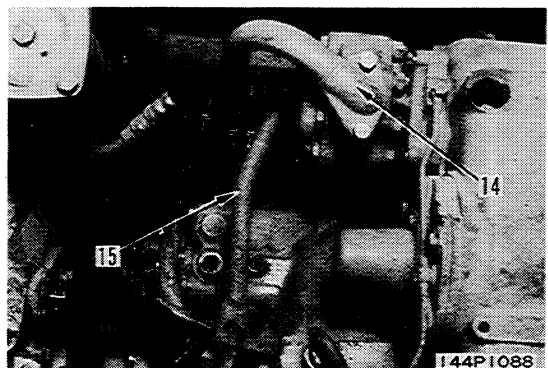
- 1) Remove inlet tube (10) of steering pump.
- 2) Remove outlet tube (11) of steering pump.

**9. Hydraulic pump piping**

- 1) Remove inlet tube (12) of hydraulic pump.
- 2) Disconnect outlet tube (13) of hydraulic pump.

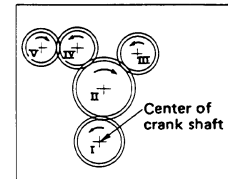
**10. Transmission pump piping**

- 1) Remove clamp, then remove inlet tube (14) of transmission pump.
- 2) Disconnect outlet tube (15) of transmission pump.



Gear shift lever position and power train

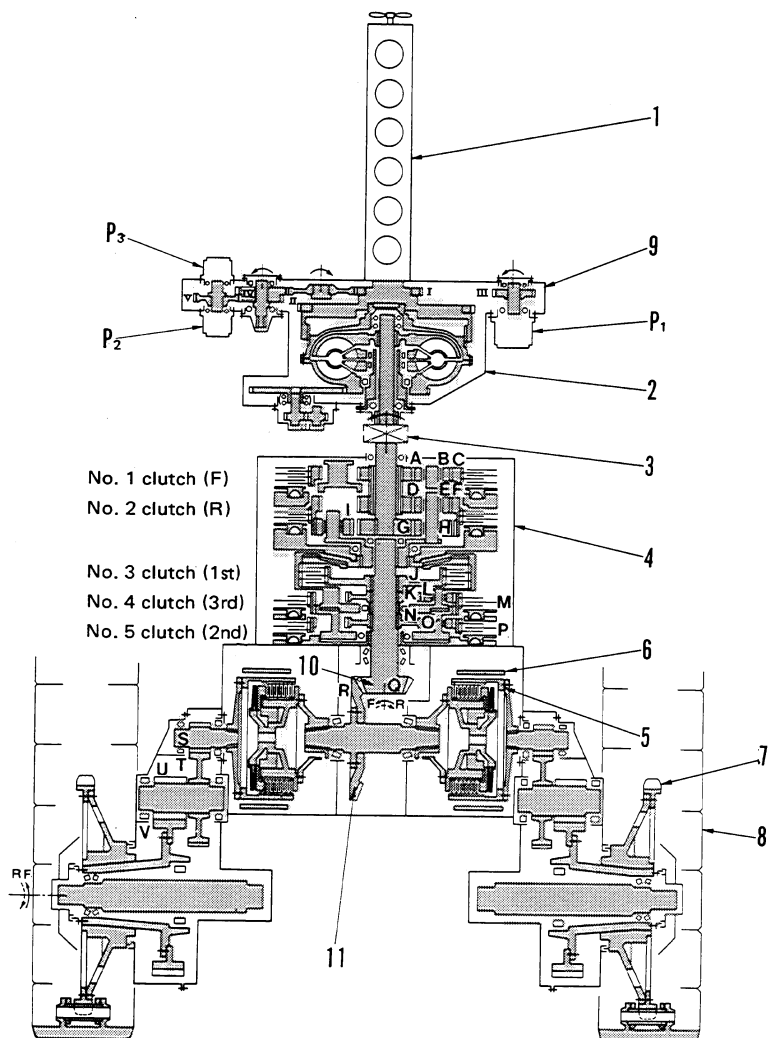
Forward & reverse	Gear speed	Clutch engaged (transmission)
Forward	1st	No. 1 · No. 3
	2nd	No. 1 · No. 5
	3rd	No. 1 · No. 4
Reverse	1st	No. 2 · No. 3
	2nd	No. 2 · No. 5
	3rd	No. 2 · No. 4



P T O gear train

- 9. P T O case
- 10. Bevel pinion
- 11. Bevel gear
- P₁: Hydraulic pump (PAR112)
- P₂: TORQFLOW pump (FAL040)
- P₃: Steering pump (FAR032)

- A: Sun gear for No.1 clutch (30 teeth)
- B: Planet gear for No.1 clutch (21 teeth)
- C: Ring gear for No.1 clutch (72 teeth)
- D: Sun gear for forward (30 teeth)
- E: Planet gear for forward (21 teeth)
- F: Ring gear for No.2 clutch (72, 78 teeth)
- G: Sun gear for No.2 clutch (30 teeth)
- H: Planet gear for No. 2 clutch (21 teeth)
- I: Planet gear for No.2 clutch (21 teeth)
- J: Gear for No.3 clutch (90 teeth)
- K: Sun gear for No.4 clutch (41 teeth)
- L: Planet gear for No.4 clutch (19 teeth)
- M: Ring gear for No.4 clutch (79 teeth)
- N: Sun gear for No.5 clutch (41 teeth)
- O: Planet gear for No.5 clutch (19 teeth)
- P: Ring gear for No.5 clutch (79 teeth)
- Q: Bevel pinion (15 teeth)
- R: Bevel gear (40 teeth)
- S: Final drive 1st pinion (11 teeth)
- T: Final drive 1st gear (48 teeth)
- U: Final drive 2nd pinion (11 teeth)
- V: Final drive 2nd gear (42 teeth)



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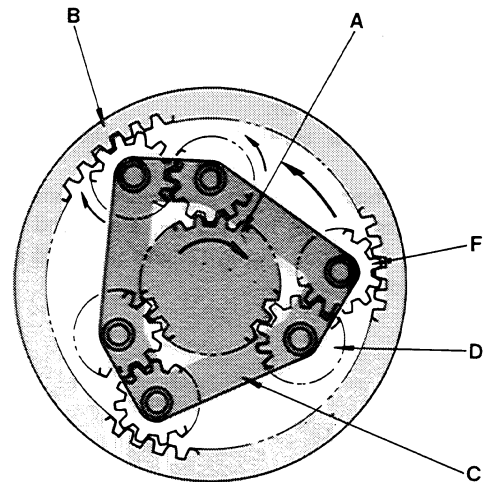
(3) Double planet gear mechanism

The combination in which another planet gears (F) is incorporated between planet gears (D) and ring gear (B) is also used. Sun gear (A) rotates while the ring gear is locked.

As ring gear (B) is locked, planet gears (F) cannot revolve at the same position, but rotates around sun gear (A) along ring gear (B).

In this case, the torque of sun gear (A) is transmitted to carrier (C) to drive it in the opposite direction to the rotation of sun gear (A).

This combination of sun gear → planet gear → planet gear → carrier is used for the No. 2 clutch, by which the machine is reversed.

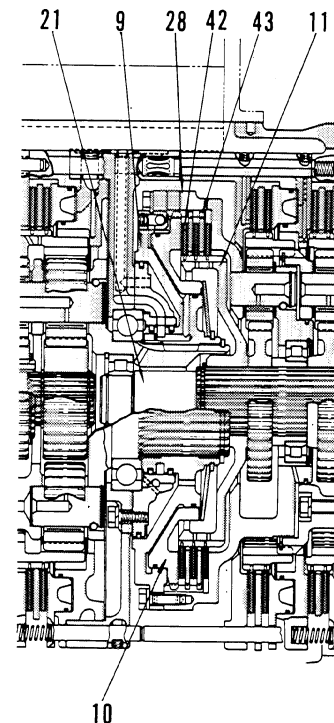


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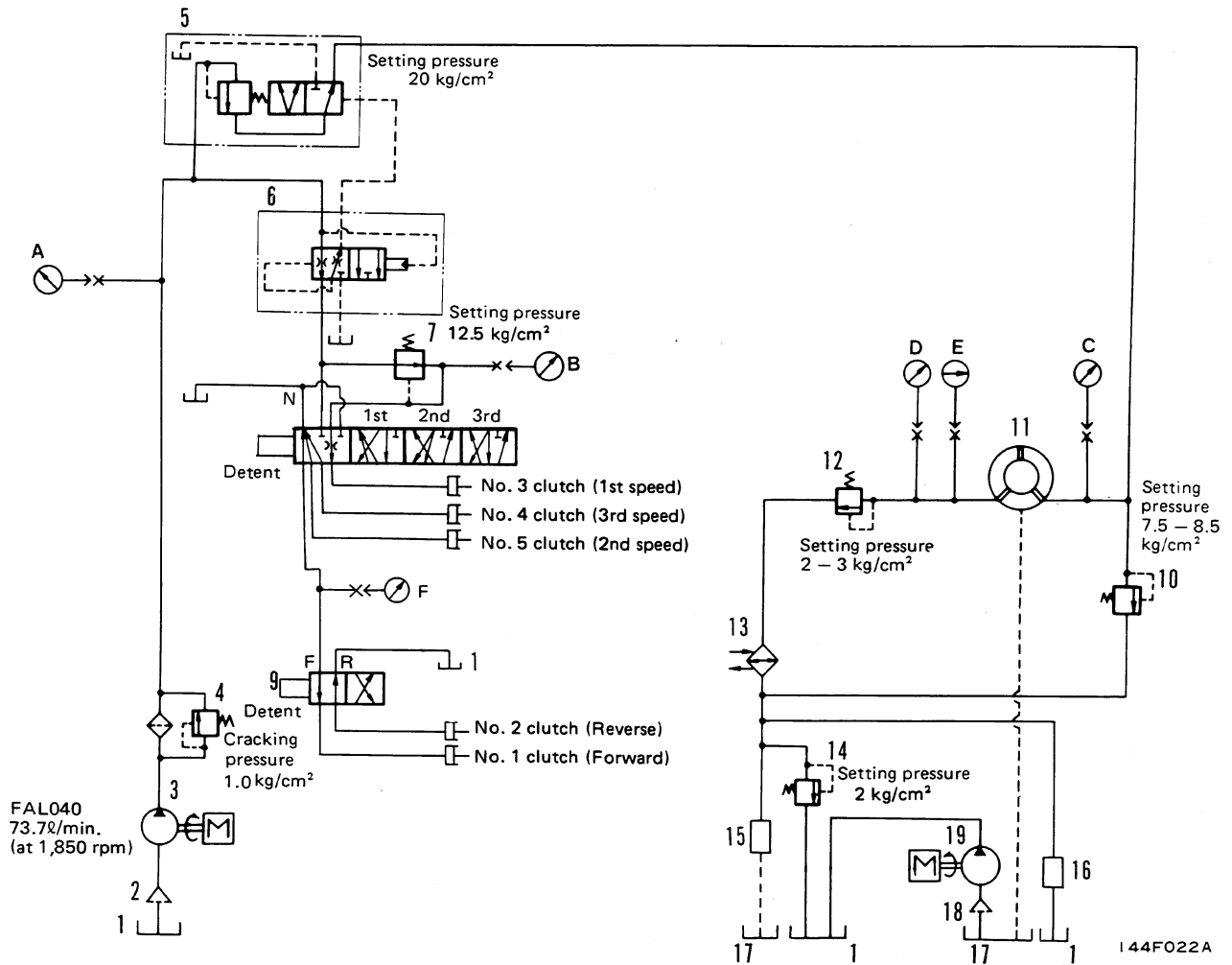
(4) Rotating clutch (No. 3 clutch for 1st speed)

