31. DISASSEMBLING AND ASSEMBLING

TABLE OF CONTENTS

Book Code No. **S5YN3118E01**

(5) Removing bucket cylinder
Sling tube of bucket cylinder with nylon sling, and remove it.
Bucket cylinder weight : 140 kg (310 lbs)

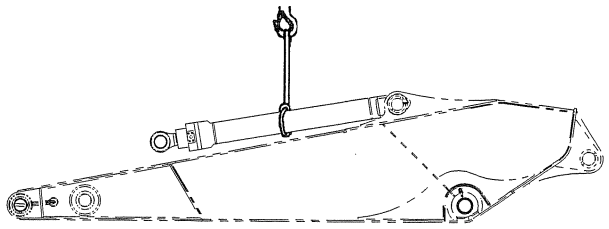


Fig. 32-12 Slinging bucket cylinder

(6) Removing arm cylinder rod pin (E)
Put a wooden block between the arm cylinder and the boom.
Loosen nut (3), remove capscrew M16×150 (4), and push out arm cylinder rod pin (E).

: 24mm

Retract arm cylinder rod, and return pin (E) to the original position (hole).

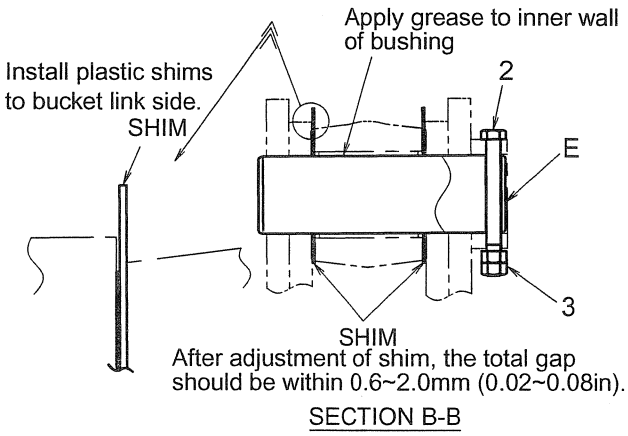
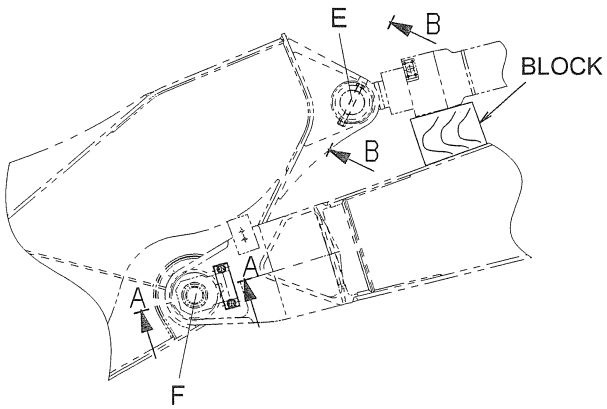


Fig. 32-13 Detail of arm cylinder rod pin (E)



(7) Removing boom top pin (F)
Loosen capscrew M14×30 (2), and pull out boom top pin (F).

: 22 mm

Insert pin (F) into the original hole.

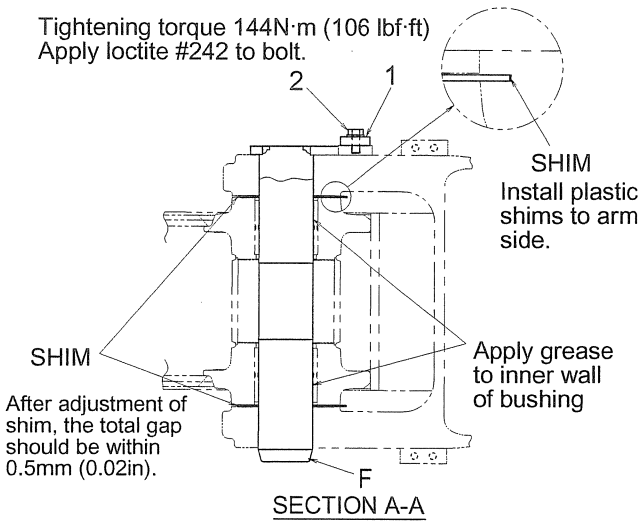


Fig. 32-14 Detail of boom top pin (F)

- At this time, the weight of piston rod (2) is loaded on rod cover (3). Therefore, lift the top end of the piston rod with a hoist to the extent that only the rod weight may be held.

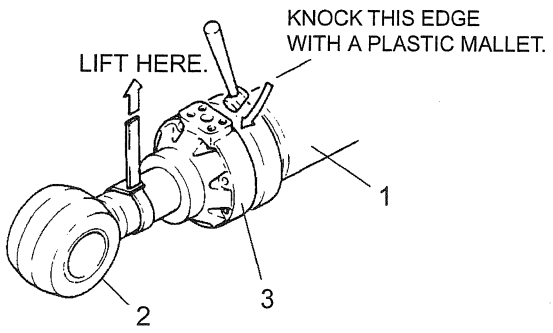


Fig. 32-30 Drawing out piston rod assy (2).

(5) Draw out the piston rod assy from cylinder tube (1).

⚠CAUTION

Since the piston rod assy is heavy in this case, lift the tip of the piston rod (2) with a hoist and draw it out. However, when piston rod (2) has been drawing out to approximately two thirds of its length, lift it in its center to draw it completely. However, since the plated surface of piston rod (2) is lifted, do not use a wire rope which may score the surface, but use a strong cloth belt or a rope.

