Service Manual

JS110
JS130
JS150LC

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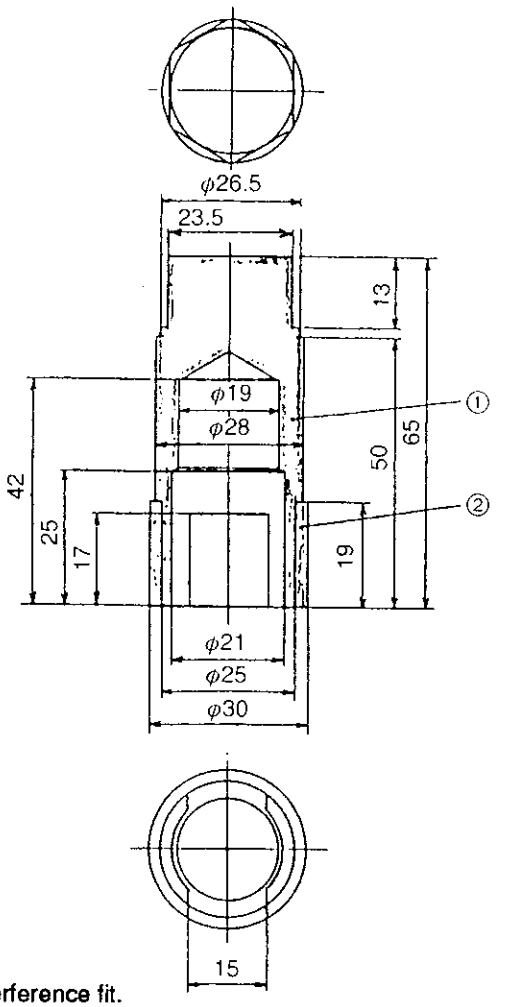
Service Tools (continued)

SECTION E - HYDRAULICS

Servo Hand Control Valve - JS 110, 130 and 150LC



Joint Removal Tool

Items 1 and 2 are assembled with an interference fit.

In this publication and on the machine, there are safety notices. Each notice starts with a signal word. The signal word meanings are given below.

⚠ DANGER

Denotes an extreme hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.

INT-1-2-1

⚠ WARNING

Denotes a hazard exists. If proper precautions are not taken, the operator (or others) could be killed or seriously injured.

INT-1-2-2

⚠ CAUTION

Denotes a reminder of safety practices. Failure to follow these safety practices could result in injury to the operator (or others) and possible damage to the machine.

INT-1-2-3

General Notes

For the type of grease to use at each point, see ***Lubricants and Capacities.***

Do not mix different types of grease. Keep them separate.

⚠ WARNING

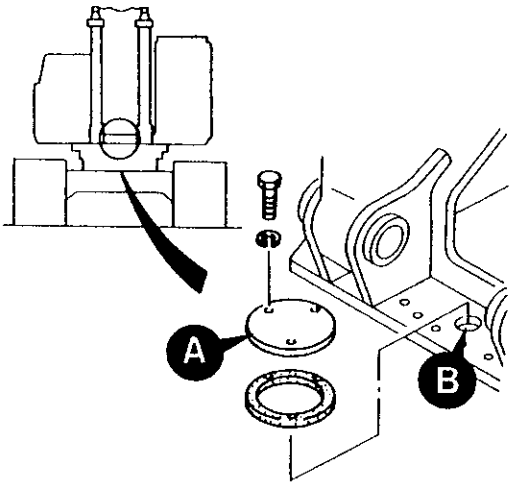
You will be working close into the machine for these jobs. Lower the attachments if possible. Remove the starter key and disconnect the battery. This will prevent the engine being started.

8-3-1-3

Swing Ring Teeth and Swing Pinion

Ensure swing ring is kept full of grease. Always grease whenever the machine has been steam-cleaned.

For location of the swing ring gear refer to ***Component Location Diagrams*** at the end of this section.



1 **Make the Machine Safe**

Stop the engine and remove the starter key.

2 **Grease the Swing Ring**

a Remove the cover **A**.

b Apply grease to the slew ring via aperture **B**.

3 **Swing the Machine**

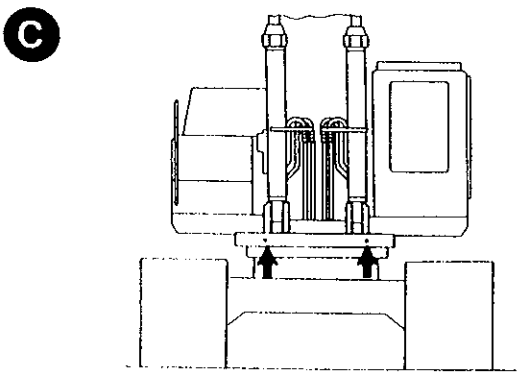
Start the engine and swing the machine a few degrees. Stop the engine, remove the starter key and apply grease again.

Repeat until the whole ring is greased. Check that grease exudes around the entire circumference.

4 **Refit the Cover**

Swing Ring Bearing

The three grease nipples are situated around the turntable circumference. Two of the nipples are indicated **C**, with the third on the opposite side.



Checking/Adjusting the Track Tension

1 Position the machine on firm and level ground.

⚠ WARNING

NEVER position yourself or any part of your body under a raised machine which is not properly supported. If the machine moves unexpectedly you could become trapped and suffer serious injury or be killed.
INT-3-3-7

2 a Raise the track to be measured off the ground. Block the undercarriage.

b Rotate the track in forward direction only to ensure that the track is able to rotate freely.

c Stop the engine and remove the key.

3 Measure dimension **A**, between track plate and undercarriage.

Note: See the table on the following page for the correct values for dimension **A** and the position at which the measurement must be taken. (The position will vary between models).

4 If the chain is too tight, release a small amount of grease from the tension unit, by loosening the check valve **B** on the tensioner.

Note: A maximum of 3 turns of the check valve should be sufficient.

⚠ WARNING

When opening the check valve always stand to one side and loosen a little at a time until grease starts to come out. If you over-loosen too much grease could spurt out or the valve cover fly out and cause serious injury.
8-3-4-5

⚠ WARNING

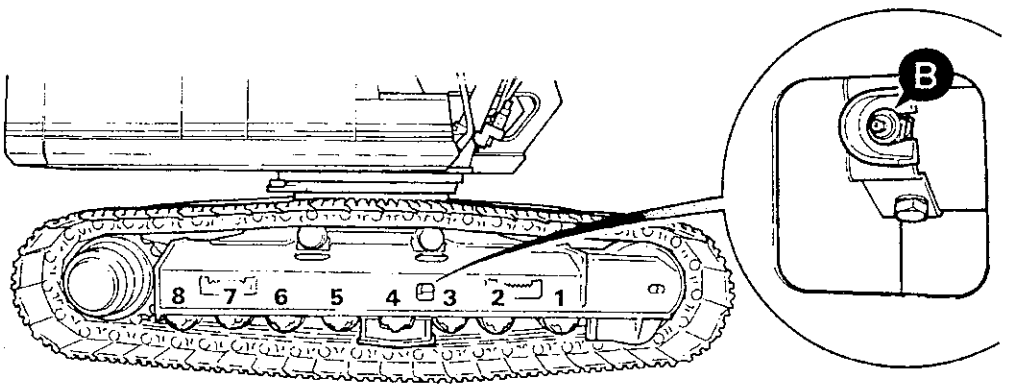
Under no circumstances must the check valve be dismantled or any attempt made to remove the grease nipple from the check valve.
8-3-4-9

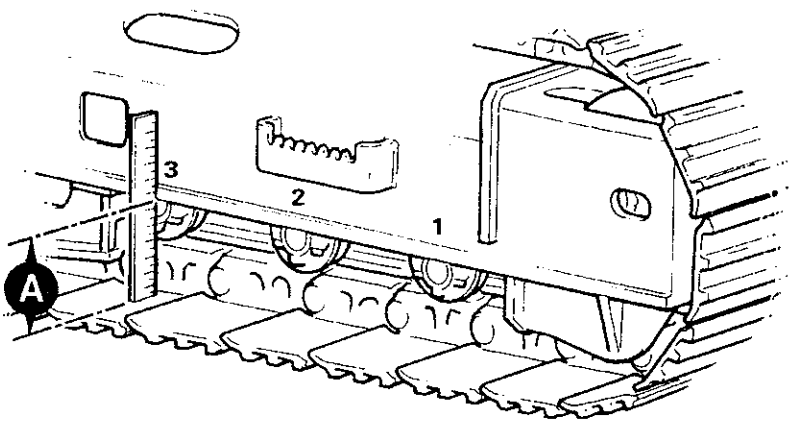
5 If the chain is too slack, pump grease into the tensioner.

6 Remove the blocks from beneath the undercarriage and lower the track to the ground using the boom and dipper controls.

7 Repeat the procedures for the other track.

Note: The machine shown is typical. The track rollers must be counted from the front, i.e. the idler end. The example shows the measurement taken at track roller number 3.



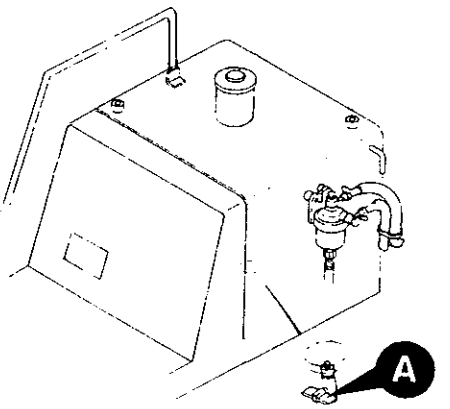


Draining Fuel Tank Impurities

Stop the engine and remove the key.

Loosen the drain tap **A** on the underside of the fuel tank. Drain the water and deposits until clean diesel oil flows out.

Close the drain tap firmly.



⚠ WARNING

Fuel oil is highly inflammable. Completely wipe off any spilt fuel which could cause a fire.

8-3-4-3

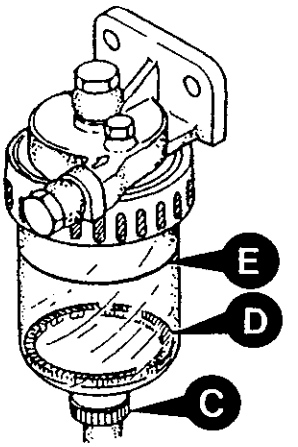
Draining the Water Separator

The water separator should be drained at least every 50 hours, but more often if necessary.

Stop the engine and remove the key.

Open the drain plug **C** to release the accumulated water in the bowl.

Under no circumstances should the float **D** be allowed to rise above the red line **E** or water could get taken further into the system with serious consequences.



Technical Data - Electrics JS 110, 130, 150LC

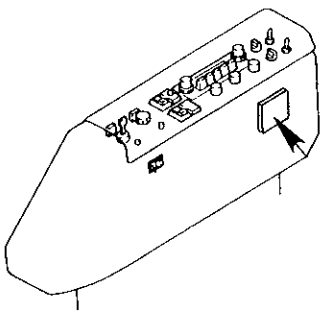
System	24 Volt, negative earth
Battery	2 x 12 Volt Heavy Duty, 120Ah
Alternator	24 Volt, 40 Amp
Starter Motor	24 Volt, 3.5 or 4.5 kW, 30 secs.