No. 3 clutch is rotating type clutch different from clutches No. 1, No. 2, No. 4 and No. 5.

In this type, gear for No. 3 clutch (11) is fixed to output shaft (21), No. 3 clutch piston (10) presses discs (42) and plates (43) to carrier for No. 4 clutch (28). The frictional force enables the power transmission from carrier for No. 4 clutch (28) to gear for No. 3 clutch (11). This rotating type clutch is generally used as a 1st speed clutch having a large transmitting torque.



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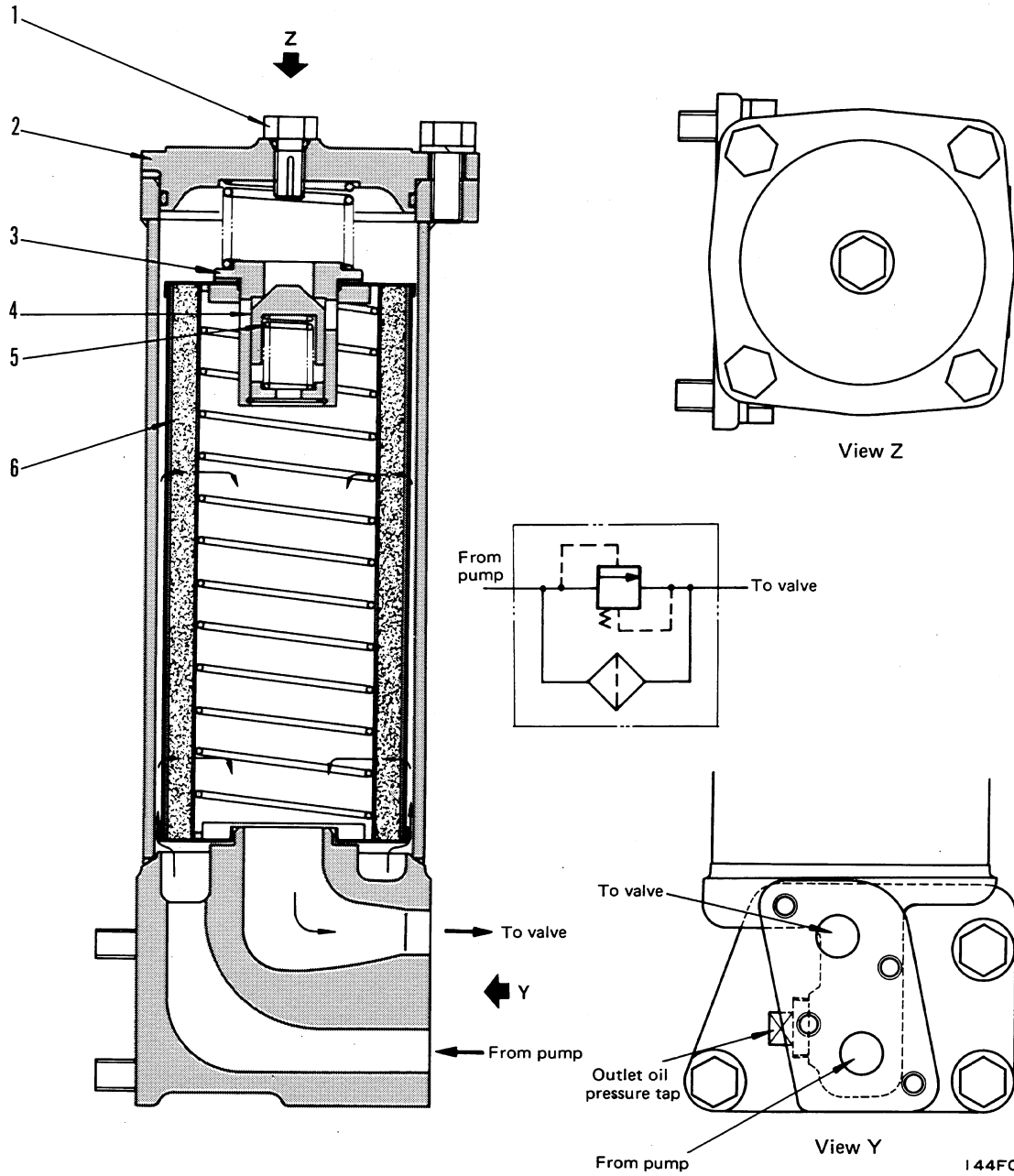
- | | | |
|-----------------------------------|--------------------------------------|--|
| 1. Transmission case | 11. Torque converter (TCS38-1C) | A. Plug for transmission modulating relief pressure (PT 1/8) |
| 2. Strainer | 12. Torque converter regulator valve | B. Plug for transmission 1st speed clutch pressure (PT 1/8) |
| 3. TORQFLOW pump (FAL040) | 13. Oil cooler | C. Plug for torque converter relief pressure (PT 1/8) |
| 4. Oil filter | 14. Lubricating relief valve | D. Plug for torque converter regulator pressure (PT 1/8) |
| 5. Modulating relief valve | 15. P T O lubrication | E. Adapter for torque converter oil temperature |
| 6. Quick return valve | 16. Transmission lubrication | F. Plug for F-R clutch pressure (PT 1/8) |
| 7. Reducing valve | 17. Torque converter case | |
| 8. Speed valve | 18. Strainer | |
| 9. Forward-Reverse valve | 19. Scavenging pump | |
| 10. Torque converter relief valve | | |

The fundamental components of the transmission hydraulic control system are the oil strainer (2), oil pump (3), and control valve group, and oil cooler (13). The pipes are connecting the lubrication relief valve (14) to oil cooler (13), and connecting the oil strainer in the transmission bottom to the oil pump suction port. The control valve group consists of the speed valve group and the direction valve group.

The hydraulic control system is used for selecting one of the three forward and reverse speeds. The speed valve feeds oil to the specified clutches so that the desired traveling direction and speed of the machine can be attained. Oil pressure for this purpose is regulated by the modulating relief valve (5).

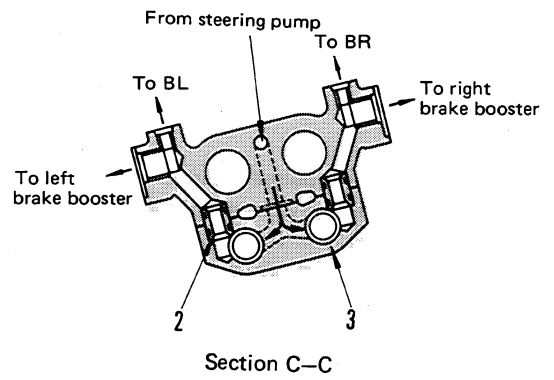
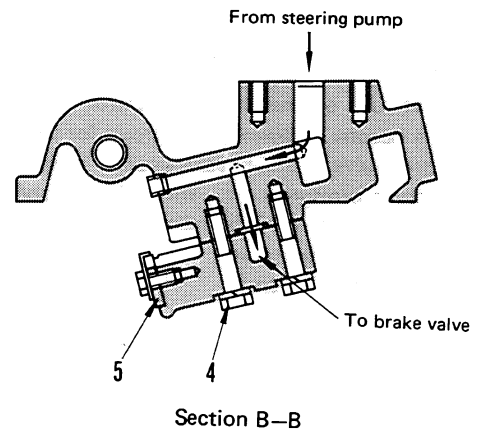
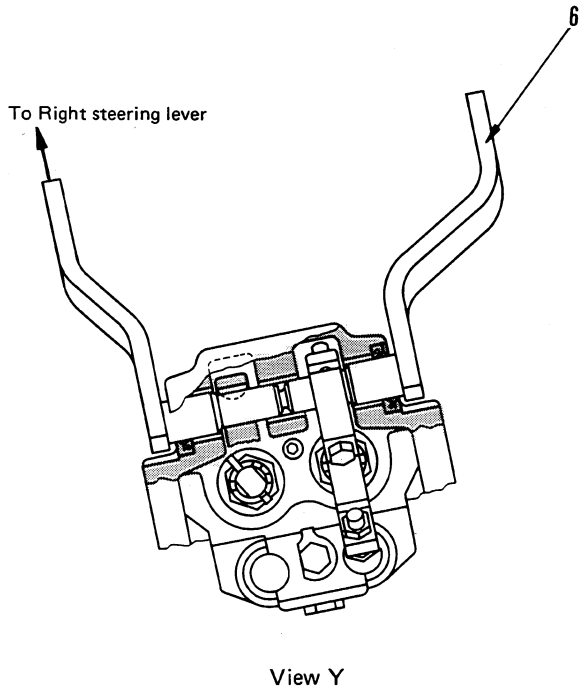
When the engine is started and the transmission control lever is placed in the "NEUTRAL" position, oil from the oil pump is directed to the modulating relief valve. This valve keeps 20 kg/cm² of oil pressure.