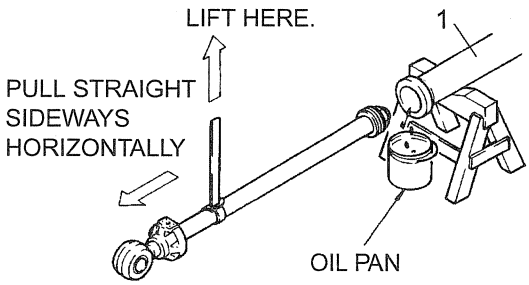


Fig. 32-31 Method of drawing out the piston rod assy

(6) Place the removed piston rod on a horaizontal wooden V-block.

- Cover a V-block with cloths.

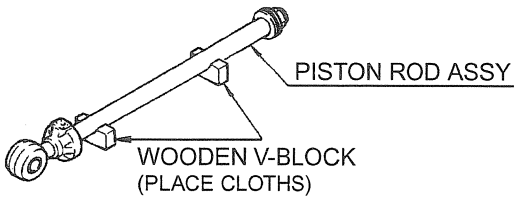


Fig. 32-32 Method of placing the piston rod

(7) Remove slide ring (18) and (19) from piston (15).

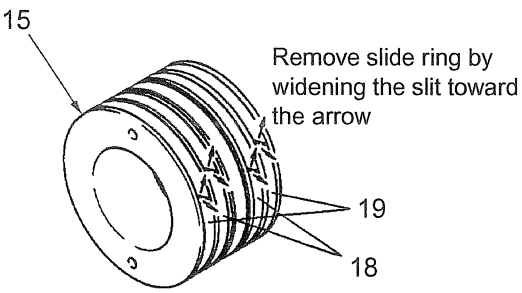


Fig. 32-33 Remove slide ring (18) and (19)

32.2.1.6 INSPECTION AFTER ASSEMBLY

(1) No-load functional test
Place the cylinder level at no load, operate the piston rod 5 to 6 strokes by the directional valve and make sure that it operates without failure.

⚠CAUTION

- Do not raise the hydraulic pressure above the maximum pressure of 37.8MPa (5480psi) for the cylinder of the machine.
- Grease coated on the O-rings and the seals of the rod cover may come out. Wipe it off and retest the cylinder in such a case.

(2) Leak test

1) Apply a test pressure to the retracting and extending sides of the cylinder for three minutes independently, and check that the rod section and the welds have external leaks and permanent deformation. For an internal leak test, connect the cylinder with a test unit as shown in Fig. 32-60.

2) After completing the test, apply a plug to each port and store the cylinder. (Fig. 32-61)

- For storage, place the cylinder on wooden V-blocks and bring the cylinder to the most retracted condition.

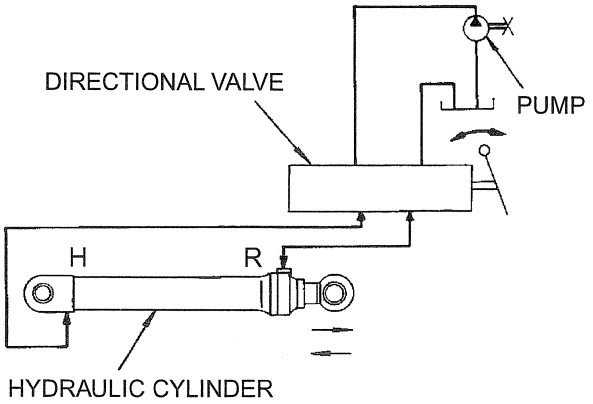


Fig. 32-59 External leak test

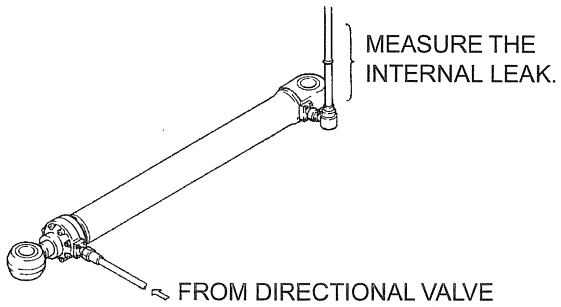


Fig. 32-60 Internal leak test

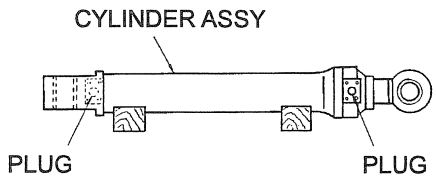
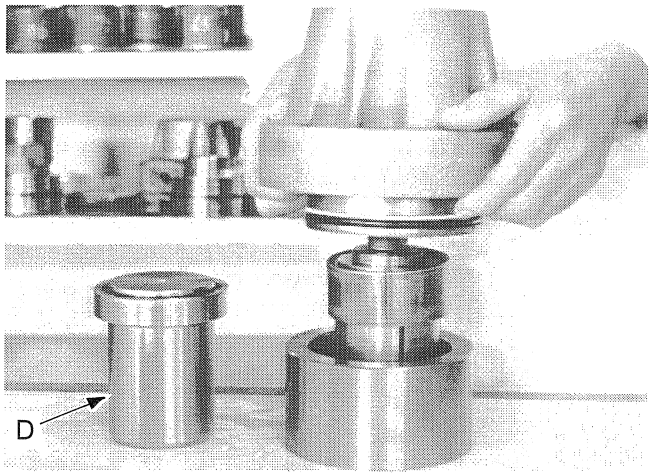