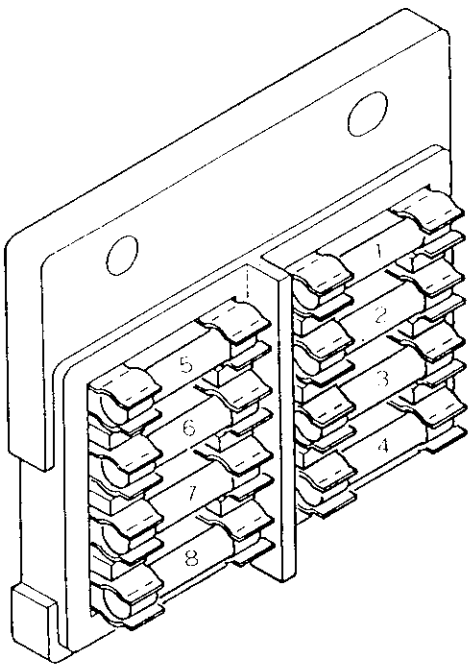
Light Bulbs

Working, Boom Mounted	70 Watt
Working, Tank Mounted	70 Watt
Cab	10 Watt x 2
Engine Compartment	10 Watt

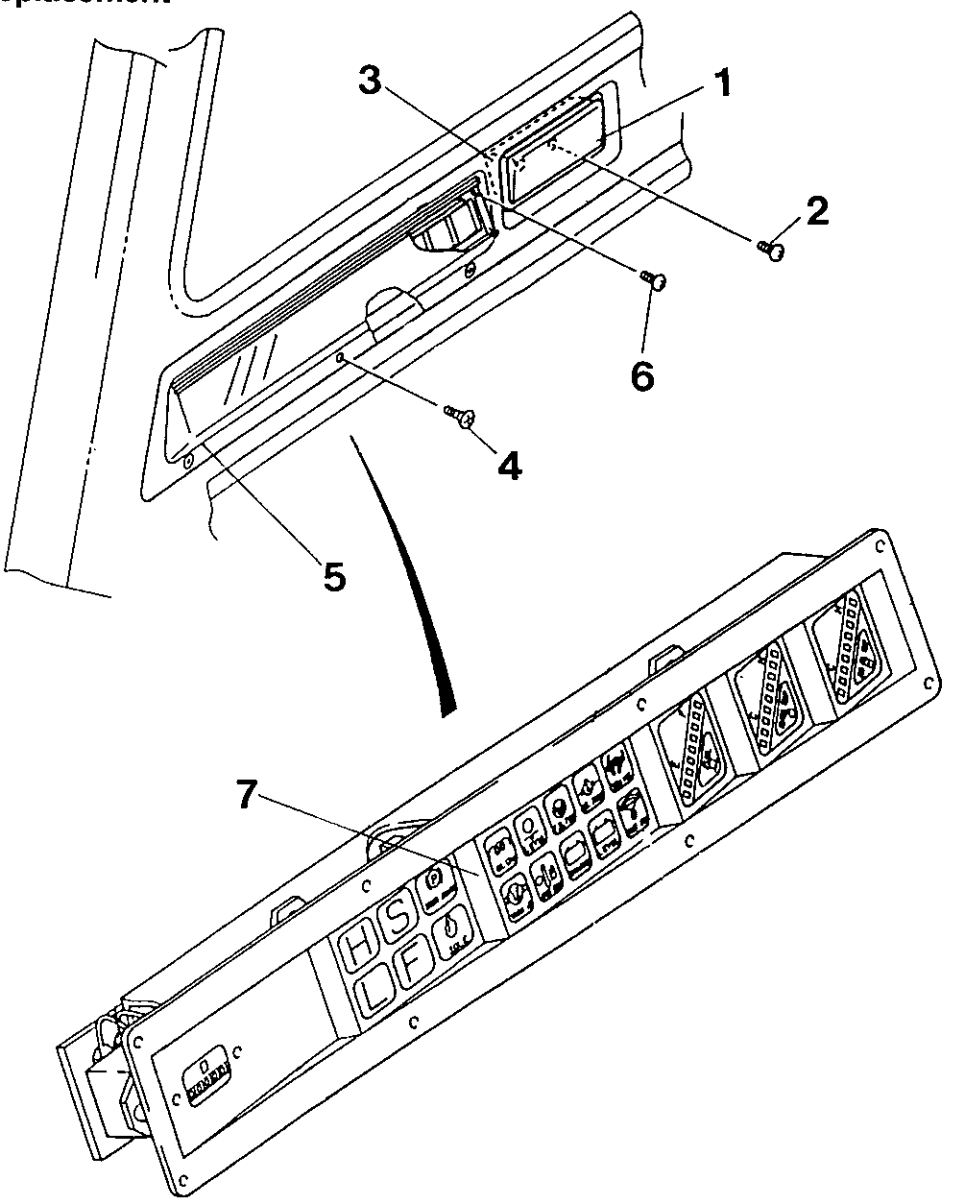
Circuit Protection

Circuits	Rating (Amps)	Fuse No.
Controller	10	1
Electric Control	15	2
Horn/Working Light	15	3
Windscreen Wiper	15	4
Cab Light/Radio	10	5
Oil Pressure	10	6
Heater/Cooler (Optional)	15	7
Spare	15	8





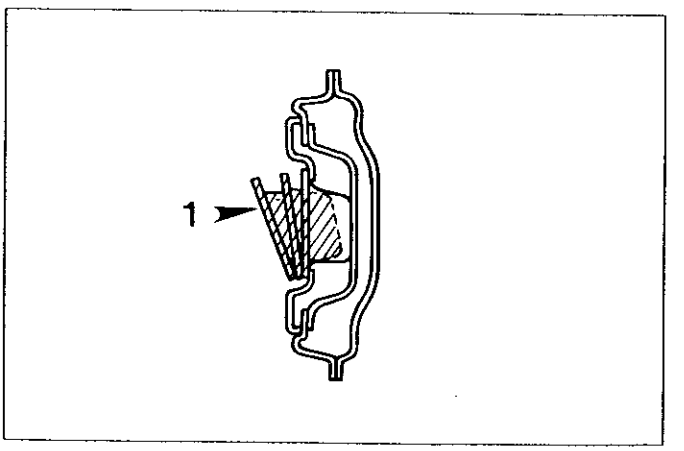
Removal and Replacement



Removal

Before removing the Systems Control Monitor, remove the starter key from the starter switch.

1. Remove the ash tray 1.



Technical Data - JS 110

Pump

Type	Variable displacement, two element piston pump in tandem. Integral gear servo pump.

*Control Valve

Manufactured in two halves and bolted together.

Left Hand Valve	Servo actuation of bucket, boom and right track (from Serial No 697014 on).†
Right Hand Valve	Servo actuation of dipper, swing and left track (from Serial No 697014 on).†

† Mechanical track actuation on earlier Serial Nos.

* Pressures

(All pressure checks should be undertaken at maximum speed in the 'S' mode with the hydraulic fluid at 50° C ± 5° (3 to 4 LED's illuminated).

	bar	kgf/cm²	lbf/in²
Servo	39 + 5/ - 0	40 + 5/ - 0	570 + 72.5/ - 0
Main Relief Valve (M.R.V.)	294 ± 5	300 ± 5	4270 ± 72.5
Control Valve MountedAuxiliary Relief Valves (ARV's)			
Boom Raise (Head Side)	245 ± 5	250 ± 5	3555 ± 72.5
Boom Lower (Rod Side)	206 ± 5	210 ± 5	2985 ± 72.5
Bucket Open (Rod Side)	255 ± 5	260 ± 5	3700 ± 72.5
Bucket Close (Head Side)	255 ± 5	260 ± 5	3700 ± 72.5
Dipper In (Head Side)	255 ± 5	260 ± 5	3700 ± 72.5
Dipper Out (Rod Side)	255 ± 5	260 ± 5	3700 ± 72.5
Component Mounted Relief Valves			
Swing Cross Line Relief Valves	211 ± 5	215 ± 5	3057 ± 72.5
Track Cross Line Relief Valves	323 ± 5	330 ± 5	4700 ± 72.5

Rams

	Bore	Rod Dia.	Stroke
Boom (2 off)	100mm (3.9in.)	65mm (2.6in.)	1043mm (41.1in.)
Dipper	110mm (4.3in.)	75mm (3.0in.)	1282mm (50.5in.)
Bucket	100mm (3.9in.)	65mm (2.6in.)	890mm (35.0in.)

* Motors

Track	Variable displacement, axial piston motor
Swing	Fixed displacement, axial piston motor

Schematic Hydraulic Circuit JS 150LC (from Machine No. 701045)

Component Key

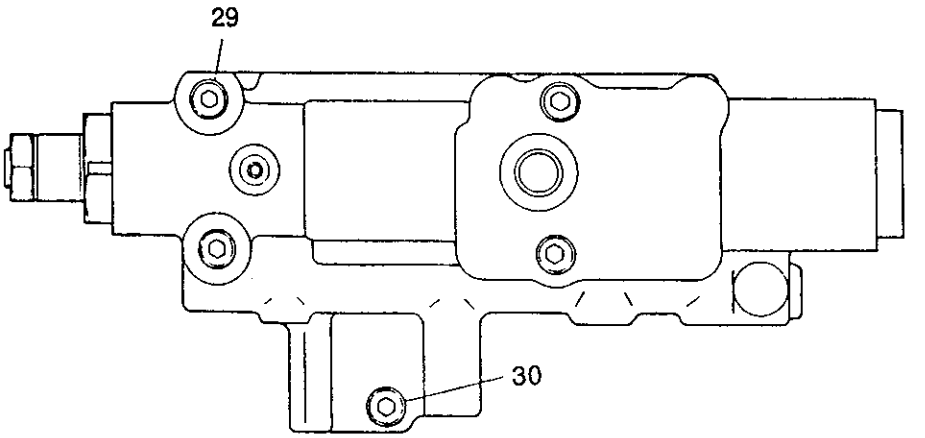
P1 Front Pump Element
P2 Rear Pump Element
P3 Servo Pump
M Engine
1 Swing Park Brake Solenoid Valve
2 Shuttle Valve
3 Swing Motor
3A Cross Line Relief Valves
4 Dipper Ram
5 Dipper Hose Burst Check Valve
6 Track Motor LH
6A Counterbalance Spool
6B Brake Release Piston
6C Brake Release Valve
6D Cross Line Relief Valve
6E Speed Selection Spool
6F Speed Actuator
7 Rotary Coupling
8 Track Motor RH
9 Bucket Ram
10 Boom Rams
11 Boom Hose Burst Check Valves
12 Control Valve
12A Main Relief Valve
12B Track Spools
12C Boom Spool
12D Bucket Spool
12E Dipper Boost Spool
12F Dipper Spool
12G Swing Spool
12H Boom Boost Spool
12J Straight Ahead Track Valve
12K Boom Rod Side ARV
12L Boom Head Side ARV
12M Bucket Rod Side ARV
12N Bucket Head Side ARV
12O Dipper Rod Side ARV
12P Dipper Head Side ARV
12R Swing Left ARV
12S Swing Right ARV
12T Negative Control Pressure Relief Valves
12U Swing Priority Valve
13 Swing Brake Release Pressure Switch
14 Cooler
15 Cooler Check Valve (0.49 bar, 7.1 lb in^2)
16 Breather
17 Cooler Check Valve (3.4 bar, 49.8 lb in^2)
18 Return Filter (10µ)
19 Filter By-pass Relief Valve (0.98 bar, 14.2 lb in^2)
20 Suction Strainer (150 µ)
21 Hydraulic Tank
22 Drain Line Filter (10µ)
22A Filter By-pass Relief Valve (0.6 bar/8.5 lb in^2)
23 Servo Hand Control Valve LH
24 Servo Hand Control Valve RH
25 Warm Up Filter (100 x 800 Mesh)
26 Warm Up Restrictor
27 Cushion Valve Solenoid
28 Cushion Valve
29 Servo/Drain Manifold
30 Accumulator
31 Servo Isolator Solenoid Valve
32 Check Valve (0.4 bar/5.7 lb in^2)
33 Servo Filter (10µ)
33A Filter By-pass Relief Valve (1.03 bar/14.9 lb in^2)
34 Auxiliary Control Valve
34A Auxiliary Services ARV's
34B Auxiliary Control Valve MRV
35 Hydraulic Pump
35A Proportional Solenoid Valve
35B Swing Pump Control
35C Summator Assembly
35D Pump Control Spool
35E Pump Control Actuators
36 Servo Pump Relief Valve
37 Speed Change Solenoid
38 Servo Track Control RH
39 Servo Track Control LH
40 Servo/Drain Manifold

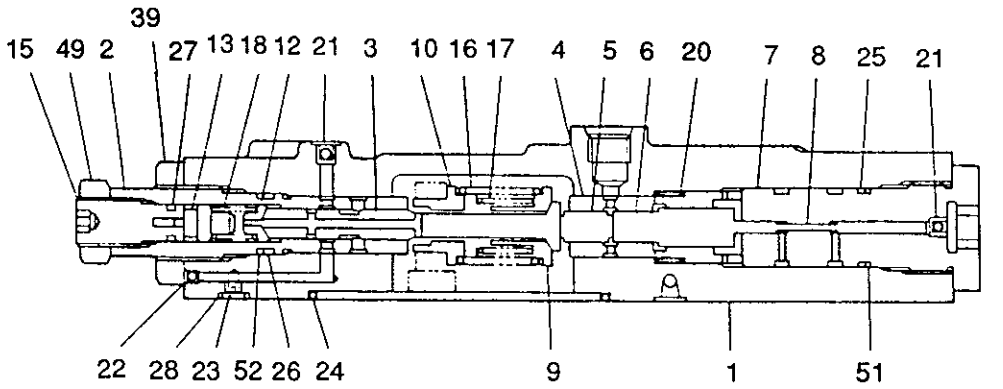
Note: To aid the clarity of the diagram, some servo lines have been omitted. To assist in tracing these lines, an identification letter has been included where the line terminates, e.g. **f**. The component to which the line connects has been added after the letter, e.g. **f(12)**. Therefore, reference **f(12)** means that the line connects to line f on component **12**, the control valve.