TRANSMISSION FILTER



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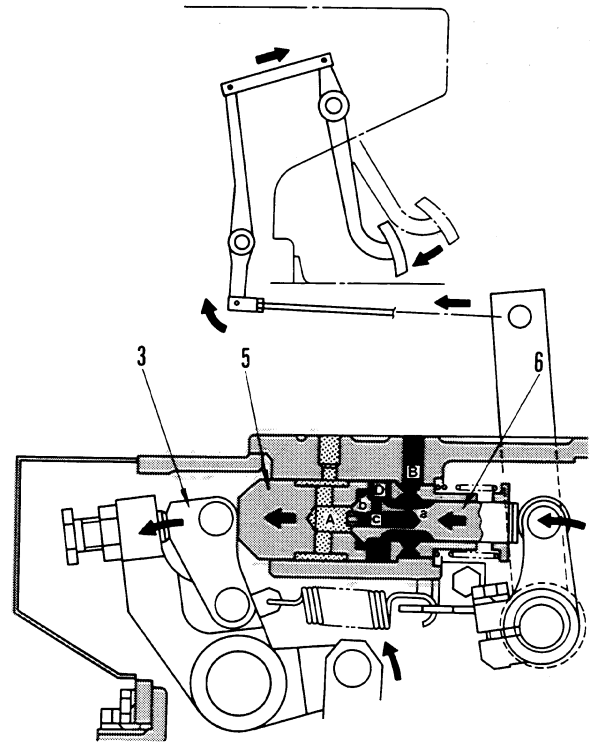
- 2. Tube
- 3. Brake valve body
- 4. Bolt
- 5. Plate
- 6. Lever



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Spool (6) moves further to the left and connects the flow of oil at port (B) and port (D). The volume of oil flowing to port (D) increases and piston (5) moves faster. Piston (5) continues to push lever (3), then brake band contracts smoothly and the brake is applied.

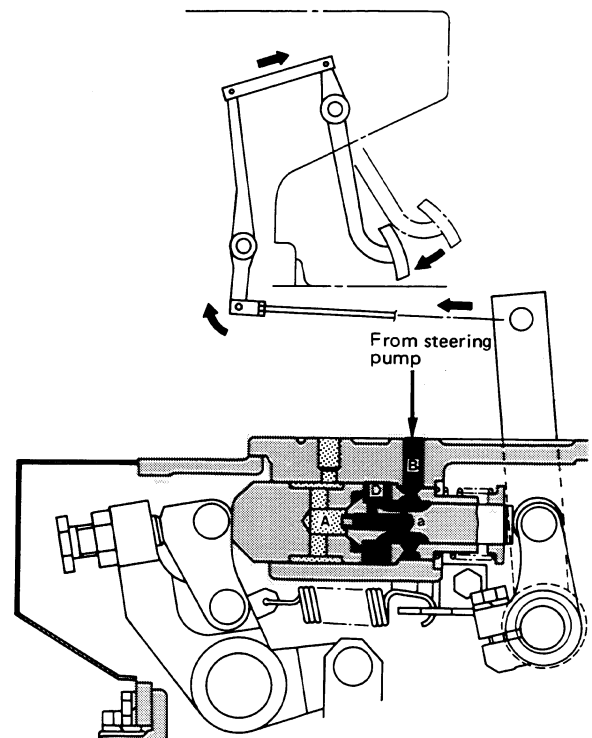
In this way, the hydraulic pressure rises in two stages. At first, the oil pushes piston (5) lightly, and when the flow of oil at port (D) and port (B) is connected, it pushes strongly. This prevents the brake from being applied suddenly.



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4. When brake pedal is depressed fully (brake applied)

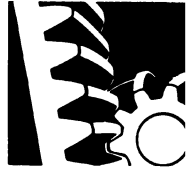
When the brake pedal reaches the end of its travel, the flow of oil at port (D) and port (A) remains shut off, and the hydraulic pressure rises further. When the pressure reaches 20 kg/cm^2 , the main relief valve functions and the oil flows into the lubrication circuit.



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POWER TRAIN

22 TESTING AND ADJUSTING



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Adjusting clearance between	
brake band and drum	22-6
Adjusting steering lever travel	22-7
Adjusting brake pedal travel	22-8
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DIAGNOSTIC TABLES

1. Oil temperature in torque converter is higher.

Ask the operator the following questions.

- Does the oil temperature rise with stalling of the torque converter, and vice versa?
 Yes → The torque converter is proper.
 (The cause is the improper gearshifting.)
 In this case, the torque converter should not be considered as the cause of trouble.

Check before troubleshooting.

- Is oil quantity in transmission case and/or steering case proper?

Test results and causes.

- ★ If the oil temperature in torque converter case is proper and the gauge is over the green range, the oil temperature gauge is improper.

Cause							
a	b	c	d	e	f	g	h
Tank to pump		Torque converter			Scavenging pump		
Remedy							
C	Δ	X	X	Δ	Δ	C	X
X	X	X	X	X	X		

No.	Problems	C	Δ	X	X	Δ	Δ	C	X
1	An unusual noise is made from torque converter pump when oil temperature is low.	○							
2	The engine high idling speed and low idling speed are lower than standard speeds.					○		○	
3	Oil pressure at torque converter outlet is lower.					○			
4	Oil pressure at torque converter inlet is lower.				○				
5	Transmission modurating relief pressure is lower.	○	○						
6	Oil leakage inside the case is more.					○			

→ If the other possible causes have been eliminated, this may be considered at the cause of trouble

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

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

POWER TRAIN

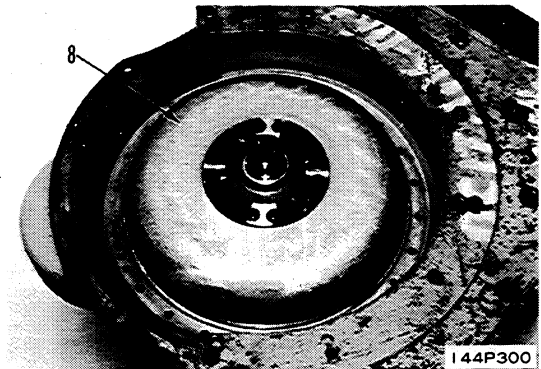
23 DISASSEMBLY AND ASSEMBLY



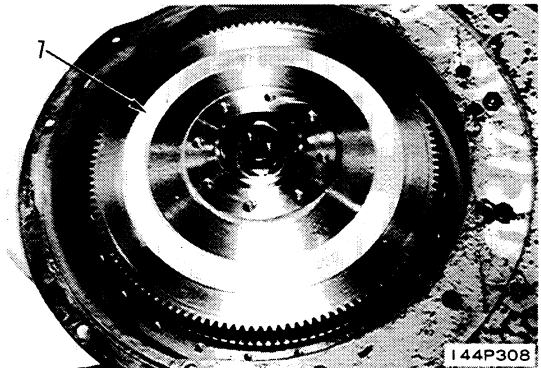
TORQUE CONVERTER		STEERING CONTROL VALVE	
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Mounting	23- 4	Mounting	23-68
Disassembly	23- 6	Disassembly	23-70
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TORQUE CONVERTER RELIEF, REGULATOR VALVE ASSEMBLY		STEERING MAINRELIEF VALVE	
Dismounting	23-13	Disassembly	23-72
Mounting	23-13	Assembly	23-72
TORQFLOW TRANSMISSION		TRANSMISSION PUMP, STEERING PUMP	
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BEVEL GEAR SHAFT, BEVEL GEAR ASSEMBLY			
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STEERING CLUTCH			
Dismounting	23-60		
Mounting	23-62		
Disassembly	23-64		
Assembly	23-66		

7. Turbine

Install turbine (8).

**8. Drive case**


1) Align drain plug with notch on mating side, and install drive case (7).



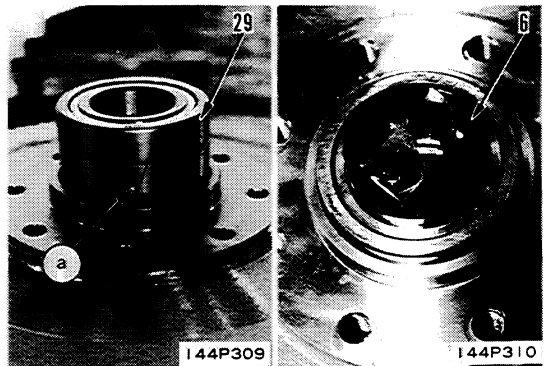
2) Align match mark "a", and install bearing (29) (I.D. 45 mm).

★ Press fit the inner and outer race at the same time.

3) Install plate (6).

 Mounting bolt: 5.8 ± 0.2 kgm

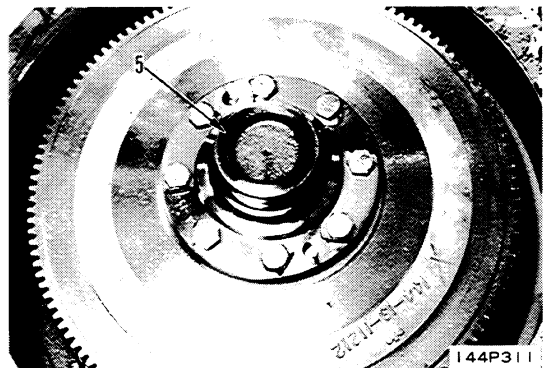
★ Bend lock plate securely.