Fig. 32-61 How to store the cylinder

7) Removing of rod cover

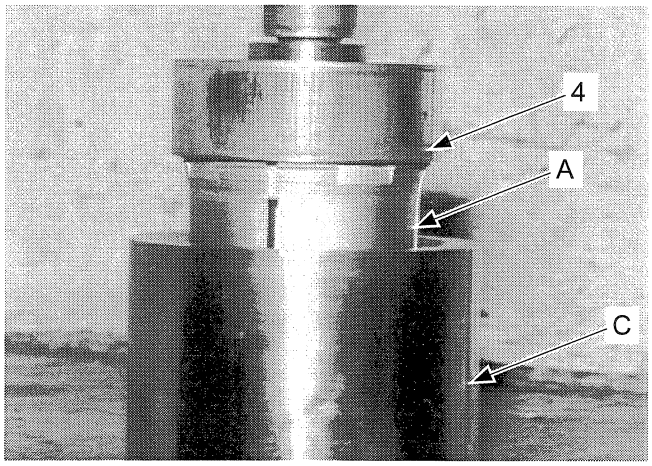
a. Remove block (C) with rod cover (3) near side, remove retainer tool (D) from rod cover (3), and then move rod cover (3) to other place.

b. Take out the chuck tool (A) with bushing from block (C).



WARNING

Do not work under the press because it is very dangerous.

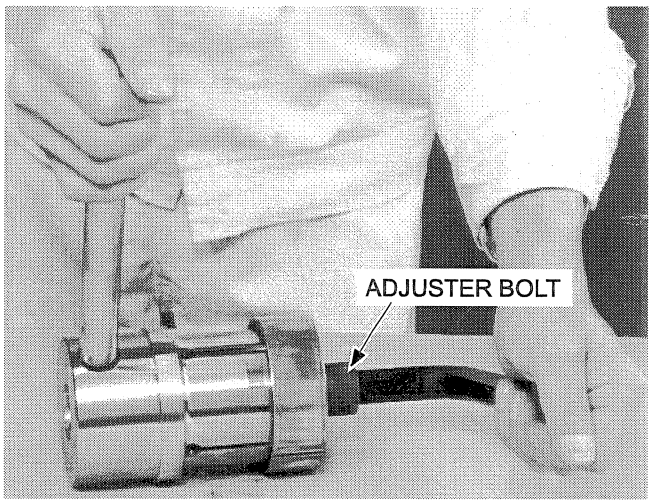


8) Removing of bushing

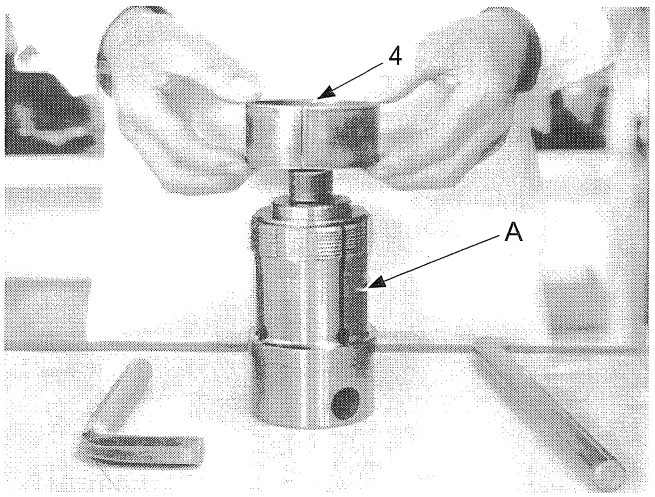
a. Place chuck tool (A) with bushing (4) sideways, and loosen adjuster bolt with allen wrench and lever.

b. Place the chuck tool (A) vertically and turn the adjuster by hand until the wedge is raised about 5mm (0.2 in).

c. Remove the wedge from the edge of chuck.



- Clean the surface of work bench, and be careful for the tool not to be damaged by foreign matters like dust, chips, etc.



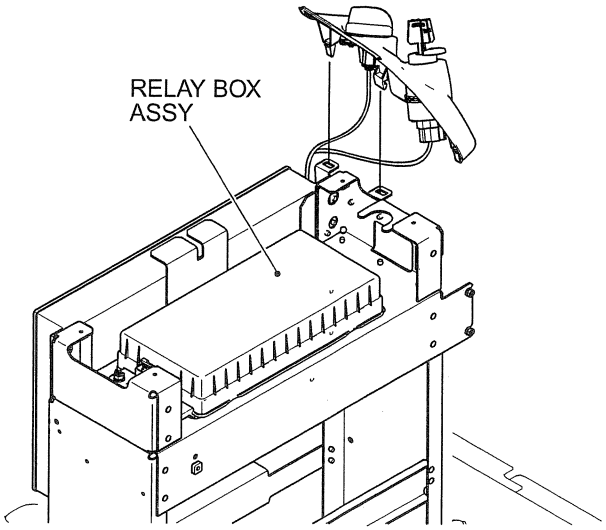


Fig. 33-5 Move switch cover assy

(7) Remove cab attaching bolt

1) 5 capscrews (A1) M12×65 and 1 capscrew (A3) M12×30. (Mark △)

2) 2 nuts (B4) M16 (Mark O)

(8) Slinging cab

1) Remove two plastic plugs at the front of the ceiling of the cab. Then place a wire sling with eye rings and a hook around the cab, as shown in Fig. 33-7.

2) Then lift up slowly avoiding interference with surroundings.
Wire with hook ;
Length 1.5m (4ft 11in)×Dia. 8mm (0.315in)×3pcs.
Weight of cab ; Approx. 250kg (550 lbs)

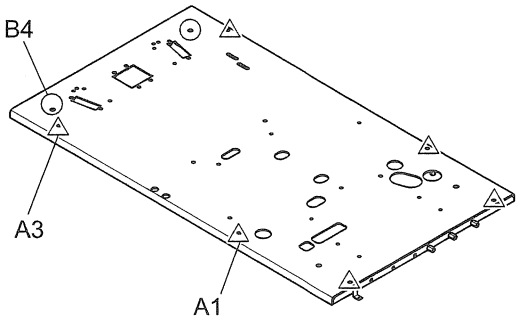


Fig. 33-6 Removing and installing cab mounting bolts.