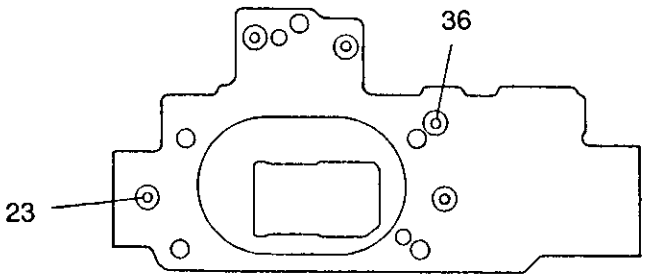
JS 150LC (cont'd)

SYMPTOM	POSSIBLE CAUSE	ACTION
5. Swing Motor (cont'd)		
d. (cont'd)	3. The relief valve plunger seat is defective.	Dismantle and inspect the relief valve, as detailed on page 36-5, paying particular attention to the valve seat. Renew the seat if damage is found.
e. Oil leak at the oil seal.	1. Damage or wear to oil seal lip.	* Renew oil seal, as detailed on pages 36-1 to 36-4.
	2. The shaft is damaged or worn.	*Renew shaft and oil seal, as detailed on pages 36-1 to 36-4.
	3. Abnormal pressure in the casing.	Check drain line for damage or blocking. Clear or renew drain pipe.
f. Oil leaks from mating face.	1. 'O' ring damaged or missing.	*Dismantle and inspect, as detailed on pages 36-1 to 36-4, and renew 'O' rings.
	2. The seal face is damaged.	*Dismantle and inspect, as detailed on pages 36-1 to 36-4, and repair as necessary.
	3. Bolts are loose.	Check bolts and torque tighten to specified torque.
6. Hand Control Valves		
a. Low pressure from hand control to main control valve spool.	1. Servo pressure is low.	*Check servo pressure as detailed on page 10-6 and adjust as necessary.
	2. Spring **241** is damaged.	Renew spring.
	3. The clearance between the spools and casing is too large.	Renew spool and casing assembly
	4. The handle unit is loose.	Renew the handle unit.
b. Unstable pressure from hand control to main control valve spool.	1. Sliding parts are sticking.	*Dismantle and inspect as detailed on pages 40-1 to 40-10. Repair or renew as necessary.
	2. Air is trapped in the pipes.	Operate the valve several times to remove the air.
c. High pressure from hand control to main control valve spool.	1. Sliding parts are sticking.	*Dismantle and inspect as detailed on pages 40-1 to 40-10. Repair or renew as necessary.

Front Regulator

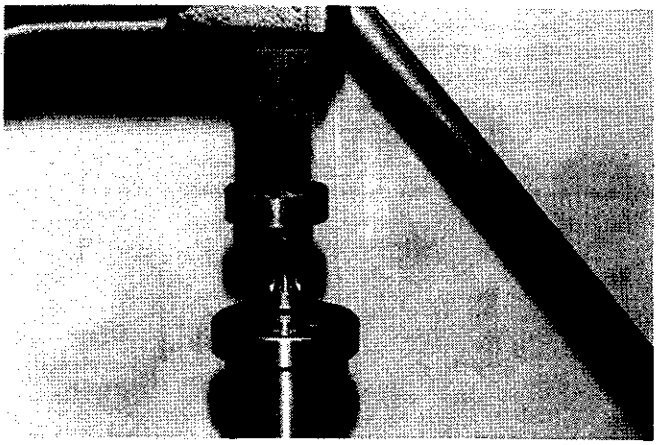






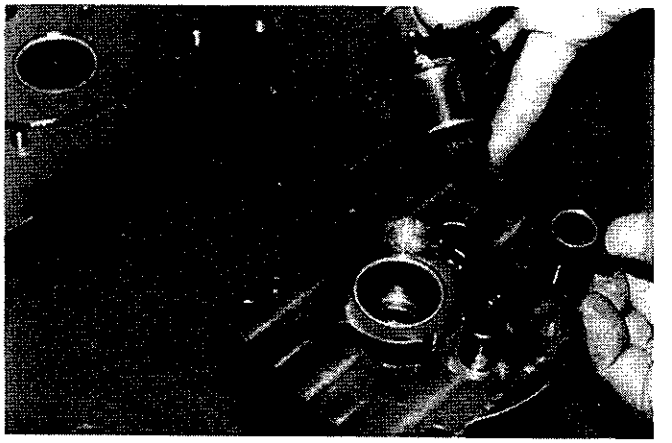
Dismantling - JS 110, 130, 150LC (cont'd)

32. Remove snap ring **P49** and spacer **P26**. Using a press and jig, remove bearing **P15**, noting the positions of all components as an aid to assembly.



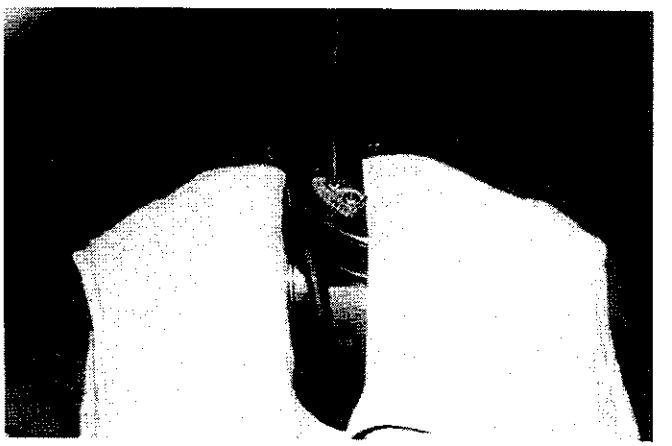
33. Remove servo pump case **P36** and servo pump cover **P 35**. Remove coupling **P39 (JS 110, 130 only)**, drive gear **P37**, driven gear **P38** and washer **P44 (JS 110, 130 only)**.

Note: Gear shaft **P40** is lightly press fitted into pump casing **P 36**, and key **P41 (JS 110, 130 only)** is lightly press fitted into coupling **P39 (JS 110, 130 only)**. If there is no fault in this area do not dismantle them. In addition, if there is no reason to remove bushes **P42** and **P43** leave then in place.



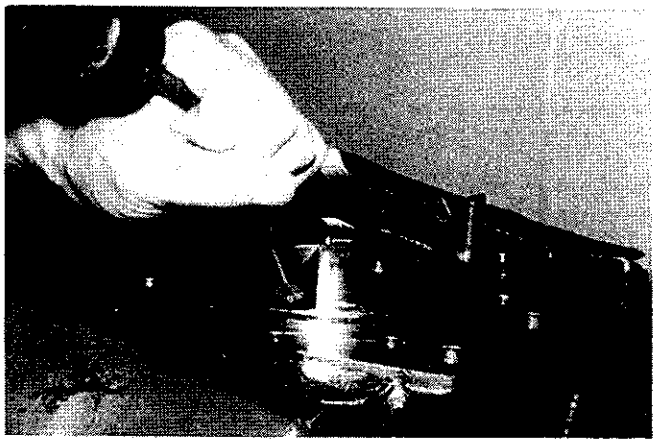
34. Remove screw **P73** and remove swash plate gear **P72** from swash plate **P10**.

Note: The swash pate gear **P72** is adjusted so that its engagement with guide gear **P71** is correct and fastened in place using Loctite. As long as there are no faults in this area, such as teeth wear, do not attempt to dismantle it.



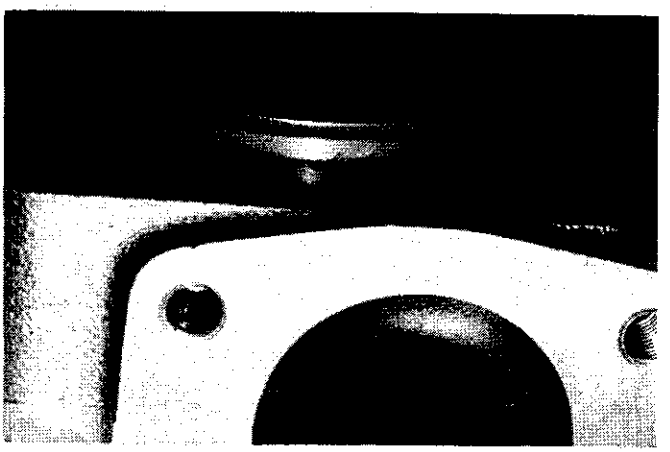
35. Remove guide gear assembly **P71** from flange **P4** and rear cover **P5**.

Note: If there is no fault with the swash plate gear (see step 34) do not dismantle the guide gear assembly.



Assembly - JS 110, 130, 150LC (cont'd)

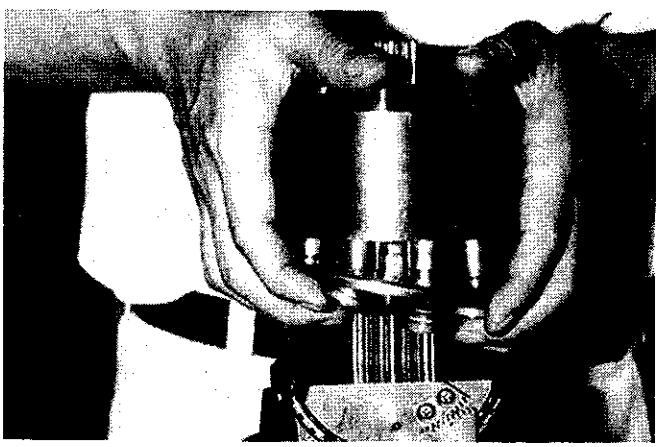
15. Mount pins **P46** and collars **P18** on both sides of port block **P3**. Apply a thin film of grease to the rear surfaces of valve plates **P11** and **P12** and fit them in position.



16. Fit belville spring assembly **P22** and spring seat **P23** in the retainer holder **P14** in the positions from which they were removed. Mount the retainer holder onto cylinder block assembly **P6**.

17. Lift retainer plate **P13** into position above cylinder block assembly **P6**. Apply clean hydraulic fluid to the cylinder block piston bores and insert piston assemblies **P9**, one at a time, in the positions from which they were removed.

18. Apply clean hydraulic fluid to the sliding face of swash plates **P10**. Fit the rotating groups assembled in step 17 to shafts **P7** and **P8** and lower onto swash plates **P10**, taking care to prevent piston assemblies **P9** from falling out of cylinder blocks **P6**. Fit front valve plate **P11** and rear valve plate **P12** onto their respective cylinder block assemblies. Ensure that each valve plate is fitted to the correct position as each cylinder block is machined to fit the respective valve plate.



Checks After Installation JS 110, 130, 150 LC

After the pump has been fitted to the engine, the following procedure must be carried out.

* 1. Remove pump drain port **A** and loosen air bleed plug **B**.