**9. Pilot**

Reinsert previously removed shims, and install pilot (5).

★ Bend lock plate securely.

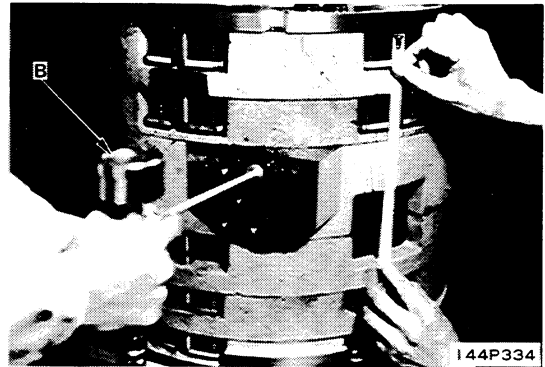
★ Clearance between pilot and drive case is 0 – 0.05 mm.



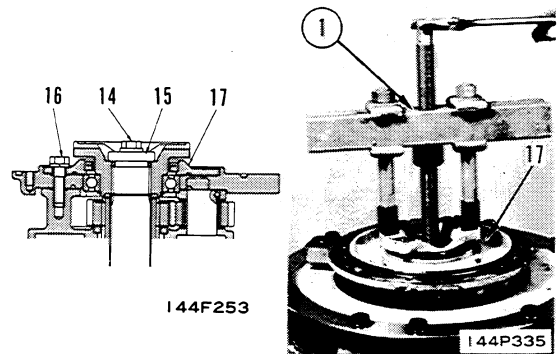
4. Checking operation of piston

Using tool B, check operational function of each piston.

★ Air pressure: 3 to 5 kg/cm²

**5. Cage, coupling assembly**

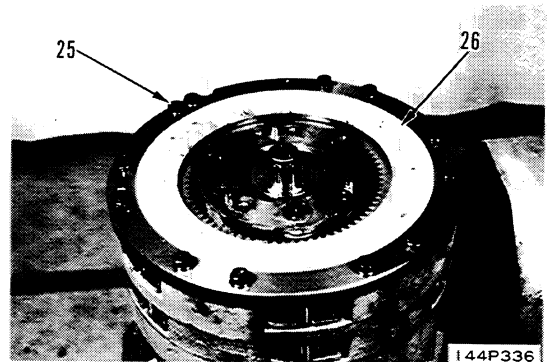
- 1) Remove bolt (14), then remove plate (15).
- 2) Remove cage mounting bolts (16).
- 3) Remove cage and coupling assembly (17).

**6. Tie bolt**

Remove tie bolts (25).

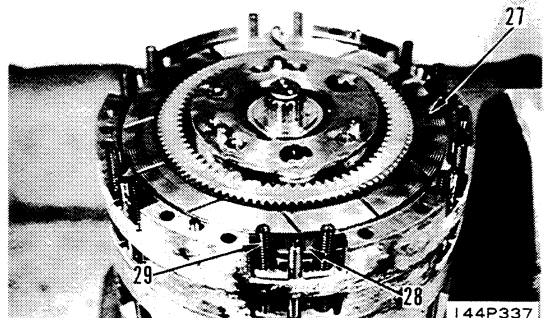
7. Front plate

Remove front plate (26).

**8. No. 1 disc, plate, spring**

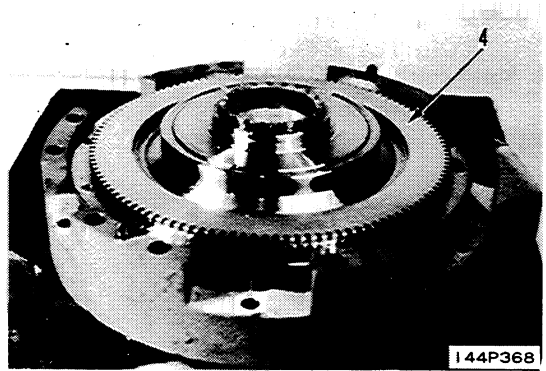
Remove disc (27), plate (28) and spring (29).

★ 3 discs, 2 plates.

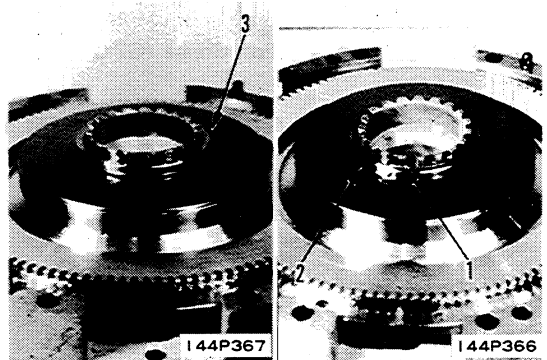


6. Install seal ring, then install piston (4).

- ★ Fit a seal ring so that pressure is applied to the grooved side of the ring.



7. Install spring (3), then install snap rings (2) and (1).



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MOUNTING BEVEL GEAR SHAFT, BEVEL GEAR ASSEMBLY


Special tools required

	Part number	Part name	Q'ty
A	791-435-6000	Remover	1
B	791-440-4000	Installer	1
	790-101-1102	Pump	1
C	790-100-1340	Wrench	1

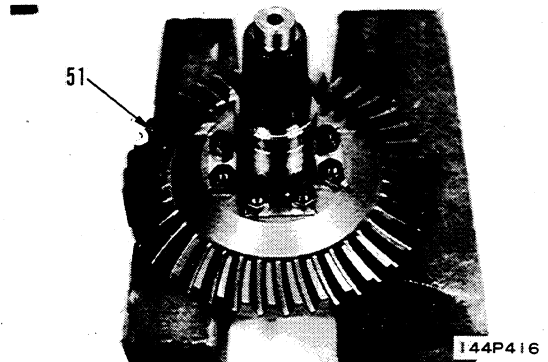
1. Bevel gear shaft, bevel gear assembly

1) Assemble bevel gear shaft and bevel gear assembly as follows.

i) Install bevel gear (51) on shaft.

 Nut: 39 ± 4 kgm

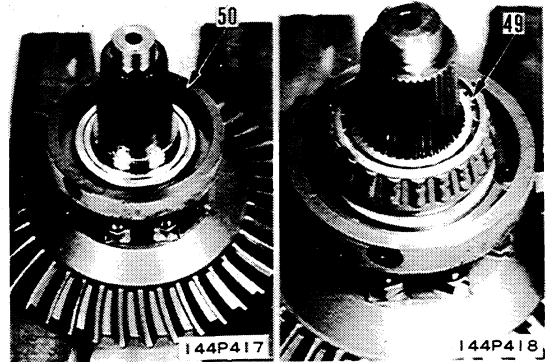
★ Bend lock plate securely.



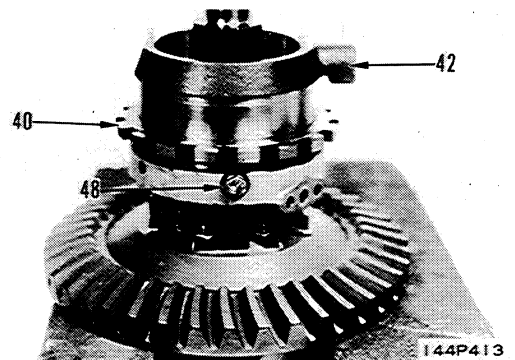
ii) Install flange (50).

iii) Shrink-fit bearing (49).

★ Temperature for shrink-fit:
100°C for about one hour

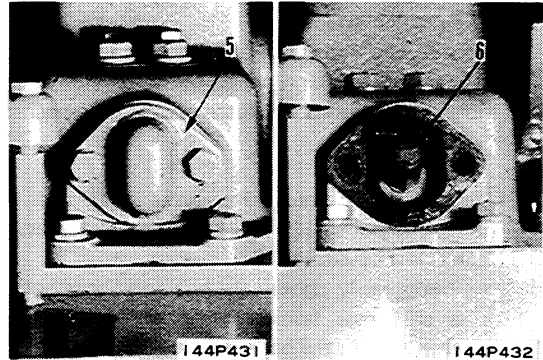


iv) Attach ring nut (40) to cage (42), align with dowel pin on flange, mount cage on shaft and tighten bolt (48).



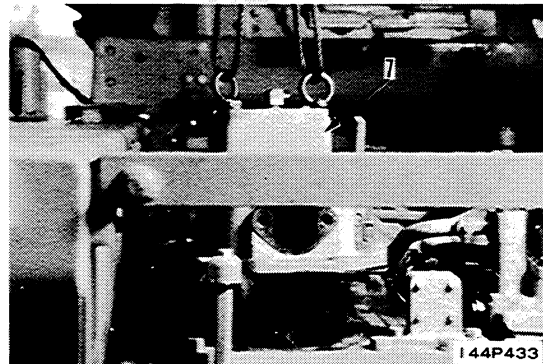
9. Brake adjustment nut

- 1) Remove cover (5).
- 2) Remove nut (6).

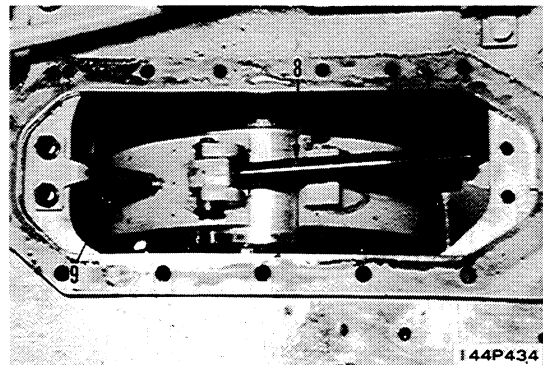
**10. Brake booster assembly**

Using eye bolts (Dia. = 12 mm, Pitch = 1.75 mm), lift brake booster assembly (7), and remove assembly by screwing in a forcing screw.