33.1.2.2 INSTALLATION

Install it in reverse order of removing according to the Tightening Torque Table.

Tightening position	Allen wrench HEX	Tightening torque N·m (lbf·ft)
Nut M16 (B4)	24	191 (140)
Capscrew (A1)(A3)	19	79.4 (60
Sems bolt M6 (A39)(A40)	Torx driver (T30)	8.5 (6.3)
Sems bolt M6 (A22)(A23)	Plus driver	5.0 (3.7)

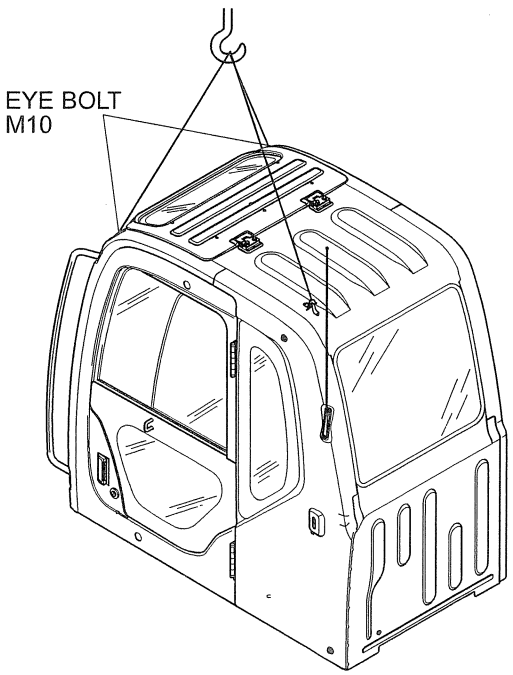


Fig. 33-7 Slinging cab

33.1.6.3 INSTALLATION

(1) Installing is done in the reverse order of removing.
Tank attaching bolt (A1) M16×40


: 24 mm, Apply Loctite #262
Tightening torque : 191 N•m (140 lbf•ft)

⚠CAUTION

If the gap (looseness) between tank mount and frame exceeds 1mm (0.04inch), adjust the gap with shim (A3) and tighten capscrew (A1) to install the tank.

(2) Tightening torque

No.	Name	Q'ty	Tightening torque N·m (lbf·ft)
A1	Capscrew	4	191 (140)
A6	Machine screw	5	1.96 (1.4)
A8	Cock	1	34 (25)

33.1.9 AIR CLEANER

33.1.9.1 PREPARATION FOR REMOVAL

(1) Opening bonnet assy (21) and (23).
(See 33.1.4 GUARD)

(2) Open bonnet assy (11).
(See 33.1.4 GUARD)

(3) Remove Panel assy (3).
(See 33.1.4 GUARD)

(4) Unplug terminals on indicator (1-8) wiring.
(See Fig. 33-48)

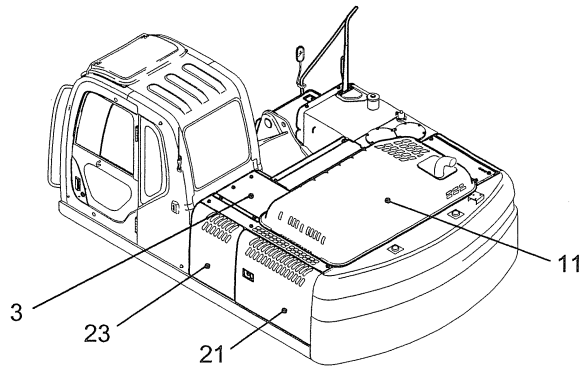


Fig. 33-47 Preparation for removal

33.1.9.2 REMOVAL

(1) Pulling out hose (3).

1) Loosen clips (5), (6) on both sides of hose (3).

2) Pulling out hose (3)

: Flat-blade screw driver

(2) Remove air cleaner assy (1)

1) Remove 4 sems bolts (8) M10×25

: 17 mm

2) Remove air cleaner assy (1) from plate (4).