2. Fill the pump casing with clean hydraulic fluid (approximately 2litres).

3. Bleed air from hydraulic piping.

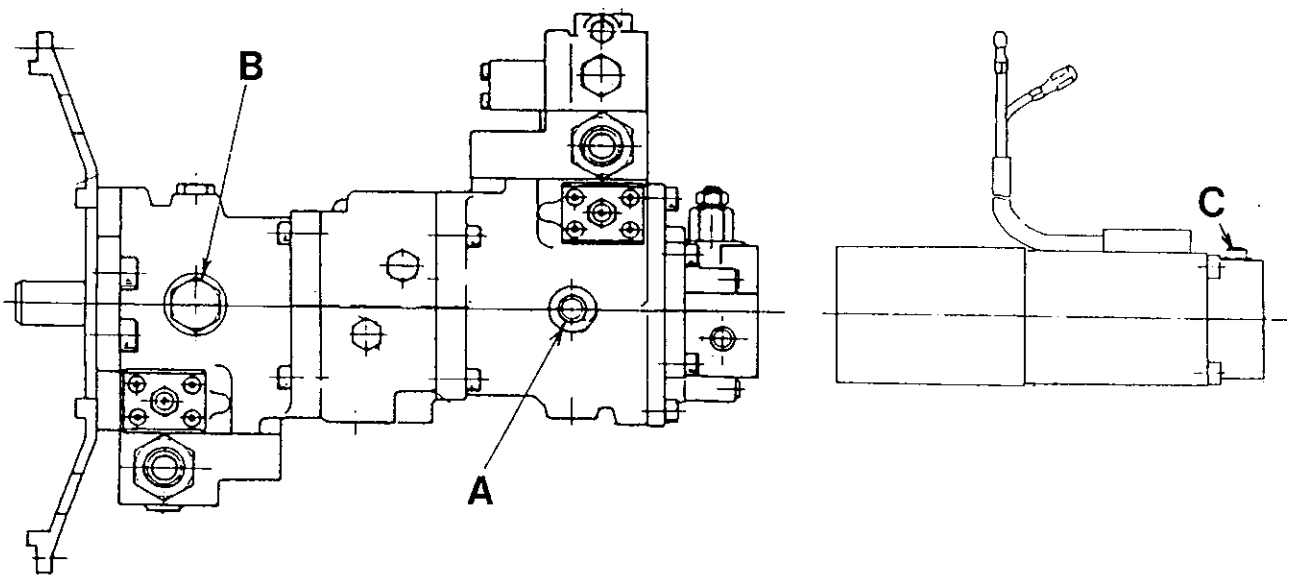
* 4. Fit and tighten the drain and air bleed plugs **A** and **B**.

* 5. Start the engine and run at a slow speed. Check the pump for abnormal noises which could signify air trapped in the pump. If the pump is noisy, stop the engine, vent the hydraulic pressure and loosen the air bleed plug **B**. When satisfactory, tighten the plug, restart the engine and check for abnormal noises.

6. When satisfactory, gradually increase engine speed until the machine operating range is reached.

7. Operate each service several times with a light load. Check for leaks. If satisfactory, operate each service with a greater load. If satisfactory, operate each service under normal working loads.

* 8. For stable control of the Solenoid Proportional Pressure Control valve, it is necessary to bleed air from the valve by loosening bleed screw **C**. When all air has vented, torque tighten the screw to 0.15 - 0.245 Nm (0.11 - 1.8 lbf ft).



Bucket Side Control Valve (4 Spool Valve)

Dismantling

Note: To aid reassembly, all items should be labelled during dismantling.

1. Remove bolts **21** and cap **19**. Remove 'O' ring **20** from the cap and discard.
2. Withdraw spools **12**, **13** and **14** from the valve housing as a sub-assembly.
3. The threads of each spool are coated with adhesive, to remove the cap screw, heat each spool to 200 to 250°C (392 to 482F) and immediately remove cap screw **18**. Remove spring seat **16** and spring **17**. To prevent damage to the outer surface of the spools, set the spool between wooden spool clamps, see **X**, and clamp in a vice.
4. Remove bolts **10** and cap **9**. Withdraw spool **11** from the valve housing as a sub- assembly.
5. Remove spring side seal **2**, wiper **3** and seal plate **4** from the spool. Heat the threaded portion of spool **11**, remove cap screw **8** and dismantle spring seat **5**, spring **7** and spacer **6**.
6. Heat spool head **15**, as detailed in **3** above, and dismantle it.
7. Remove bolt and cap **22** from the opposite side of the valve housing.
8. Remove plug **25** and withdraw poppet **23** and spring **24** from the valve housing.
9. Remove check valve **35** and withdraw poppet **33** and spring **34** from the valve housing (JS 150 only).

Note: For the JS 110/130, check valve **35**, spring **34** and poppet **33** are replaced by plug **25**, spring **24** and poppet **23**.

10. Remove relief valves **30** and **31** from the valve housing.
11. Remove relief valve **32** from the valve housing. As the plug in the front end of the relief valve is removed during disassembly, ensure that the plug and poppet do not remain inside the valve housing after disassembly.

* **Note:** For Disassembly/Assembly of relief valves, refer to page 26-1 of this Section.

12. Disassemble plug assembly **27** and remove it from the valve housing. As this pulg is blind, do not dismantle unless it is defective.

Cleaning and Inspection

1. Clean all disassembled parts in clean mineral oil and dry using compressed air.
2. Check the surfaces of all parts for burrs, scratches and other defects.
3. Check the seating surface of each valve housing for pitting and scratches. Remove all small flaws by rubbing with polishing powder. Ensure that all polishing powder has been removed after polishing.
4. Check the outside surfaces of all spools for scratches, dents and other flaws. Use an oil stone or cloth, dipped in a polishing solution to remove small flaws.
5. All sliding and engaging parts should slide smoothly and freely. Check that each channel or groove is free from dirt and dust.
6. Replace all broken, damaged, deformed or worn springs.

Assembly

Note: Hydraulic fluid should be applied to all screw threads unless otherwise stated.

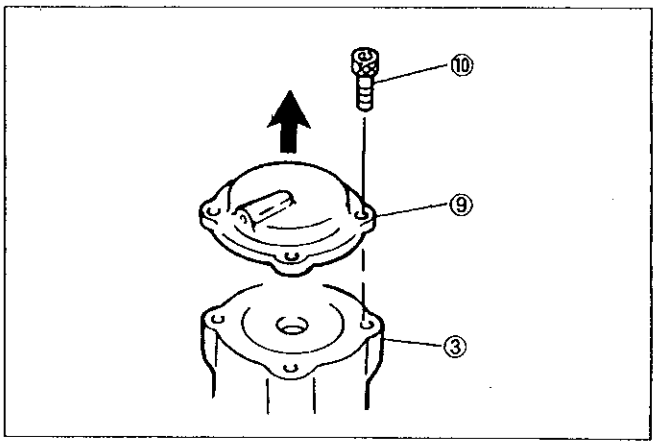
1. Fit new 'O' rings to components during assembly.
2. Apply adhesive and hardening accelerator to the threads of cap screw **18**. Fit spring seat **16** and spring **17** in place and fit the screw into spool **12**. Torque tighten to 9.8 to 11.8 Nm (7.2 to 8.7 lbf. ft.). Care must be taken not to overtorque the screw as deformation of the spool could occur, leading to faulty operation.
3. Repeat item **2** for spools **13** and **14** and fit spring seat **16**, spring **17** and cap screw **18** to each spool.
4. Apply adhesive to the threads of spool head **15** and fit it to spool **11** (into the larger diameter end). Torque tighten to 10 to 12 Nm (7.2 to 8.7 lbf. ft.).
5. Fit seal **2**, wiper **3** and seal plate **4** on the opposite side. Fit spring seat **5**, spacer **6** and spring **7**. Apply adhesive to the threads of cap screw **8** and fit the cap screw into spool **11**. Torque tighten to 10 to 12 Nm (7.2 to 8.7 lbf. ft.).
6. Fit each spool assembly into the valve housing in the position from which it was removed.
7. Fit 'O' ring **20** into cap **19**. Fit the cap in the valve housing using bolts **21**. Torque tighten to 19.7 to 24.5 Nm (14.5 to 18.1 lbf. ft.).
8. Fit cap **9** and secure with bolts **10**. Torque tighten to 9.8 to 11.8 Nm (7.2 to 8.7 lbf. ft.).

Dismantling - JS 110, 130, 150LC

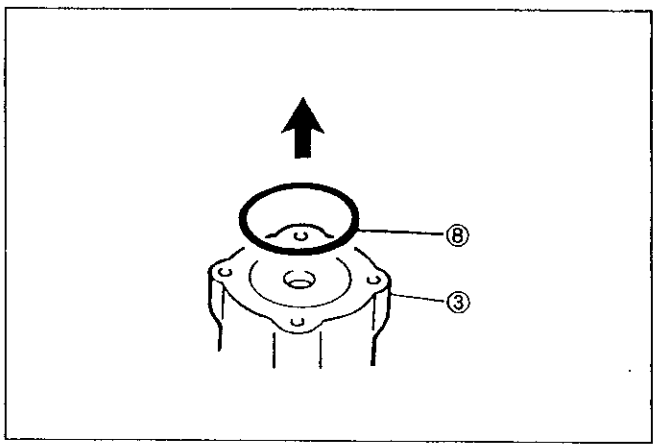
Refer to the sectional illustration on page E/30-1 as a guide to dismantling and assembly.

Details of service tools used in the dismantling and assembly procedures are given in Section 1, Service Tools.

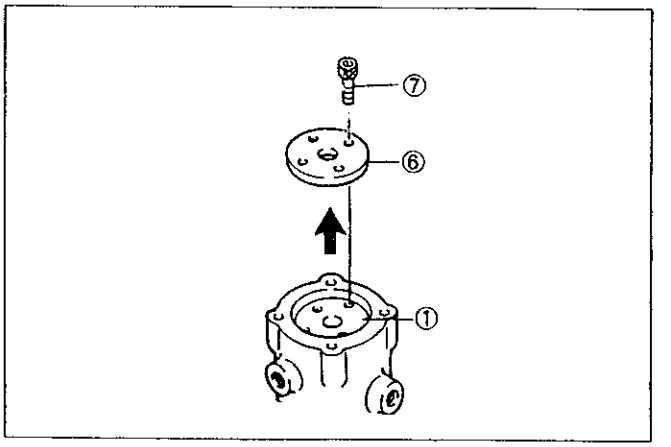
1 Remove socket head bolts **10** and then cover **9**.



2 Remove and discard O-ring **8**.

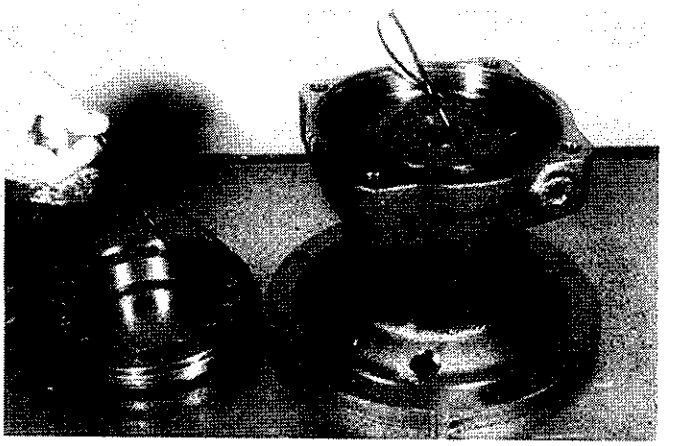


3 Remove socket head bolts **7** and then thrust plate **6**.

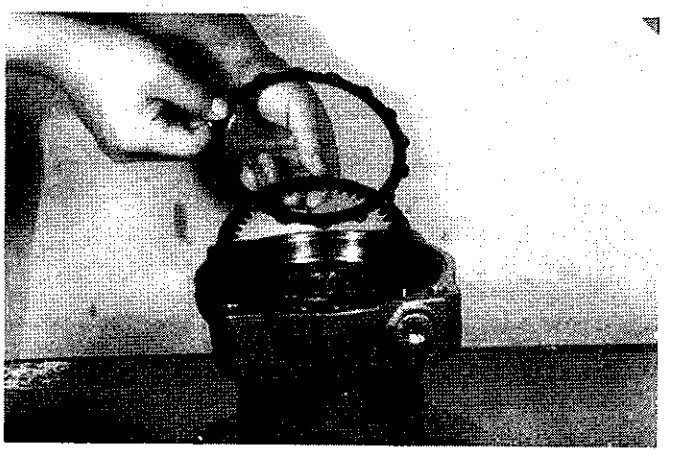


Dismantling - JS 110, 130 (cont'd)

16. Remove 'O' ring **10** from housing **24** and 'O' ring **12** from piston **11**.



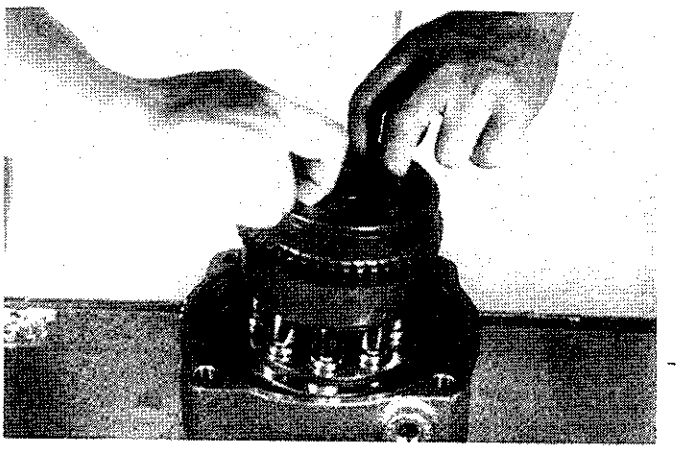
17. Remove friction plate **9** and mating plate **8**.