- ★ Lift the assembly while pulling the adjustment nut out of the lever.

**11. Rod, spring**

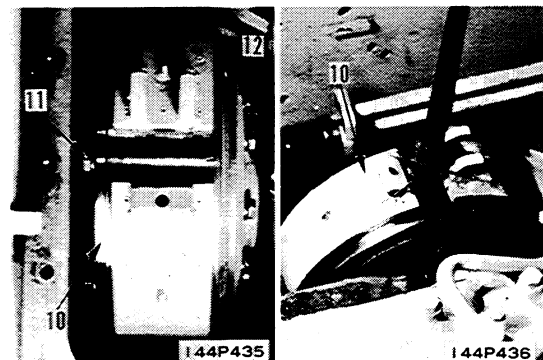
Remove rod (8) and spring (9).
Remove the spring together with the plate.

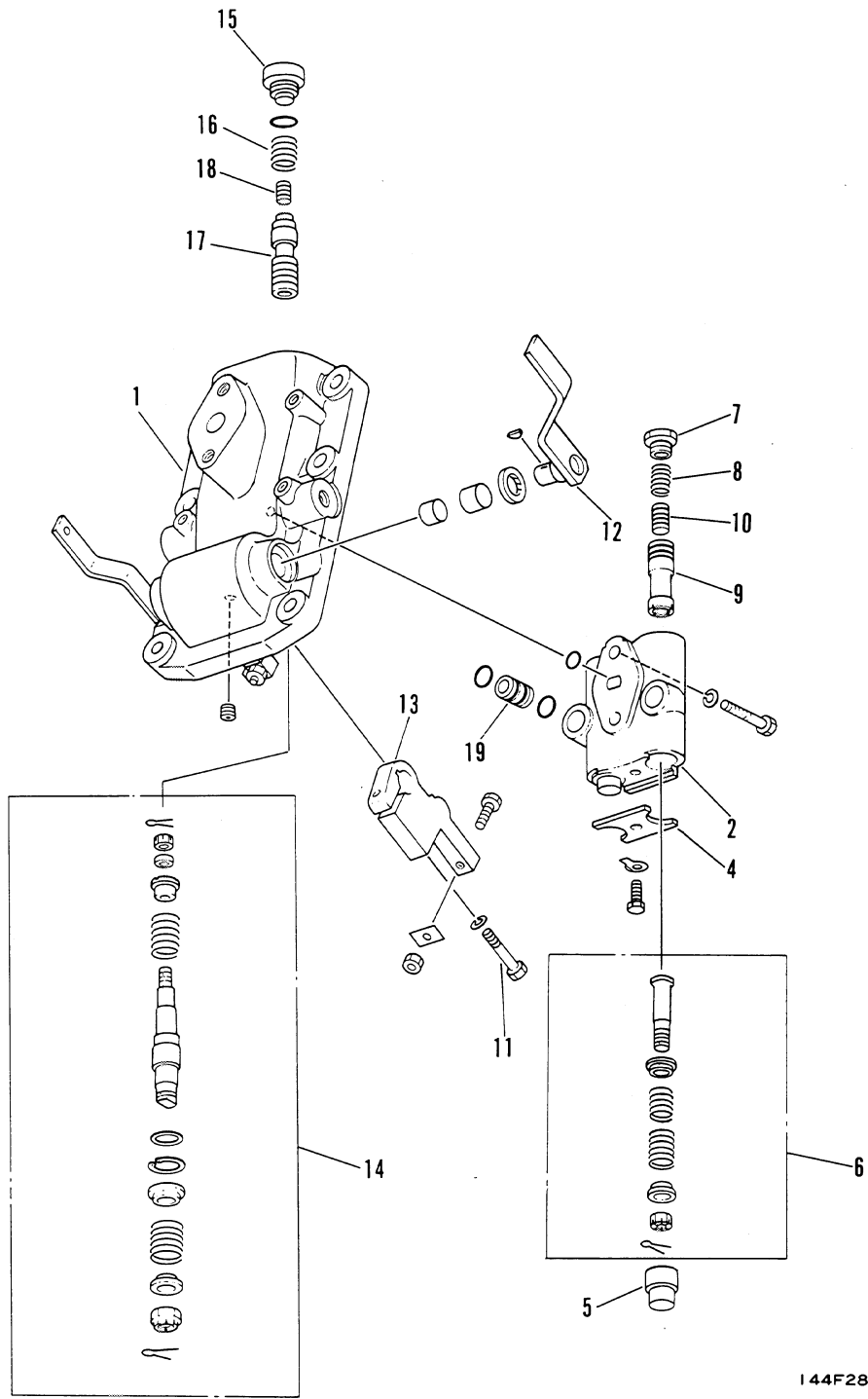
**12. Steering clutch assembly**

- 1) Remove flange bolts (11) and hub bolts (12), while turning clutch assembly (10).

- ★ Turn the clutch assembly by pressing the shoe upward with a hydraulic jack (10 ton).

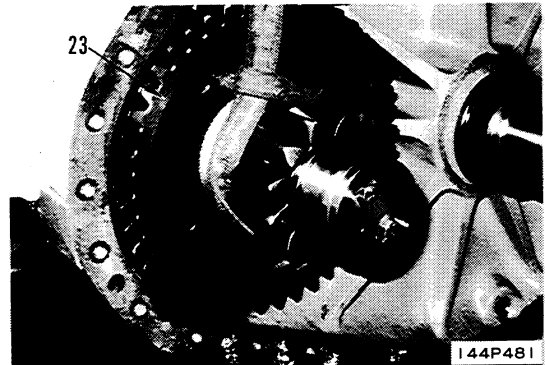
- 2) Lift brake band with wire rope, disconnect pilot and remove steering clutch assembly (10).






I 44F280

- 2) Raise 1st gear and 2nd pinion assembly (23) and install.

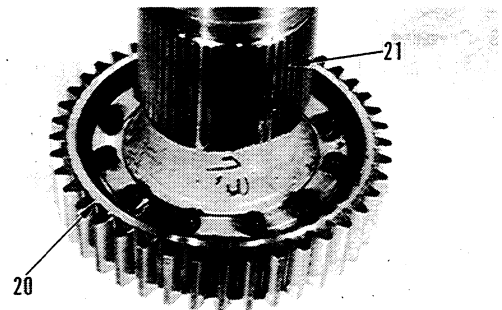
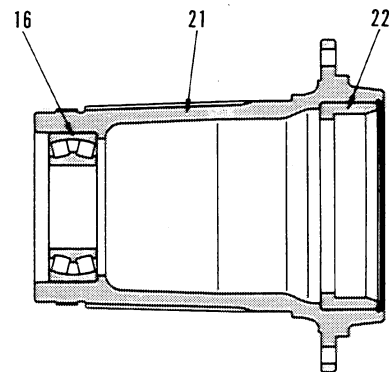


3. Final drive hub, 2nd gear assembly

- 1) Assemble final drive hub and 2nd gear assembly as follows.
- i) Install outer race (22) (O.D. 250 mm) and snap ring on hub (21).
 - ii) Install bearing (16) (O.D. 180 mm).
 - iii) Install 2nd gear (20) in hub (21).

 kgm Nut: 50 ± 5 kgm

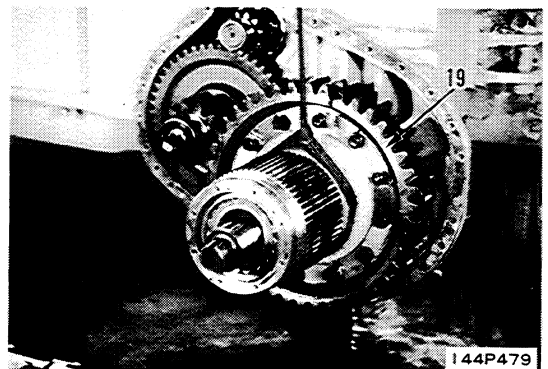
- ★ Bend lock plate securely.



- 2) Raise final drive hub and 2nd gear assembly (19) and install.

4. Press fit

- Push bearing with tool C and install final drive hub and 2nd gear assembly (19).



Unit: mm

No.	Check item	Criteria					Remedy
3	Backlash between No. 4, 5 planet gear and ring gear	Standard clearance		Clearance limit			Replace
		0.15 – 0.40		–			
4	Backlash between No. 4, ring gear and carrier for No. 5 clutch	0.18 – 0.49		–			
5	Planet gear axial play	0.35 – 0.80		–			
6	Thickness of assembled 3 discs and 2 plates for No. 1 and No. 2 clutches	Standard size		Repair limit			
		29.2		25.2			
7	Thickness of assembled 2 disc and 1 plate for No. 4 and No. 5 clutches	17.3		14.9			
8	Thickness of assembled 3 discs and 2 plates for No. 3 clutch	25		22			
9	Thickness of discs for No. 1, 2, 4, 5 clutches	5.4		4.6			
10	Thickness of plate for No. 1, 2, 4, 5 clutches	6.5		5.7			
11	Thickness of disc for No. 3 clutch	5		4.4			
12	Thickness of plate for No. 3 clutch	5		4.4			
13	Dia. of sliding surface of oil seal	95 ⁰ _{-0.087}		94.9			
14	No. 1 and No. 2 clutch springs	Standard size			Repair limit		Replace
		Free length	Installed length	Installed load	Free length	Load	
		59	46	13 kg	57.4	11.4 kg	
15	No. 4 and No. 5 clutch springs	41.3	38	13.6 kg	40.6	10.6 kg	
16	Tightening torque of tie rod bolt	17 ± 1 kgm					Retighten
17	Bolt tightening torque	18 ± 2 kgm					
18	Carrier for No. 1 clutch mounting bolt tightening torque	18 ± 2 kgm					
19	Carrier for No. 4 clutch mounting bolt tightening torque	7 ± 0.5 kgm					
20	Shim thickness	Standard: 0.5					Adjust
21	Shim thickness	Standard: 2.0					