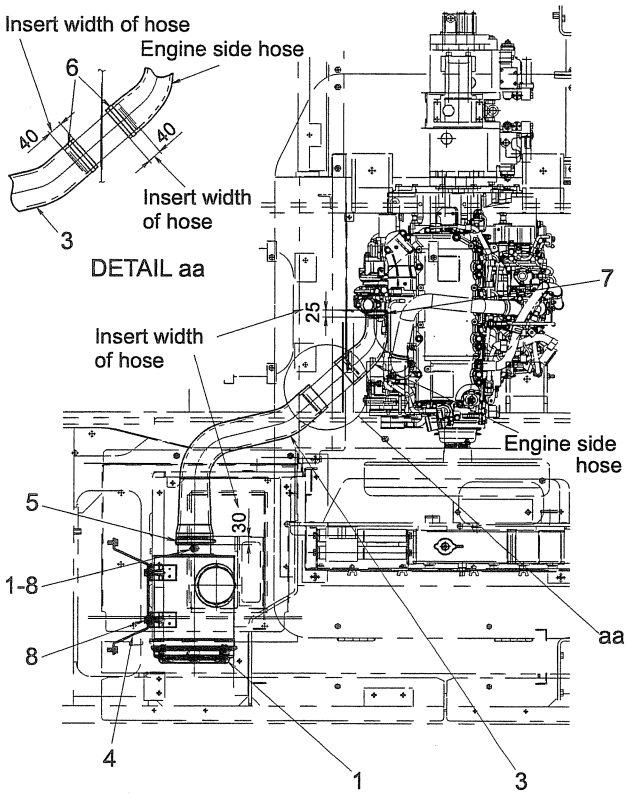


Fig. 33-48 Removing air cleaner

33.1.9.3 INSTALLATION

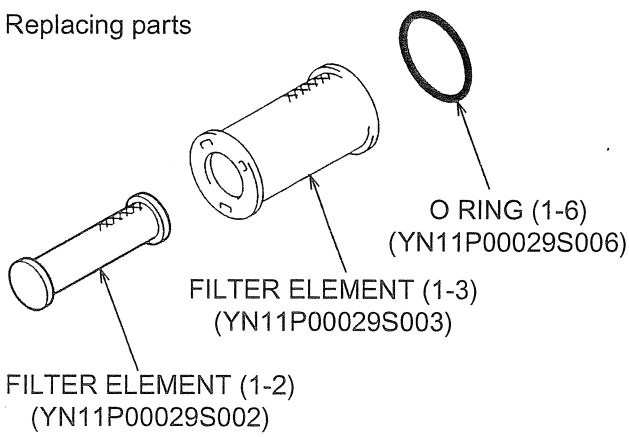
(1) Installing is the reverse order of removing with attention paid to the following items:

1) Put in air hoses (2), (3) to the end as shown in Fig. 33-48.

2) Tightening torque :

No.	Name	Tightening torque N·m (lbf·ft)
1-8	Indicator	3.9 (2.9)
8	Sems bolt	39.2 (29) (Apply Loctite #262)
5,6,7	Clip	5.9 (4.4)

Replacing parts



33.1.13 ENGINE

33.1.13.1 PREPARATION FOR REMOVING

(1) Remove battery ground (See 33.1.3 BATTERY)

(2) Remove bonnet and guard (See 33.1.4 GUARD) Remove under cover (See 33.1.5 UNDER COVER)

(3) Remove air cleaner hose (See 33.1.9 AIR CLEANER)

(4) Remove counterweight (See 33.1.11 COUNTERWEIGHT)

(5) Remove radiator hose and inter-cooler hose (See 33.1.12 RADIATOR & OIL COOLER)

(6) Remove fuel hose and heater hose, and if necessary disconnect air-con hose.

(7) If necessary, remove pump, muffler and radiator.

(8) Remove harness connector (Refer to ELECTRIC SYSTEM)

1) Remove E/G ground cable

2) Starter cable-Starter B terminal

3) Remove the connector that connects the upper harness with the engine and ECU harness.

4) Upper harness

- CN-206–E/G sub harness
- P5–Alternator B terminal
- CN-136–E/G speed sensor
- CN-141, CN142–Pump proportional valve
- CN-139, CN-140–P1,P2 pump pressure sensor
- CN-212–Glow
- P3–Starter motor C terminal

Note

Prepare a stand, which withstands the weight of the engine assy and can place the removed engine firmly. (Refer to Tools)