18. Hold the end of cylinder **23** and pull the cylinder assembly out of housing **24**.

Note 1: The end face of cylinder **23** is a sliding contact face and should be protected to prevent damage.

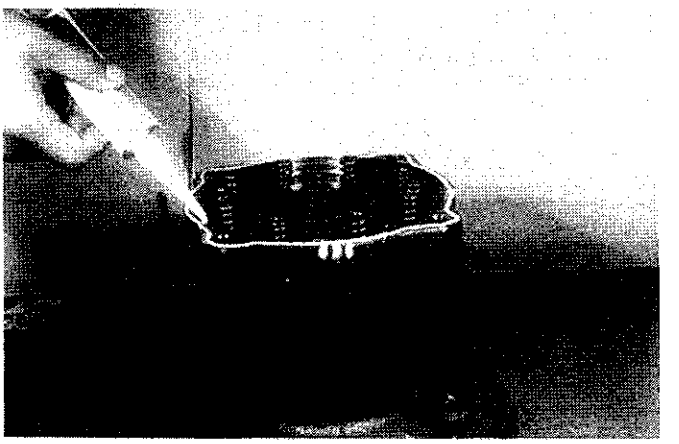
Note 2: Make alignment marks or write numbers on the piston bores and piston assemblies to ensure that the piston assemblies are replaced in the same bores during assembly.



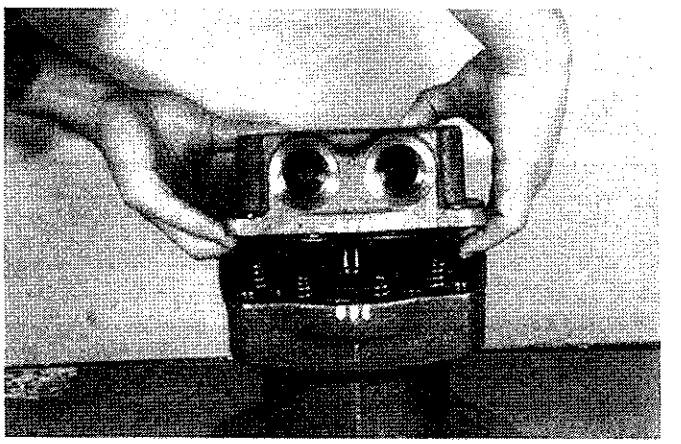
19. Remove the outer ring of taper roller **3** from the housing.

Assembly - JS 110, 130 (cont'd)

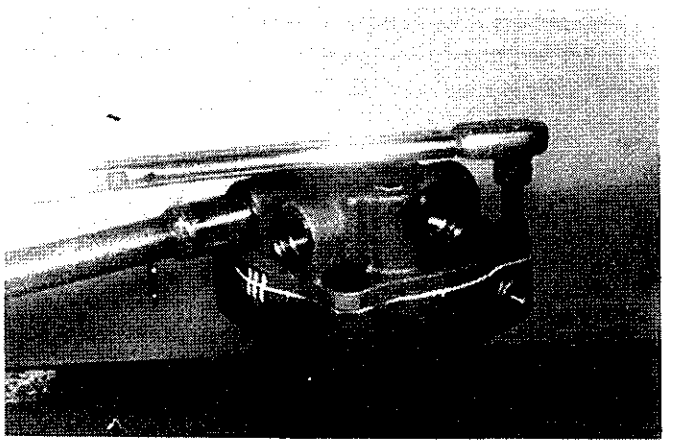
21. Apply JCB Multi-Gasket to the mating face of housing **24**.



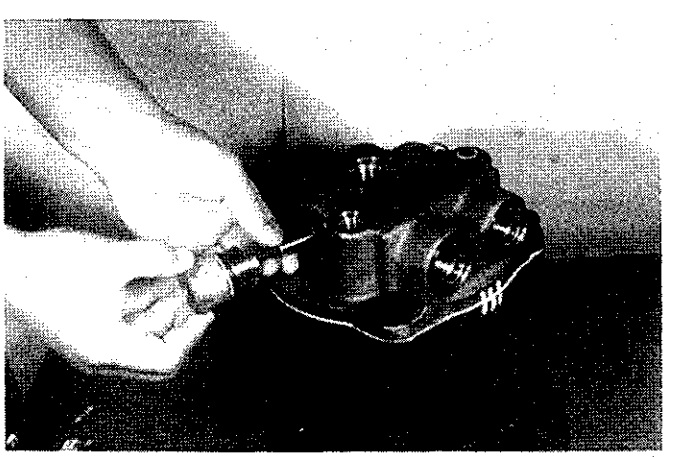
22. Align housing **24** and cover **16** to marks previously made. Carefully fit cover **16** and balance plate **20** onto housing **24**, ensuring that they do not fall out.



23. Fit cover securing bolts **46**. Torque tighten to 157 Nm (115.7 lbf. ft.).



24. Fit check valves **31** and springs **28** into cover **16**. Fit and torque tighten caps **27** to 137 Nm (101.3 lbf. ft.).



Dismantling - JS 110, 130, 150LC

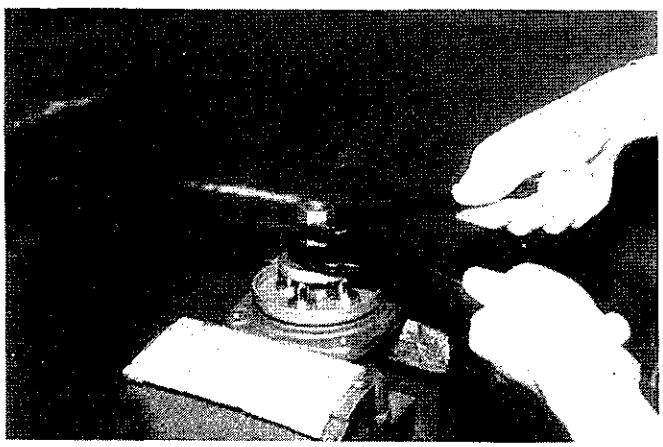
Refer to the sectional drawings on page 40-1 as a guide to dismantling and assembling.

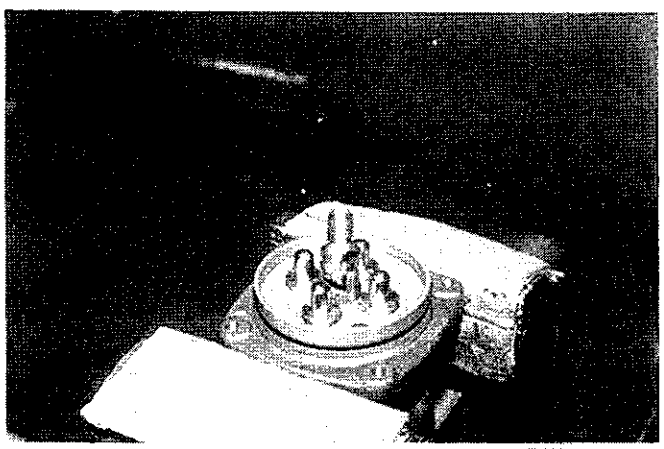
Before attempting to dismantle the hand control valve, blank all inlet and outlet ports and wash the outer surfaces with a suitable solvent to remove all dirt and dust. Dry using compressed air.

1. Hold the control valve casing **101** in a vice. Detach the bellows from the lower edge of the casing and remove the bellows over the handle.

   Protect the jaws of the vice to prevent damage to the casing.

2. Loosen the locknut and the adjusting nut **312** and remove the complete handle assembly. Hold the disc **302** with a spanner to prevent it turning. Remove the adjusting nut **312** and the disc **302**.





Boom, Dipper and Bucket Rams

The illustrations opposite apply as follows:

View A - JS110, JS130 boom and dipper
JS110, JS130, JS150LC bucket
View B - JS150LC boom and dipper

Dismantling

1 Drain all hydraulic fluid from the ram, disconnect and remove the hydraulic pipes.

2 Place the ram horizontally on a dismantling/assembly fixture and secure firmly.

3 Remove end cap **1** as follows:
- a View A - unscrew the gland using a suitable hook spanner (refer to table on page 45 - 4 for correct size).
- b View B - unscrew retaining bolts **2** using an Allen key.

4 Use slings to support the weight of the piston rod assembly **3** and pull the assembly clear of the ram cylinder **4**. Use a suitable container to catch any residual hydraulic fluid displaced.

Note: It may be necessary to apply air or hydraulic pressure to the head side of the ram in order to extract the piston rod assembly from the cylinder.

⚠ WARNING

If air or hydraulic pressure is used to force out the piston assembly, ensure that the end cap is securely fitted. Severe injury can be caused by a suddenly released piston rod.
HYD-1-2

⚠ WARNING

You can be injured if you use faulty lifting equipment. Make sure that lifting equipment is in good condition. Make sure that lifting tackle complies with all local regulations and is suitable for the job. Make sure that lifting equipment is strong enough for the job.
INT-1-3-7

5 Position the piston rod assembly on the ram piston head dismantling/assembly rig (see page 45 - 5) with the piston rod resting on support block **J**.

6 Remove grub screw **5**, after drilling out the staking. Remove steel ball **6**.

7 Remove piston nut **7** as detailed on page 45 - 6.

8 Remove shim **8**, piston head **9**, cushion ring **10** and end cap assembly **1**, in order, from piston rod **11**.

9 Hold piston head **9** in a soft jawed vice and proceed as follows:-
- a Remove upper and lower slide bearing rings **12** and **13** by hand.
- b Cut and remove piston head main seal **14**, taking care not to damage the seal groove.
- c Remove 'O' ring **15**

10 Remove the end cap seals **16**, **17**, back-up rings **18**, 'U' shaped seal **19** and wiper seal **20** (or **20A** †).

11 Remove wear ring **21** (JS150LC only - view B).

Note: Care must be taken not to damage any seal grooves.

12 Remove gland external 'O' rings **22** and back-up rings **23**.

13 If it is necessary to remove bush **24** from end cap **1**, remove snap ring **25**. Push out the bush with a suitable press and tube. Discard all 'O' rings, seals and back-up rings.

Assembly

Before assembly, make sure all components are thoroughly cleaned in a suitable solvent and then dried. Use new 'O' rings, seals and back-up rings, lightly greased before use.

1 Fit a new bush **24**, using a suitable tube and press. Fit snap ring **25** into end cap **1**.

2 Fit buffer seal ring **17** into end cap **1**. Bend gland seal **16** into a 'U' shape (bend radius greater than 6 mm (0.24 in) to avoid kinking) and install into its groove. The open end of the 'U' shape **must** face towards the piston head.

3 Install a new back-up ring **18** and 'U' shaped seal **19** ('U' shape facing piston head). Make sure there is no twisting and rolling of the ring **18** and seal **19**.

4 Fit wear ring **21** (JS150LC only - view B).

5 Fit new wiper seal **20** (or **20A** †).

6 Install new gland external 'O' rings **22** and back-up rings **23** ('O' rings closest to the piston head).

7 Fit 'O' ring **15** into the middle groove of piston head **9**, making sure it is not twisted.

8 Fit piston head seal **14** as follows (refer to illustration on page 45 - 3):
- a Smear the surface of inner guide **X** with grease and fit seal **14** onto it in a horizontal position.
- b Fit lower slide bearing rings **12** and **13** to the piston head by hand.
- c Fit the thin end of inner guide **X** over the upper section of piston head **9**.
- d Position outer guide **Y** over inner guide **X** so that it rests on seal **14**.
- e Use a hydraulic press to push seal **14** off inner guide **X** and into its groove on piston head **9**.