Unit: mm

No.	Check item	Criteria					Remedy
		Standard size	Tolerance		Standard clearance	Clearance limit	
Shaft	Hole						
1	Clearance between lever shaft and bushing	18	+0.019 +0.001	+0.156 +0.086	0.067 ~ 0.155	0.20	Replace
2	Clearance between lever shaft and bushing	22	+0.023 +0.002	+0.170 +0.086	0.063 ~ 0.168	0.20	
3	Clearance between shaft and valve body	26	-0.035 -0.045	+0.013 0	0.035 ~ 0.058	0.08	
4	Clearance between steering valve and piston	10	-0.03 -0.04	+0.015 0	0.03 ~ 0.055	0.08	
5	Clearance between steering valve and valve body	26	-0.035 -0.045	+0.013 0	0.035 ~ 0.058	0.08	
6	Clearance between guide and brake valve body	26	-0.01 -0.03	+0.021 0	0.01 ~ 0.051	0.08	
7	Clearance between brake valve and valve body	16	-0.030 -0.035	+0.018 0	0.030 ~ 0.053	0.08	
8	Clearance between brake valve and piston	9	-0.03 -0.04	+0.015 0	0.03 ~ 0.055	0.08	
9	Shaft return spring	Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Load	
		55	20.0	3.66 kg	54	3.3 kg	
10	Modulating valve spring	40.5	36.5	8.47 kg	40	8.0 kg	
11	Modulating valve spring	91.6	25.0	4.53 kg	90.6	4.3 kg	
12	Brake valve spring (Small)	28.5	25.5	3.0 kg	28	2.8 kg	
13	Brake valve spring (Large)	106	27.0	4.9 kg	88	4.1 kg	
14	Brake valve spring	50.5	14.0	2.36 kg	49.5	2.2 kg	
15	Stroke of brake valve play	13.7 ± 0.2					Adjust

UNDERCARRIAGE

31 STRUCTURE AND FUNCTION



Track group	31- 2
Recoil spring	31- 3
Idler	31- 4
Carrier roller	31- 5
Track roller (single flange)	31- 6
Track roller (double flange)	31- 7
Track	31- 8
Suspension	31-10

UNDERCARRIAGE

33 DISASSEMBLY AND ASSEMBLY



TRACK FRAME

Dismounting	33- 2
Mounting	33- 3

RECOIL SPRING

Dismounting	33- 4
Mounting	33- 5
Disassembly	33- 6
Assembly	33- 7

FRONT IDLER

Dismounting	33- 8
Mounting	33- 8

TRACK ROLLER

Dismounting	33- 9
Mounting	33- 9

CARRIER ROLLER

Dismounting	33-10
Mounting	33-10

TRACK

Separation	33-11
Connection	33-13
Adjusting tension	33-15

SEPARATION OF TRACK (MASTER LINK TYPE)

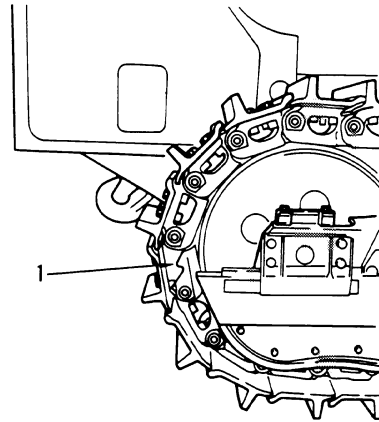
1. Blade assembly

See DISMOUNTING THE BLADE

2. Positioning the machine

Move the machine into an area wide enough to separate the tracks.

Stop the machine with master link (1) of each track aligned with the center line of the front idler.

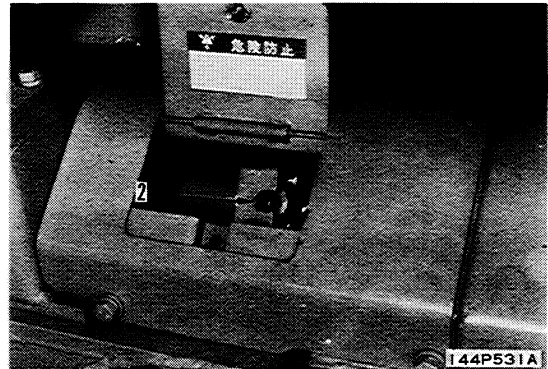


3. Relieving track tension

Loosen lubricator (2) by about one turn, to release track shoe tension.

⚠ The adjustment cylinder is under extremely high pressure. Never loosen the lubricator more than one turn.

★ If the track tension is not relieved, move the machine backwards and forwards.

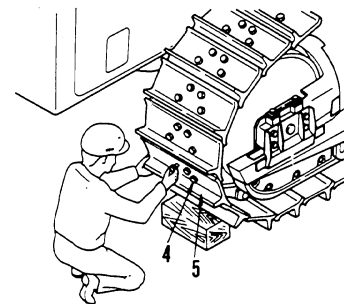
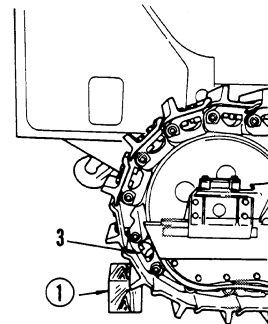


4. Shoe bolts for the master link

1) Put wooden block ① under the grouser just below the master link (3).

2) Remove four shoe bolts (4) and master shoe (5) from the master link.

★ Height of wooden block: **approx. 150 mm**



Unit: mm

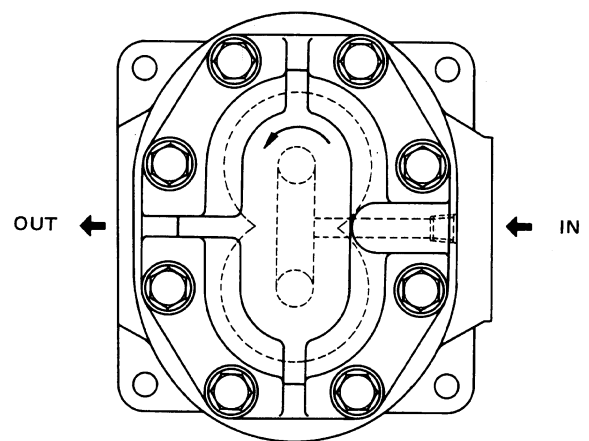
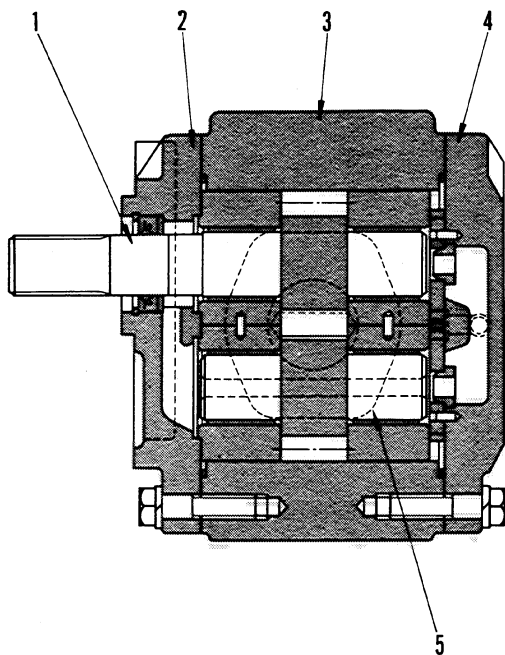
No.	Check item	Criteria				Remedy	
1	Idler drum outside diameter	Standard size		Repair limit		Rebuild or replace	
		720.0		710.0			
2	Idler tread outside diameter	680.0		670.0			
3	Idler drum width	101.0		97.0			
4	Idler tread width	44.5		48.5			
5	Idler wheel width	190		186.0			
6	Clearance between idler shaft and bushing	Standard size	Tolerance		Standard Clearance		Clearance limit
			Shaft	Hole			
		65.0	-0.250 -0.290	+0.074 0	0.250 ~ 0.364		1.5
7	Interference between idler and bushing	Standard size	Tolerance		Standard interference		Repair limit
			Shaft	Hole			
		115	+0.120 +0.066	+0.054 0	0.012 ~0.120		-
8	Width of shaft flange	Standard size		Repair limit		Rerlace	
		20.0		18.5			
9	Axial play of shaft	Standard clearance		Clearance limit			
		0.27 ~ 0.90		1.5			
10	Clearance between guide and track frame	2.0		5.0			
11	Clearance between cover and track frame	1.0		3.0			
12	Lubricating plug tightening torque	20 ± 2 kgm					Retighten

Unit: mm

No.	Check item	Criteria				Remedy	
1	Link pitch	Standard size		Repair limit		Turn or replace	
		203.45		-			
2	Grouser height	Single		25.0		Lug welding or replace	
	Swamp		94.5				
3	Link height	116.0		110.0		Lug welding or replace	
4	Bushing outside diameter	69.9		Light loading: 62.4 Heavy loading: 64.9		Turn or replace	
5	Interference between bushing and link	Standard size	Tolerance		Standard interference	Interference limit	
			Shaft	Hole			
		66.5	+0.404 +0.304	+0.074 0	0.230 - 0.404	0.100	
6	Interference between pin and link	44.4	+0.435 +0.285	+0.062 0	0.223 - 0.435	0.140	Replace
7	Clearance between pin and bushing	Standard size	Tolerance		Standard clearance	Clearance limit	
			Shaft	Hole			
		44.6	+0.235 +0.085	+0.915 +0.415	0.180 - 0.830	-	
8	Protrusion of bushing	3.05				Adjust	
9	Protrusion of pin	3.0					
10	Regular shoe bolt tightening torque	Initial tightening: 30 ± 3 kgm Additional tightening angle: 120° ± 10°				Retighten or replace	
11	Master link bolt tightening torque	Initial tightening: 30 ± 3 kgm Additional tightening angle: 180° ± 10°					