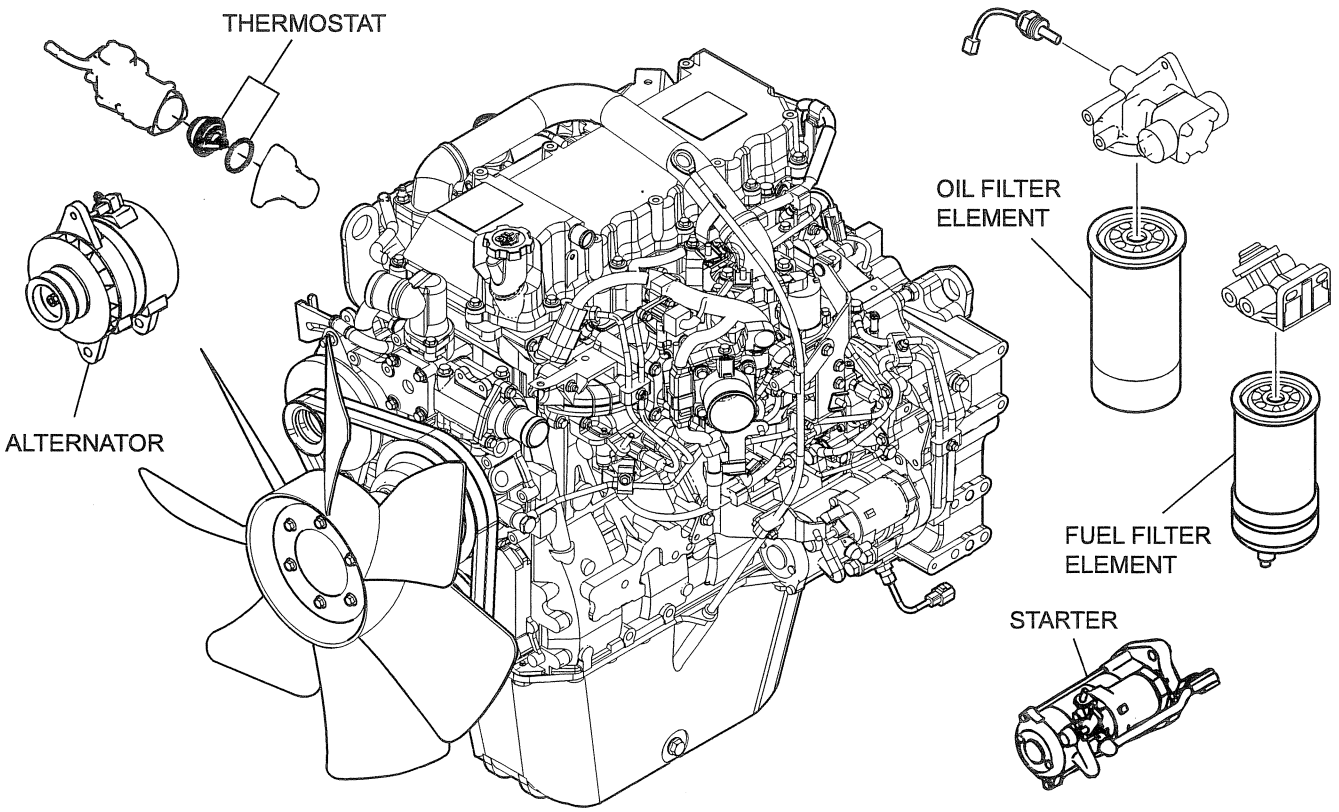


Fig. 33-63 Outside view of engine

33.1.18.3 INSTALLATION

Install it in the reverse order of removal and tighten it.

Sems bolt (A11)

 : 17 mm T = 37 N•m (27.3 lbf•ft)

Sems bolt (A7)

 : 17 mm T = 46.1 N•m (34.0 lbf•ft)

Sems bolt (A8)

 : 13 mm T = 23.5 N•m (17.3 lbf•ft)

Pressure sensor

 : 24 mm T = 16.7 N•m (12.3 lbf•ft)

Note

Marks ⓌⓍⓎⓏ in Fig. 33-111 show the position where regulator is installed.

No.	Name	Q'ty	No.	Name	Q'ty	No.	Name	No.
111	Shaft(F)	1	314	Valve plate (L)	1	724	O-ring ; 1B P8	16
113	Shaft(R)	1	325	Sensor block	1	725	O-ring ; 1B P11	9
116	1st gear	1	326	Cover	1	727	O-ring ; 1B P14	3
123	Roller bearing	2	401	Socket bolt ; M20X210	8	728	O-ring ; 1B P24	4
124	Needle bearing	2	406	Socket bolt ; M8X20	4	732	O-ring ; 1B P18	2
127	Bearing spacer	3	407	Socket bolt ; M6X55	3	774	Oil seal	1
141	Cylinder block	2	414	Socket bolt ; M10X20	4	789	Backup ring P18	2
151	Piston	18	466	VP plug ; PF1/4	2	792	Backup ring G35	2
152	Shoe	18	467	VP plug ; PF3/8	2	806	Nut ; M16	2
153	Retainer	2	468	VP plug ; PF3/4	4	808	Nut ; M20	2
156	Spherical bushing	2	490	Plug ; NPTF1/16	32	824	Stop ring	2
157	Cylinder spring	18	531	Tilt pin ; M24X2	2	885	Valve plate pin	2
211	Shoe plate	2	532	Servo piston ; M24X2	2	886	Spring pin	4
212	Swash plate	2	534	Stopper (L)	2	901	Eye bolt ; M10	2
214	Tilting bushing	2	535	Stopper (S)	2	953	Socket screw ; M16X30	2
251	Swash plate support	2	546	Spacer	2	954	Set screw ; M20	2
261	Seal cover (F)	1	548	Feed back pin	2	04	Gear pump	1
271	Pump casing	2	702	O-ring ; 1B G35	2	05	PTO gear case	1
312	Valve block	1	710	O-ring ; 1B G95	2			
313	Valve plate (R)	1	717	O-ring ; 1B G145	4			

☐ The numbers in a rectangle represent adjust screws. Do not tamper with the adjust screws as much as possible.

Tightening torque of bolt, plug, nut and servo piston

No.	Thread size	Tightening torque N·m (lbf·ft)
401	M20	430 (317)
406	M8	29 (21)
407	M6	12 (8.9)
414	M10	57 (42)
466	PF 1/4	36 (27)
467	PF 3/8	74 (55)
468	PF 3/4	170 (125)
490	NPTF1/16	8.8 (6.5)
531,532	M24X2	240 (177)
806	M16	130 (95)
808	M20	240 (177)

33.2.1.1.4 Troubleshooting

(1) Locating causes of troubles

The pump is usually fitted with a regulator, auxiliary valves and auxiliary pumps, and this makes fault location extremely difficult. However, faults would be found out easily if the following check items were attended to.

1) Inspecting the filter and drain oil

Inspect the filter element to check for abnormal contaminations. Some metallic particles will be deposited on it as the shoe and the cylinder wear off. In case metallic particles are found in large quantity, the elements may be damaged. In that case check the drain oil in the pump casing as well.

2) Checking for abnormal vibration and sound

Check that the pump does not vibrate and make an abnormal sound.

Check that the hunting of the regulator and the attached valveÅfs relief valve are of regular frequency. In case vibration and sound are abnormal, the pump may be making a cavitation or internally broken.

3) When two pumps are used

In case two single pumps or motors are used or when a double pump is used. change pump pipelines. This will make clear that the pumps are faulty or the circuit after the pumps is faulty.

4) Pressure measurements

If the problem is related to control functions, avoid disassembling the pumps carelessly, but look for causes by measuring pressures.

(2) Troubleshooting

1) Overloading to engine

Cause	Remedy	Remarks
1. Revolution and pressure are higher than set values.	1) Set pressure to specified value.	
2. Regulator torque is set higher than normal.	2) Readjust regulator.	2)Refer to Regulator Manual.
3. PumpÅfs internal parts are seized or broken.	3) Replace damaged parts.	3) Check filter and drain oil to see if abnormal wear particles are present.
4. Regulator is piped incorrectly.	4) Pipe regulator correctly.	