Note: Press carefully to ensure that the seal fits straight onto the inner guide **X** and thence squarely into its groove. Once pressing starts do not stop in mid-travel or the seal will become deformed.

- f Withdraw the press and remove guides **X** and **Y**.

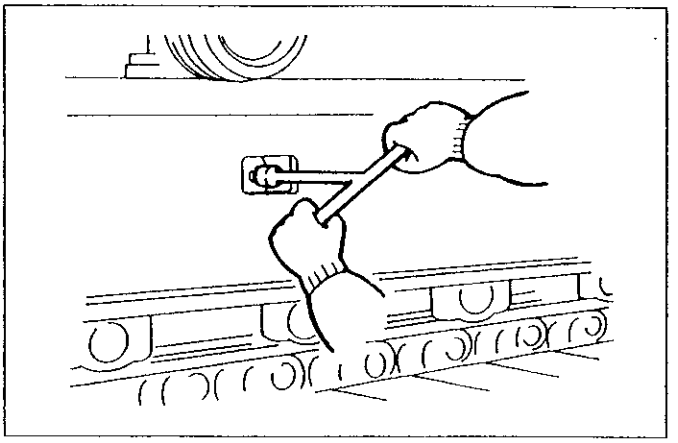
† Wiper seal **20A** is fitted as follows:
JS110 machines from serial no. 697025
JS130 machines from serial no. 699060
JS150LC machines from serial no. 701051

Removal

1 Slacken the check valve to bleed out grease.

⚠ WARNING

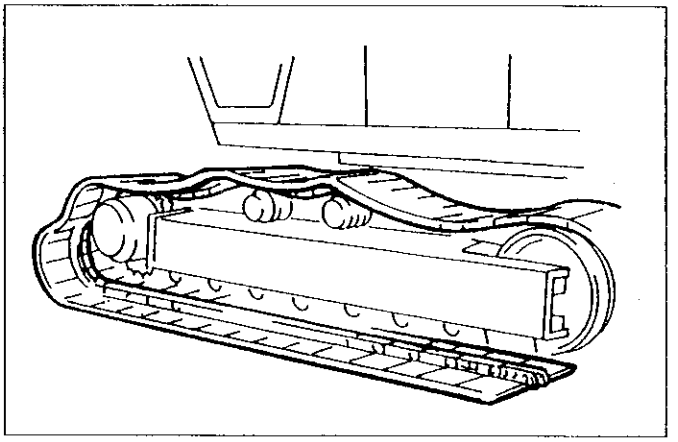
Slacken the check valve slowly and stop when grease is released. The grease and valve are under extremely high pressure and could cause injury if suddenly released.
TRANS 6-2



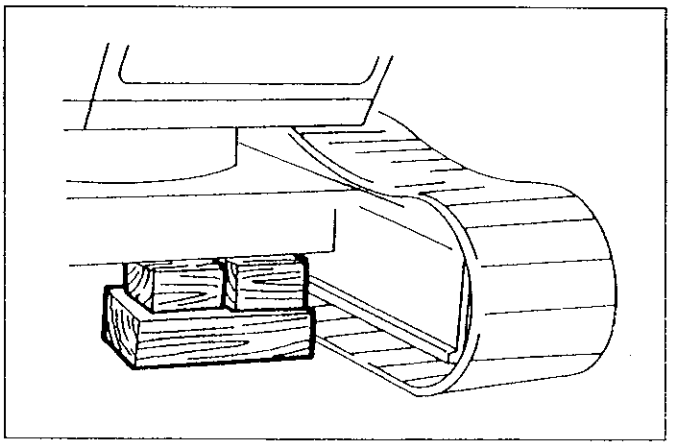
2 Disconnect the track link.

⚠ WARNING

Stand clear and to one side of the track while you remove the master pin. When the master pin is removed the track could fall forward and injure you.
TRACK 1-1

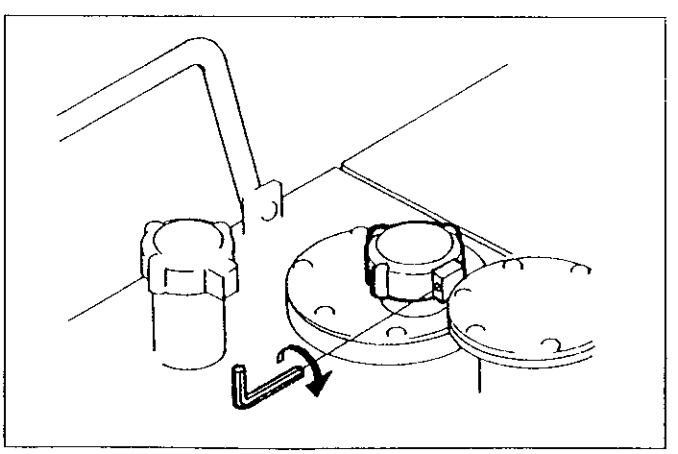


3 Lift the side of the undercarriage high enough to permit drive sprocket removal. Support with wooden blocks.



* 4 Stop the engine and operate the control lever to relieve pressure in the hydraulic system.

Slacken the air breather cap (as detailed in Section 3, page 5-1) to release pressure in the hydraulic tank.

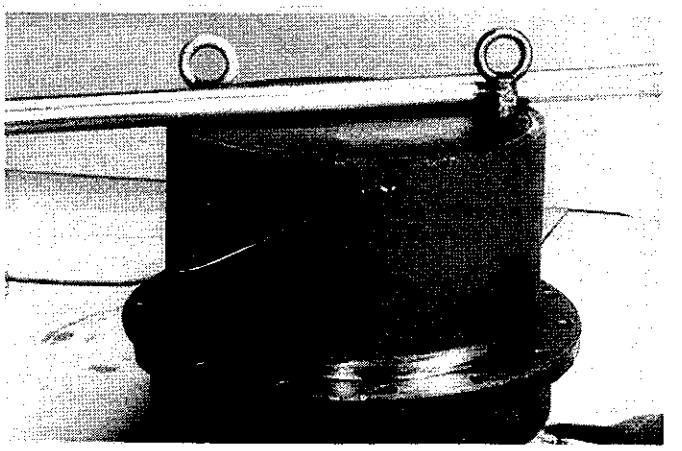


Dismantling - JS 110/130 (continued)

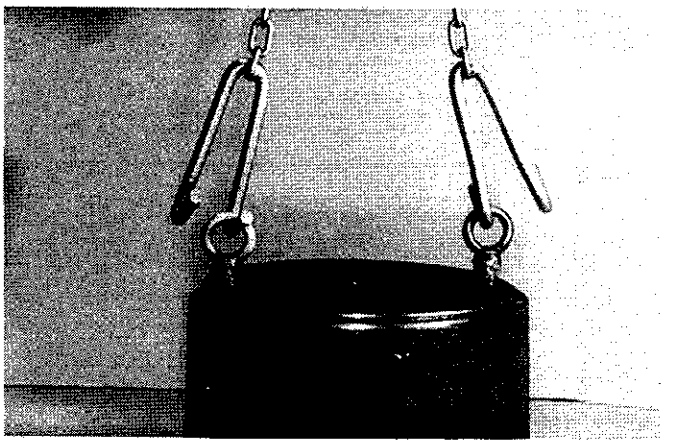
17 Remove two plugs **1-8** and one plug **1-7**. Fit eye-bolts in place of plugs **1-8**.

Using a length of bar positioned against the eye-bolts, rotate the cover plate **1-27** until the wire **1-29** is visible through the hole for plug 1-7.

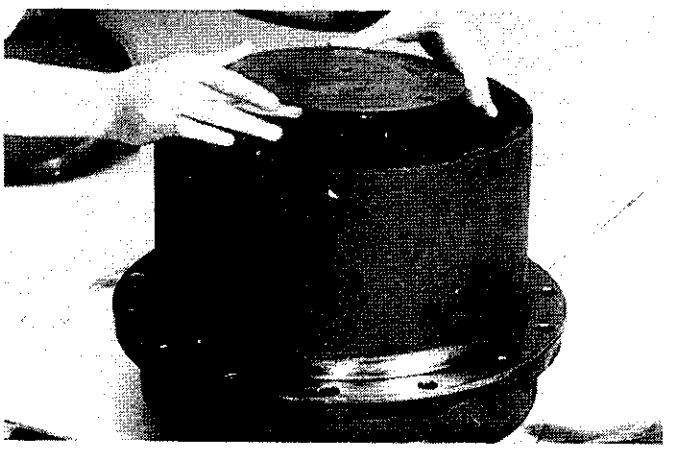
Pull out the wire with pliers whilst rotating the cover.



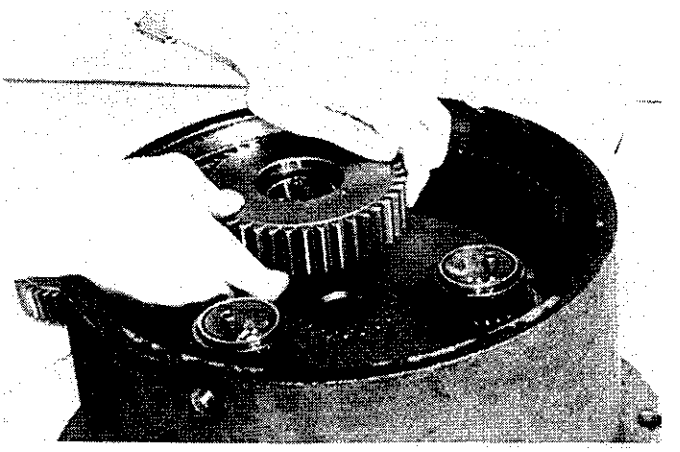
18 Connect a hoist to the eye-bolts and lift off the cover **1-27**.



19 Remove thrust plate **1-23** and drive fear **1-22**.

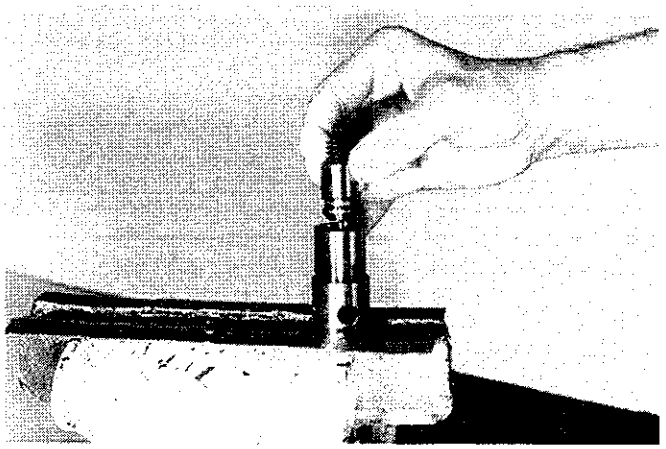


20 Remove three planetary gears **1-18** and their needle bearings **1-19**.

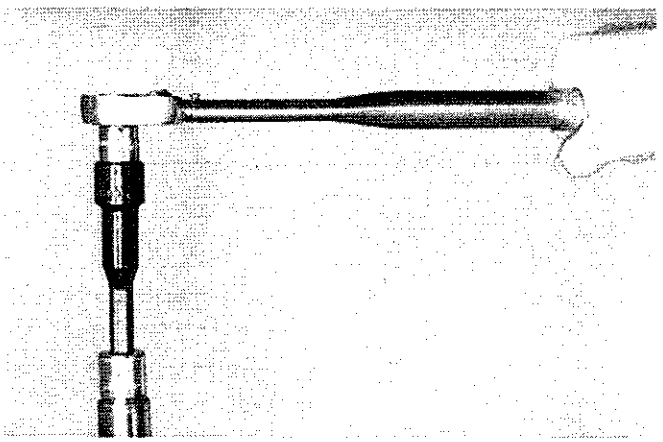


Assembly - JS 110/130 (continued)

23 Position spool **33-1** in a vice fitted with soft jaws and install the check valve and spring **33-3**.

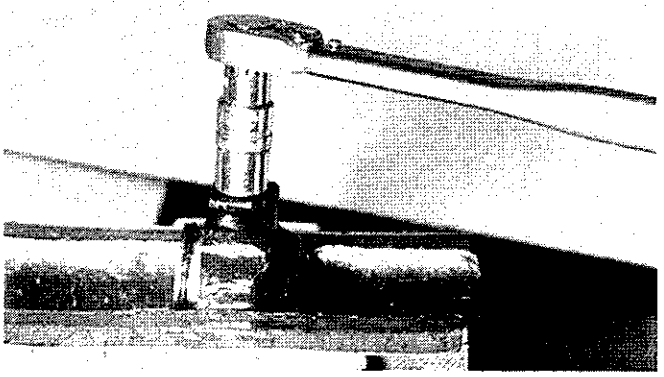


24 Fit a new 'O' ring **33-5** to plug **33-4** and install them into spool **33-1**. Using a 10 mm dia. round rod through the 11 mm dia. hole of spool **33** to prevent the spool from turning, tighten the plug to 100-116 Nm (73-86 lbf ft).