HYDRAULIC PUMP

PAR112

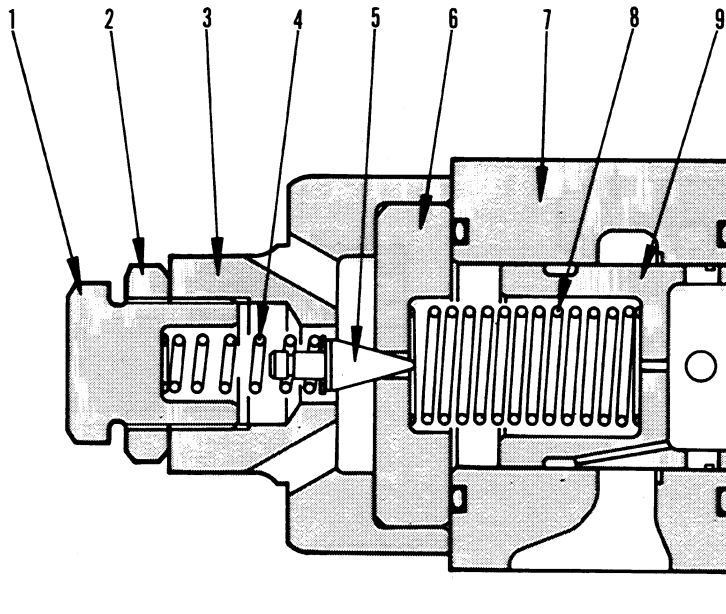


1. Drive gear
2. Bracket
3. Gear case
4. Cover
5. Driven gear

Type: Gear pump (PAR112)
Delivery: 227 l/min. at 1,850 rpm
Setting pressure: 155 kg/cm²

I 44F095

MAIN RELIEF VALVE



1. Pressure adjusting plug
2. Lock nut
3. Case
4. Spring
5. Pilot valve
6. Seat
7. Valve body
8. Spring
9. Main relief valve

61F007

Structure

- A pilot type of valve is used for the main relief valve. The pilot type valve consists of two valves: a main relief valve (9) and a pilot valve (5). The setting of the hydraulic pressure is determined by the movement of the pilot valve.
- The main relief valve is installed inside the hydraulic tank. When the main relief valve functions, the oil is drained directly inside the tank.

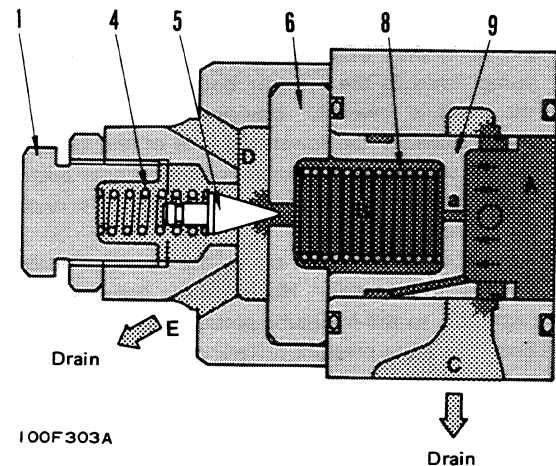
Operation

- Blade control valve in "HOLD" position
The oil from the hydraulic pump fills ports (A) and (B), passes through the control valve and is drained to the tank.
The hydraulic pressure on the left and right (port (A) and port (B)) is equal.
- Blade control valve not in "HOLD" position
The oil from the hydraulic pump passes through the control valve and flows to the cylinders. The hydraulic pressure rises and moves the cylinders. When the cylinders reach the end of their stroke, the hydraulic pressure rises further. When the hydraulic pressure in the circuit becomes greater than the force of spring (4), it moves valve (5) to the left and the oil is drained to port (E). When the oil is drained to port (E), the oil flows through orifice (a), so the hydraulic pressure at port (B) becomes lower than the hydraulic pressure at port (A). Because of this difference in pressure, the main relief valve (9) moves to the left,

and is pushed against the seat (6). Almost all of the oil at port (A) is drained to the tank through port (C). The hydraulic pressure in the circuit does not rise any further, and the set pressure is maintained.

- The set pressure of the main relief valve is determined by the strength of spring (4). Therefore, the set pressure can be adjusted by turning pressure adjustment plug (1) to change the strength of spring (4).

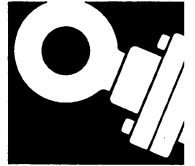
In addition, with the pilot type main relief valve, there is little difference between the pressure at which port (D) opens and the pressure at which port (C) opens (set pressure). This means that little oil escapes at below the set pressure, so the efficiency is high.



100F303A

HYDRAULIC SYSTEM

62 TESTING AND ADJUSTING



Standard for testing and adjusting	62-2
Measuring and adjusting work	
equipment oil pressure	62-4
Troubleshooting	62-5

2. Blade does not lift.

Ask the operator the following questions

- Didn't the blade move off suddenly?
→ Seizure and damage to various units.
- In this time, was an unusual noise produced?
(where did it emanate from?)
→ Damage to various units.
- Was the blade lifting speed slower than any speed has been obtained so far.
→ Wear of parts or flattening of spring.

Check before troubleshooting

- Is oil quantity in hydraulic tank proper?
- Are the travels of hydraulic control lever and control valve spool proper?

Cause								
a	b	c	d	e	f	g	h	i
Hydraulic pump			Hydraulic control valve			Hydraulic control valve to hydraulic cylinder		
No turning of pump. (PTO unit defective) Pump defective. Oil leakage from piping between pump and control valve. Drop of main relief valve setting pressure, blocked orifice a and valve defective. Suction valve on the raise side defective. Oil leakage from piping between control valve and lift cylinder head. Packing on the lift cylinder defective. Piston valve on the lift cylinder defective. Quick-drop valve defective.								

No.	Problems	Remedy	△	X	△	A	C	△	X	C	C
			X	X	X	X	X	X	X	X	X
1	The oil does not issue from the pressure take-off removed plug even if engine is cranking.		○								
2	Hydraulic pressure does not raise at engine full speed in blade lift raising circuit.			○	○			○		○	
3	Hydraulic pressure does not raise at engine full speed with tilting fully in blade lift raising circuit.			○	○					○	
4	Hydraulic pressure raises at item 3.							○		○	
5	The oil issues from cylinder without moving cylinder rod when the blade control lever is moved to RAISE position at engine low idling speed after removing the piping from lift cylinder bottom.									○	
6	There is not almost discharge of hydraulic pump with loading.		○	○							


- * In case of problems item 3 when no tilt cylinder machine, measure the hydraulic pressure with blocking the one side of lift cylinder circuit.
- * Causes item "g" to "i" for problems item 3 are applicable to no tilt cylinder machines. In this case, the damage of lift cylinder bottom is mostly considered as a same time.

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

DISMOUNTING HYDRAULIC CONTROL VALVE

1. Draining oil

-  Loosen oil filler cap to release pressure inside hydraulic tank.

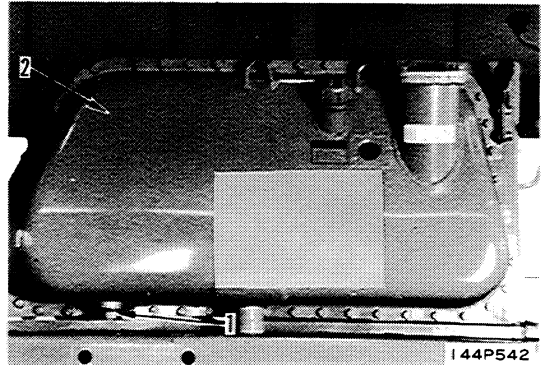
Remove drain plug (1) and drain oil from hydraulic tank.



Hydraulic tank: **Approx. 108 ℓ**

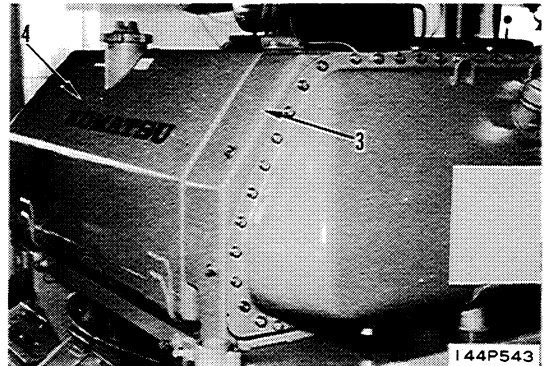
2. Hydraulic tank cover

Using guide bolt (Dia. = 10 mm, Pitch = 1.5 mm), remove hydraulic tank cover (2).



3. Fuel tank

Remove cover (3) and shift fuel tank (4) to the L.H. side.



4. Seat

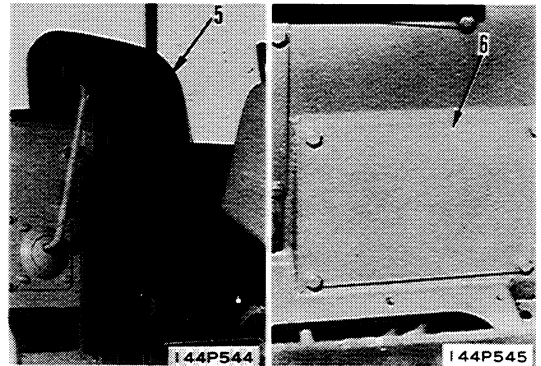
Lift off seat (5).



Seat: **45 kg**

5. Cover

Remove cover (6).

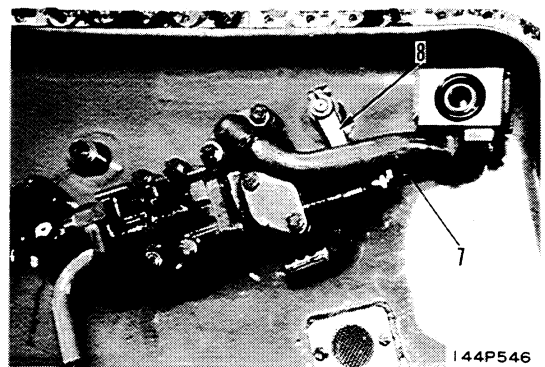


6. Return tube

Remove tube (7).