2) Pump's oil flow rate is extremely low and delivery pressure is not available.

Cause	Remedy	Remarks
1. Regulator is out of order	1) Repair regulator.	1) Refer to Regulator Manual.
2. Pump's internal parts are seized or broken.	2)Replace damaged parts.	2)Check filter and drain oil.
3. Attached pump is out of order	3) Replace damaged parts.	3) Remove attached pump and check shaft joint.
4. Attached valve is out of order.	4) Check attached valve. Particularly poppet, seat and spring.	4) Refer to Manual for Attached Valve.
5. Regulator is piped incorrectly.	5) Pipe correctly.	

5) Assembling pilot piston (See Fig. 33-111 (C) section)
Assemble pilot piston (643) into the positive control hole of the casing.

- Make sure that the pilot piston moves smoothly.

6) Assembling lever (See Fig. 33-111 (G) section)
Place pin (875) pressed in lever 2 (613) into the groove of the pilot piston and assemble lever 2 (613).

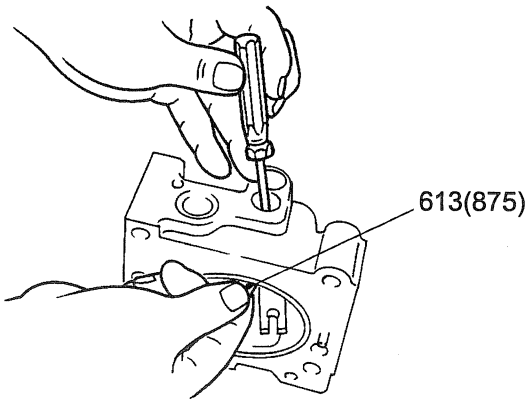


Fig. 33-127 Assembling lever 2 (613)

7) Installing fulcrum plug (See Fig. 33-111 (F) section)
Assemble fulcrum plug (614) so pin (875) pressed in the fulcrum comes in the pin hole of lever 2 (613). Then fit snap ring (858).

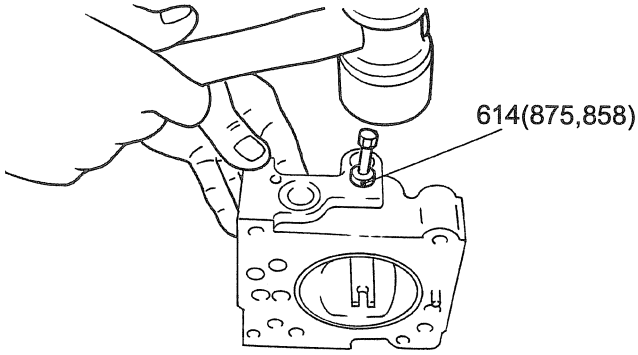


Fig. 33-128 Installing fulcrum plug (614)

8) Installing adjust plug (See Fig. 33-111 (G) section)
Insert adjust plug (615) and fit a snap ring (858).

- Use care so as not to mistake the holes into which the fulcrum and adjust plug are inserted.
- At this point, operate the feedback lever and make sure that the gap is not large and that the lever moves smoothly.

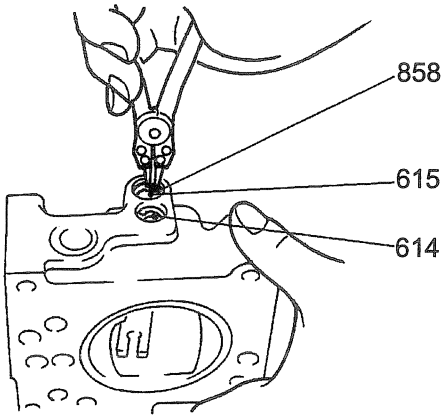


Fig. 33-129 Installing adjust plug (615)

9) Installing return spring and the spring seat (See Fig. 33-111 (A) section)
Assemble return spring (654) and spring seat (653) into the spool hole and fit snap ring (814).

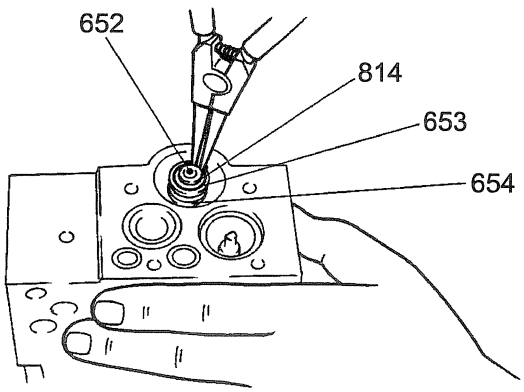


Fig. 33-130 Installing return spring (654) and spring seat (653)

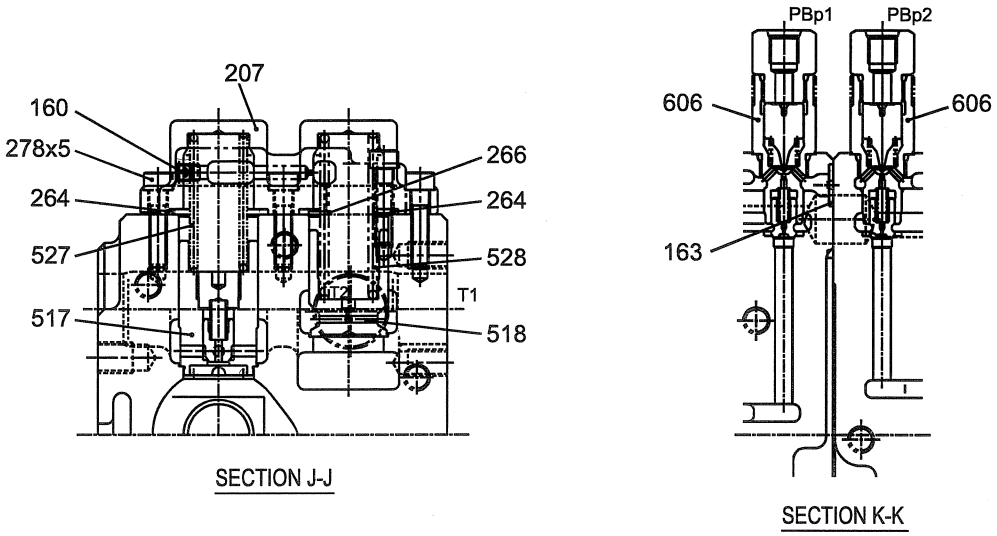


Fig. 33-144 Section (6/6)