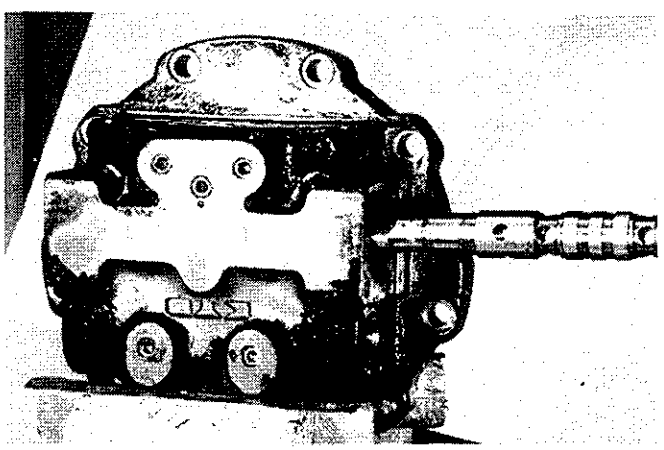


25 Fit new 'O' ring **37-2** onto cap **37-1**. Assemble steel ball **37-4** and spring **37-5** in that order.

Fit new 'O' ring **37-6** and plug **37-7**.



26 Lubricate and install spool **33,** turning it **slowly** as it enters the base plate.



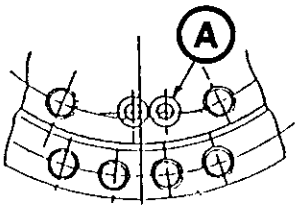
Dismantling - JS 150LC (continued)

17 Remove 2-speed control piston assembly, comprising piston **161**, shoe **162** and spring **191**, by applying compressed air to port **A** in housing **2**.

⚠ CAUTION

When using compressed air, wear safety glasses and gloves. Do not direct compressed air at your skin.

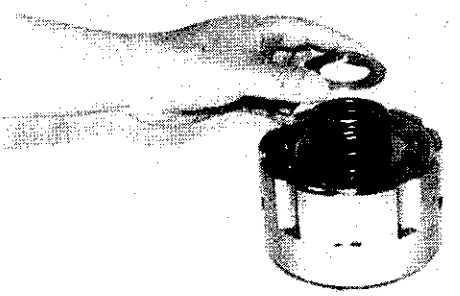
8-3-4-2



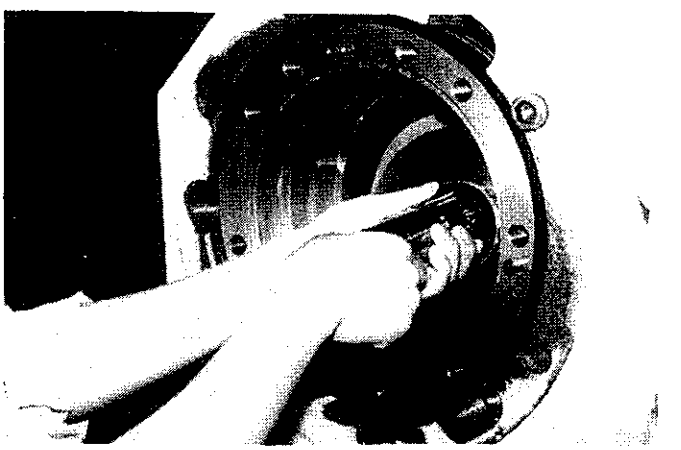
18 To remove circlip **145**, place the cylinder block on a press capable of exerting a pressure of at least 100 kgf (220 lbf) and compress spring **114** by means of a suitable tubular tool (see **Service Tools**, Section 1) pressing on washer **110**.

During this operation, protect the machined surface of the cylinder block with suitable sheeting.

19 Remove circlip **145**, followed by washer **110**, spring **114** and the second washer **110**.



20 Remove shaft **102** complete with inner race of bearing **149**.



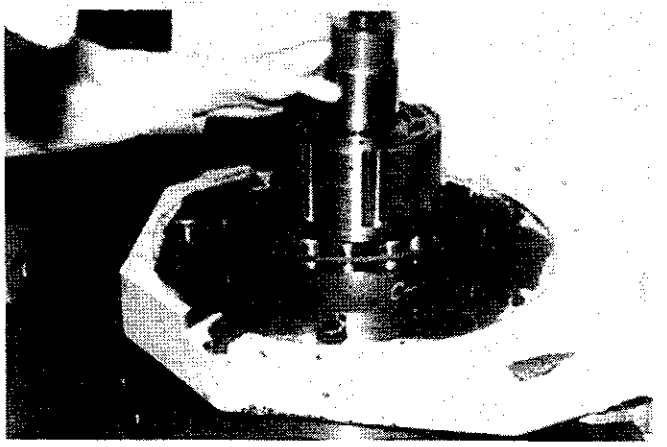
Assembly - JS 150LC (continued)

21 Assemble the cylinder block and pistons assembly with the swash plate **103** and retainer plate **107** onto the shaft **102**.

Support this complete assembly by means of a hook fitted onto the end of the shaft (see **Service Tools**, Section1).

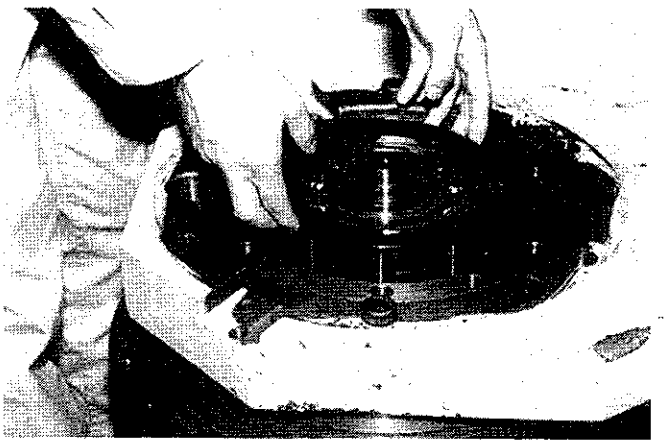
Insert the outer race of bearing **149** into the housing **2**. Carefully lower the assembly into the housing **2**, making sure that the swash plate locates correctly on the steel balls **167**.

After assembly, rotate the cylinder block to check that there is no backlash.

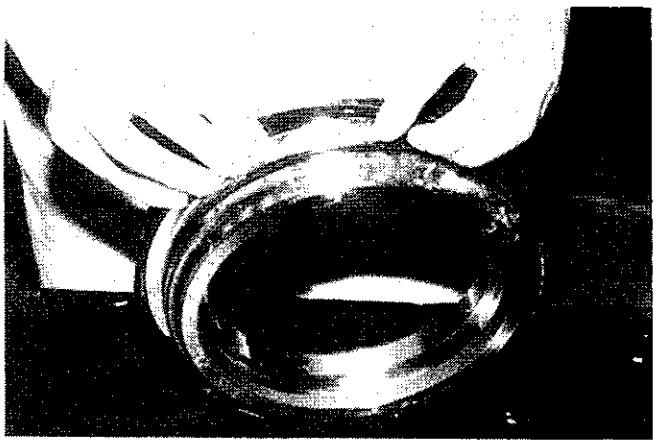


22 Dip brake friction plates **115** in hydraulic fluid before assembly.

Install the friction plates **115** and the counter plates **116**. Make sure that they are installed in the correct order as noted during dismantling.

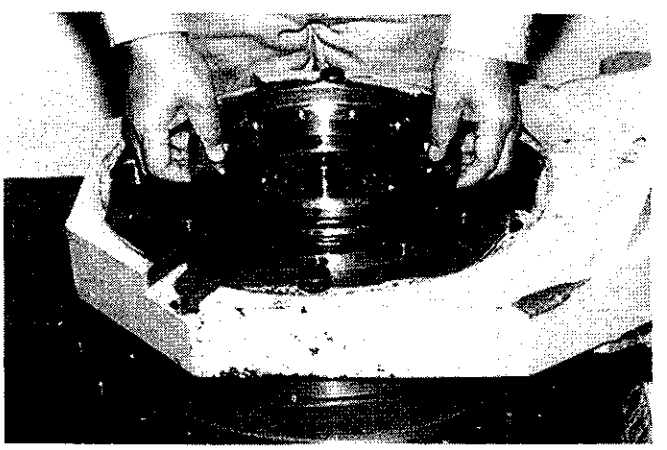


23 Lightly grease 'O' rings **135** and **139**. Install them with back-up rings **147** and **148** into the grooves of brake piston **112**.



24 Install the brake piston **112** into housing **2** taking care not to damage the 'O' rings.

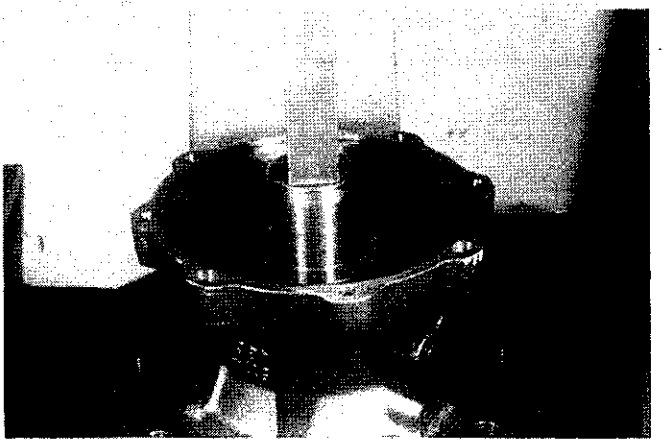
Note: If necessarry, lightly hammer the piston with a plastic hammer to overcome the resistance of the 'O' rings.



Assembly - JS 110/130 (continued)

5 Degrease both the outer surfaces of a new oil seal **53** and its bore in the casing. Apply JCB Multigasket and press in the seal using the jig shown in **Service Tools** (Section 1).

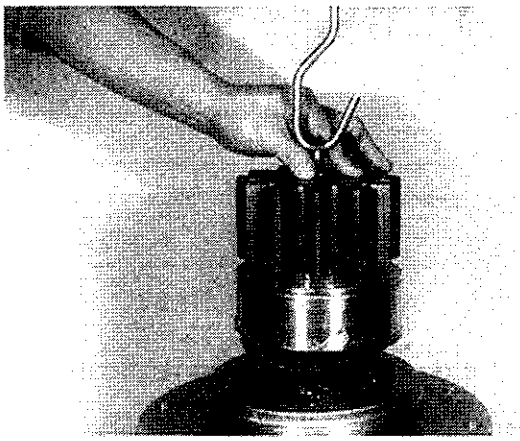
Apply grease to the seal lip after fitting.



6 Screw an eye-bolt into the M18 tapped hole in the end of the shaft.

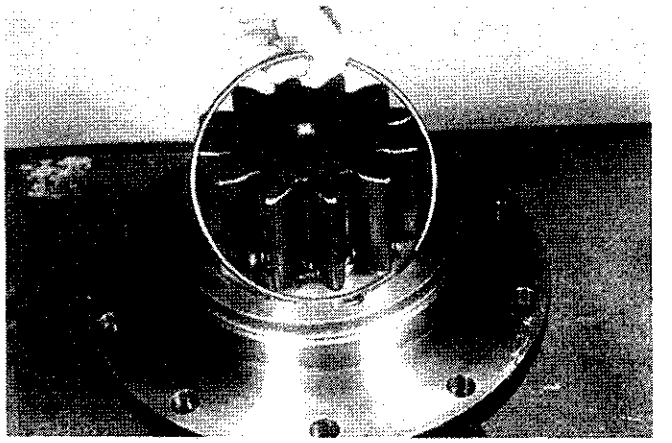
Fit a seal protector (see **Service Tools**, Section 1) over the end of the shaft to prevent the splines from damaging the oil seal.