7. Control lever

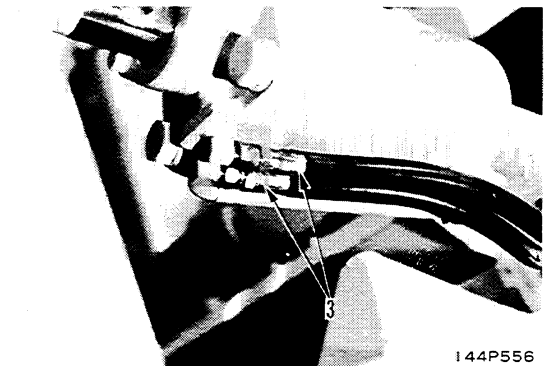
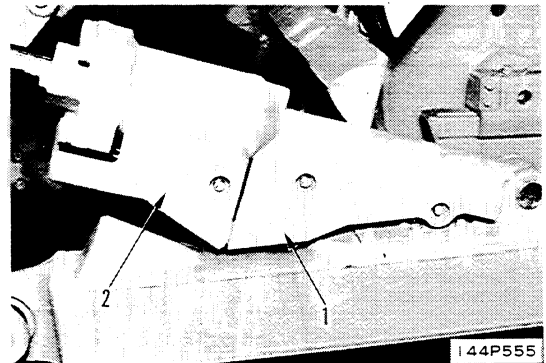
Disconnect control lever (8).



DISMOUNTING BLADE TILT CYLINDER

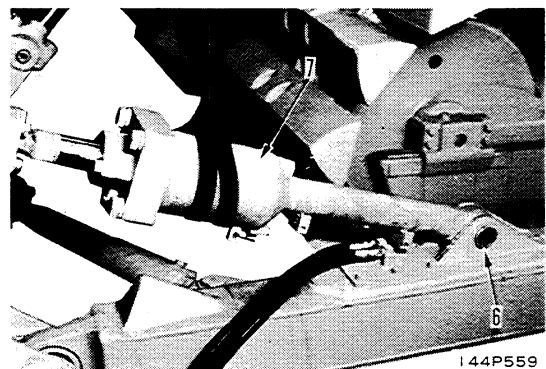
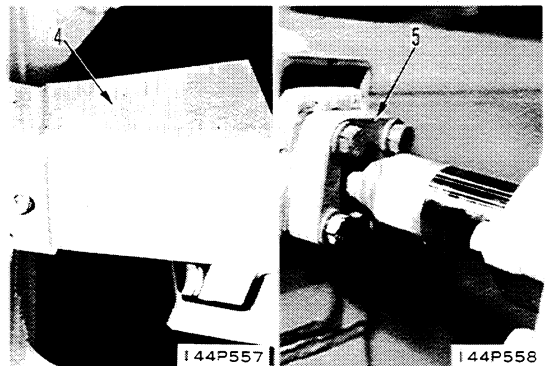
1. Lower work equipment completely to ground and stop engine. Operate control lever several times to release remaining pressure in hydraulic piping.
2. Remove covers (1) and (2).
 - ★ It is impossible to remove cover (2) unless the bolts on cover (1) are removed first.
3. Disconnect hoses (3).
4. Remove cover (4), sling cylinder assembly, and disconnect piston at rod end (5).
5. Pull out mounting pin (6) at bottom end, and remove tilt cylinder assembly (7).

 Tilt cylinder assembly: 90 kg

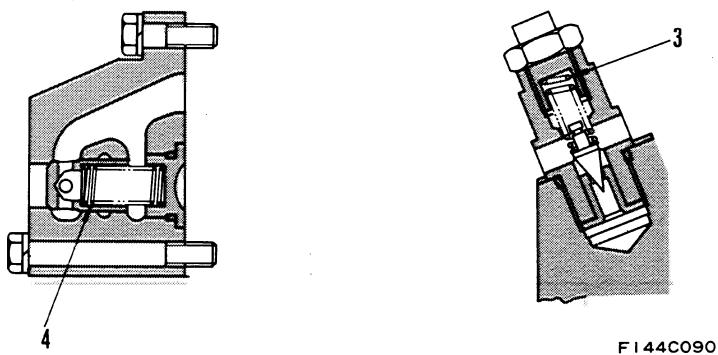
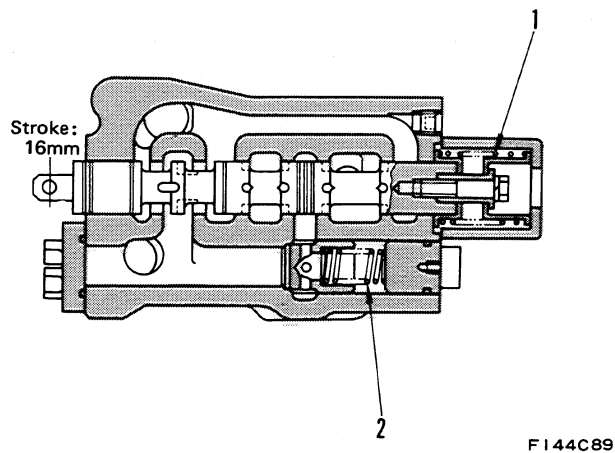


MOUNTING BLADE TILT CYLINDER

1. Sling tilt cylinder assembly (7), and install piston rod at rod end (5).
2. Install mounting pin (6) at bottom end.
 - ★ Bend cotter pin securely.
3. Connect hoses (3).
4. Install covers (4), (2) and (1).
 - ★ Temporarily fit cover (2) first, then cover (1), then tighten the bolts to fasten them together.



RIPPER CONTROL VALVE



Unit: mm

No.	Check item	Criteria					Remedy
		Standard size			Repair limit		
		Free length	Installed length	Installed load	Free length	Installed load	
1	Spool spring	120	65	13.7 kg	109.1	11 kg	Replace
2	Check valve spring	84.7	47.5	1.3 kg	—	—	
3	Safety valve spring	37.1	28.1	34.3 kg	—	—	
4	Ripper suction valve spring	74.5	47	0.83 kg	—	—	

FIXED MULTI-SHANK RIPPER

The upper and lower links (3), (7) are fastened by pins (A), (D) to the ripper bracket (1) which is mounted on the rear surface of the steering case by nuts. The beam (4) is attached to the tip of upper and lower links by pins (B), (C).

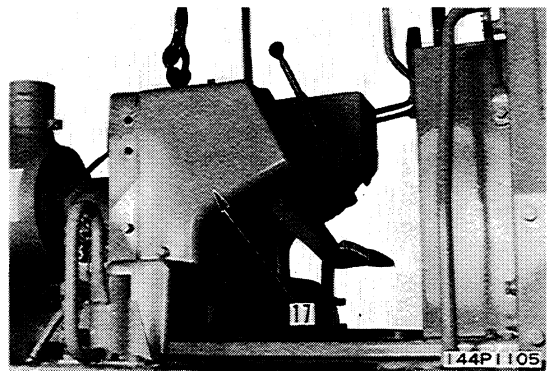
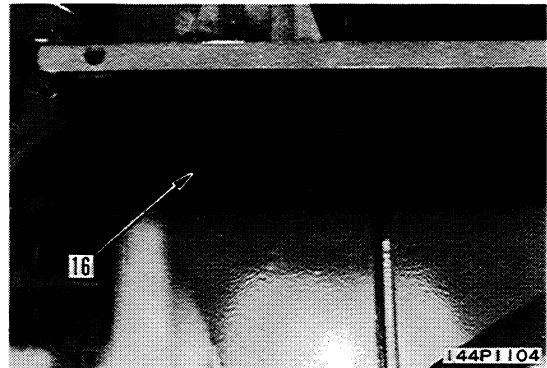
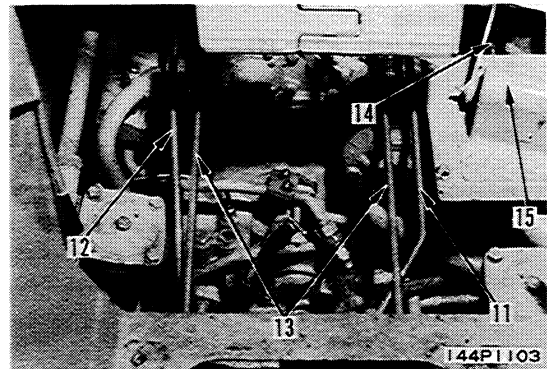
The shank (5) is mounted on the beam (4) by pin. Point (6) is mounted on shank by pin.

In the ripper cylinder used for raising and lowering

(digging) the shank, its bottom is fixed to the bracket (1) and the rod side is fixed to the beam (4). Point digging depth is obtained by converting ripper cylinder expansion and contraction operation into ripper point raising and lowering operation by using a four joints link mechanism (parallelogram which consists of pins (A), (B), (C) and (D)).

MOUNTING DASHBOARD ASSEMBLY

1. Using 2 eye bolts (Dia. = 12 mm, Pitch = 1.75 mm), raise dashboard assembly (7), and install.
 - ★ Insert the fuel control rod and dust indicator hose when installing the dashboard assembly.
2. Tighten left and right mounting bolts (16).
3. Connect rod (14), then install decelerator pedal (15).
 - ★ Bend cotter pin securely.
4. Install brake rod (13), and steering rods (12) and (11), then install floor plate.
 - ★ Bend cotter pin securely.
5. Raise operator's seat assembly and install.
6. Connect wires (10) and (9) of starting motor.
7. Connect main wiring (8), then tighten ground connection (7) with clamp.
8. Connect wiring (6), then secure with clamp.
9. Connect dust indicator hose (5).
10. Connect fuel control rod (4).
 - ★ Bend cotter pin securely.
11. Raise hood (3) and install, then install cap (2) and exhaust pipe (1).
12. Install left and right engine side covers.
13. Connect lead to negative (-) terminal of battery.



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