Turn the casing over and lower the shaft and bearing assembly into the casing.

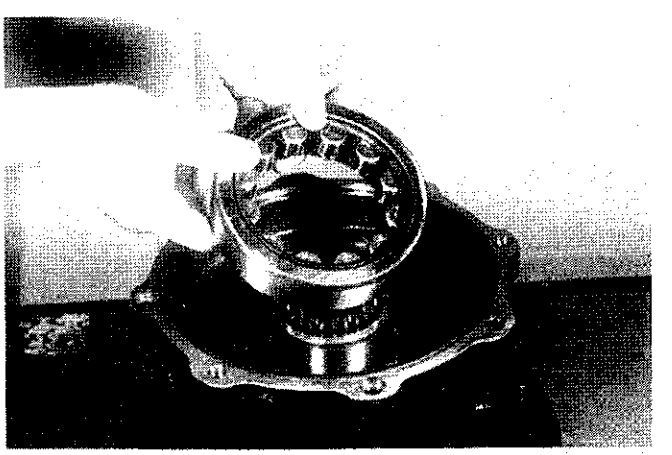


7 Fit snap ring **47**.

Note: To assist future removal of the snap ring, position the gap in the snap ring approximately 30 mm (1.2 in) away from the cut-out in the casing.

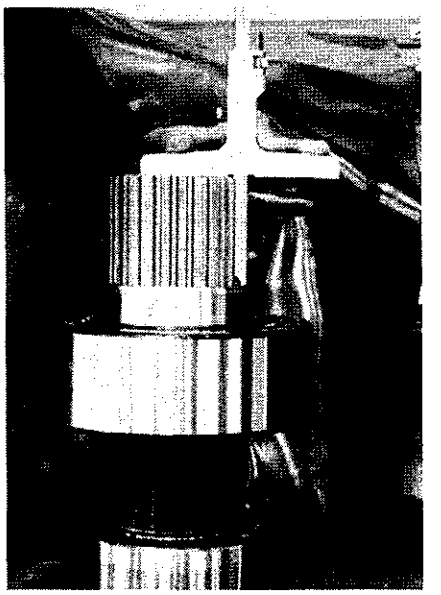


8 Heat the inner race of bearing **54** and install the bearing as far as the shoulder in the shaft.



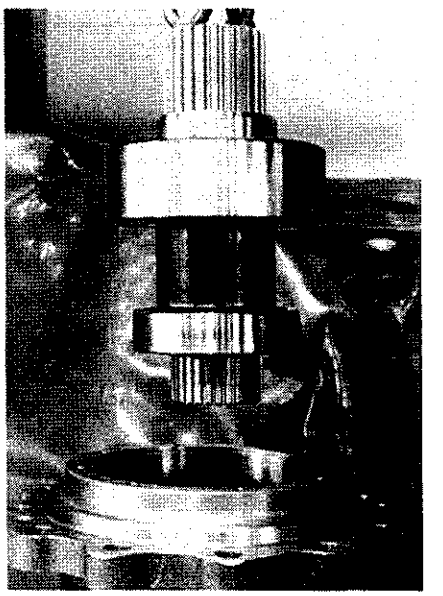
Assembly - JS 150LC

7 Turn the assembly over and make sure that the distance from the end of the seal ring to the end of the shaft is 80.0-80.3 mm (3.150-3.161 in).

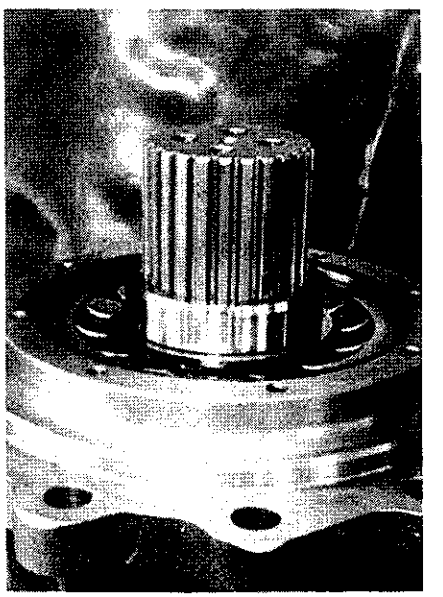


8 Position casing **102** on a level bench. Suspend the drive shaft assembly vertically and install it into the casing.

Tap on the outer ring of each bearing until it is completely level. If a light tap will not level a bearing, do not use force but remove the bearing and refit with the outer ring level.



9 Fit 'O' ring **803** into the groove in cover **101**.



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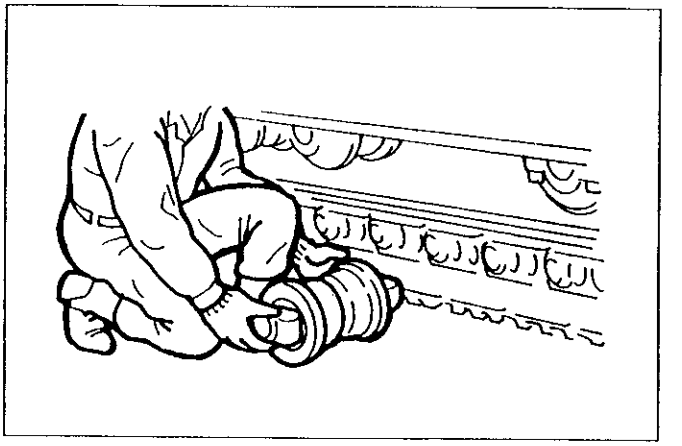
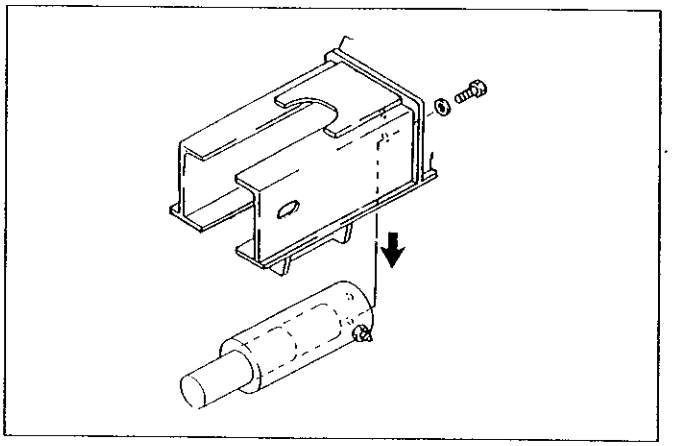
Removal (continued)

5 Remove the bottom roller (third from front).



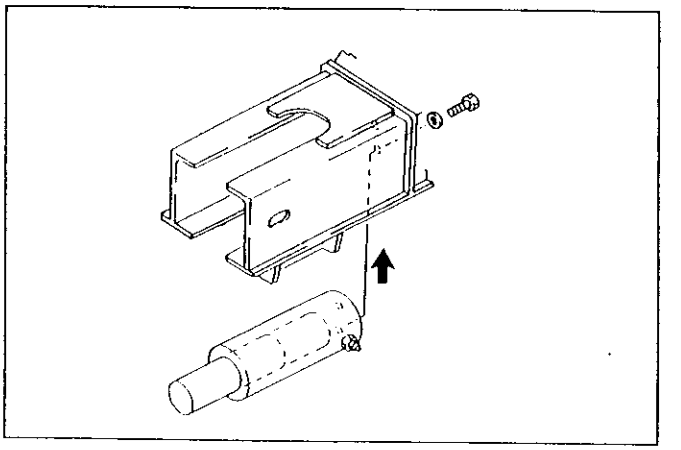
6 Remove the bolts, then take out the grease cylinder from the track frame.



Replacement

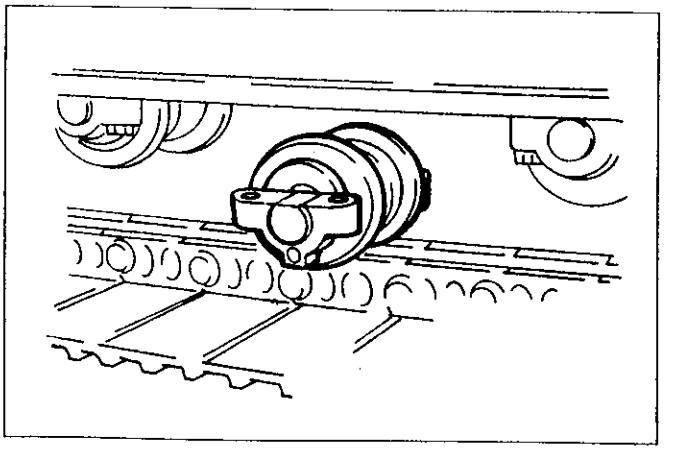
1 With the undercarriage lifted and supported as shown under **Removal**, install the grease cylinder into the track frame.

Fit the mounting bolts and tighten to 264-303 Nm (195-224 lbf ft).



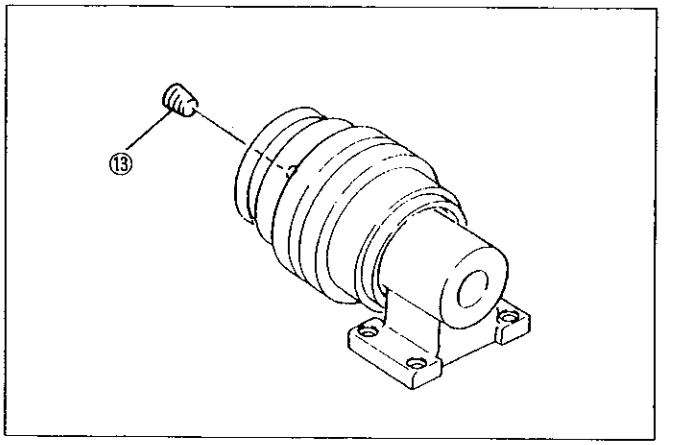
2 Position the roller on the track link as shown.

Align the holes in the brackets with the tapped holes in the undercarriage.



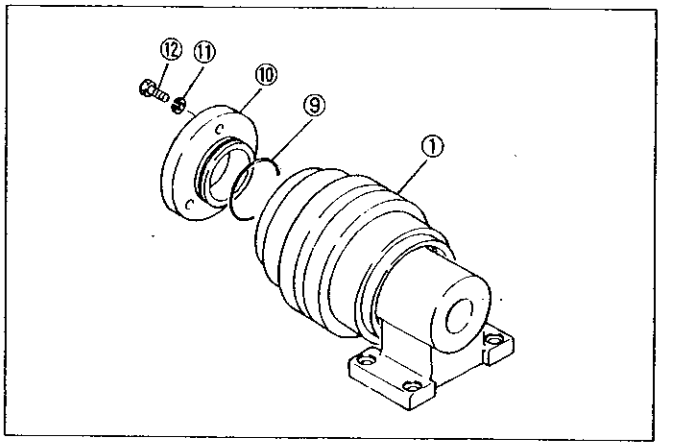
Dismantling

1 Clean the roller with a suitable solvent. Remove the plug **13** and drain the oil.

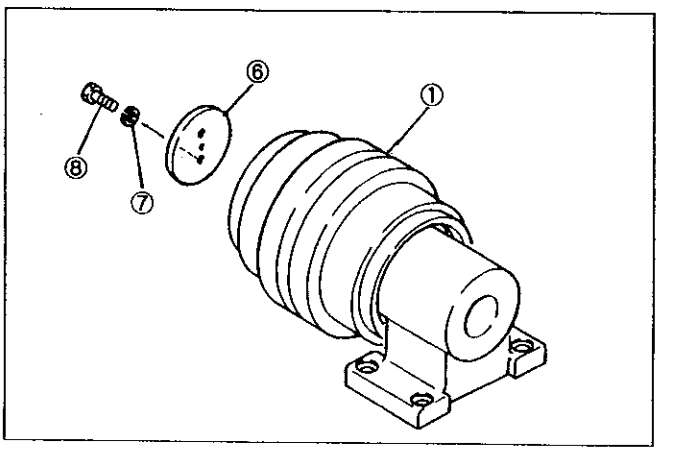


2 Remove bolt **12**, spring washer **11** and cover **10** from roller **1**.

Remove 'O' ring **9** from cover **10**.



3 Remove bolt **8**, washer **7** and thrust plate **6** from the shaft.



4 Pull roller **1** from shaft **2**.