33.2.2.3.11 Disassembling P2 unload spool

(1) Loosen socket bolts (273), and remove spring cover (202) of P2 unload spool and O-ring (261).

(2) Draw out the assembly which is consist of P2 unload spool (310), spring seat (331), spring (327, 329), stopper (336) and bolt (333) from casing A (101).

CAUTION

When drawing out the spool assy, use care so as not to score casing A (101).

(3) Fix the P2 unload spool assy with vise via a protective plate (aluminum plate etc.) and remove bolt (333). Then remove spring seat (331), spring (327, 329) and stopper (336) from P2 unload spool (310).

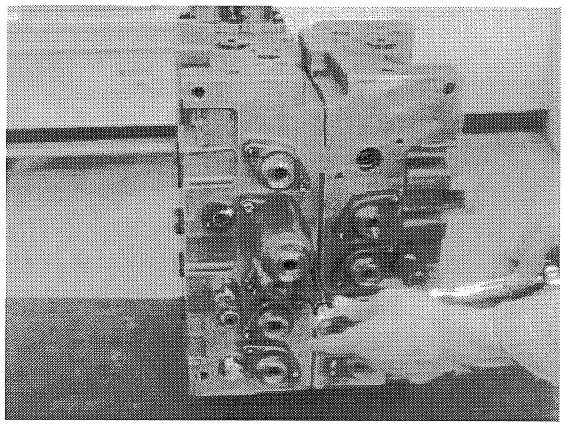


Fig. 33-169 Removing P2 unload spring cover (202)

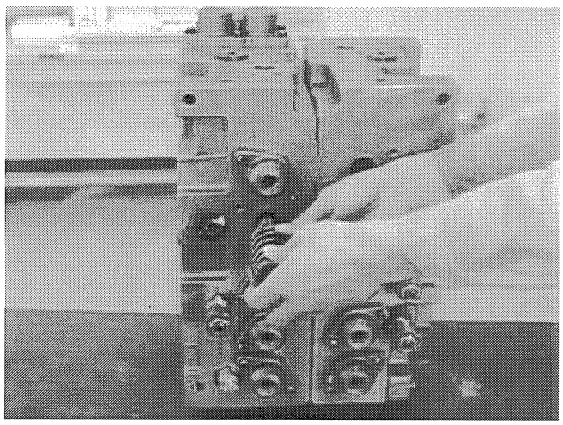


Fig. 33-170 Drawing out P2 unload spool assy (310)

33.2.2.3.12 Removing spool covers

(1) Travel, boom, bucket, arm 1, arm 2 and option
Loosen socket bolts (273) and remove spool cover (205) and O-ring (264).

(2) Swing
Loosen socket bolts (273) and remove spool cover (206) and O-ring (264), (266). Do not disassemble spool cover (206) further unless there is special reason.

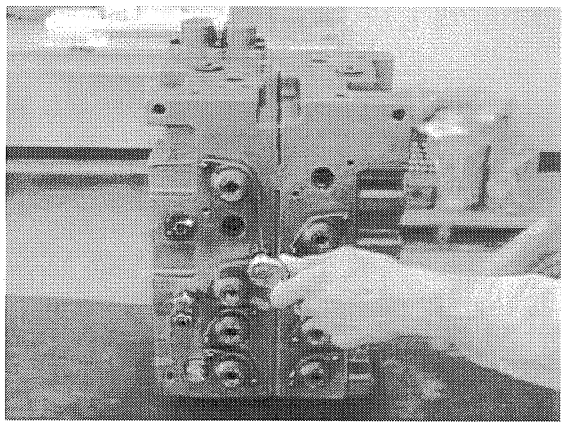


Fig. 33-171 Removing spool cover (205),(206)

33.2.2.4.14 Assembling boom spool

(1) Hold the mid section of boom spool (301) with vise provided with protection plate (aluminum plate, etc.), fit spring seat (331), springs (321), (322) and stopper (336) and tighten bolt (333) to the specified torque.

⚠CAUTION

- Apply Loctite #262 when tightening bolt (333).
- Take care not to deform boom spool (301) because of careless over clamping.

(2) Place boom spool assembly in item (1) in casing B (102).

⚠CAUTION

Place boom spool assembly in casing B (102) carefully. Do not squeeze it into place.

(3) Attach spring cover (203) with O-rings (261), (266) attached to the spring side of boom spool assembly and tighten socket bolt (273) to the specified torque.

33.2.2.4.15 Assembling boom conflux spool

(1) Hold the mid section of boom conflux spool (305) with vise provided with protection plate (aluminum plate, etc.), fit spring seat (331), springs (325)(326) and stopper (339) and tighten bolt (333) to the specified torque.

⚠CAUTION

- Apply Loctite #262 when tightening bolt (333).
- Take care not to deform boom conflux spool (305) because of careless over clamping.

(2) Place boom conflux spool assembly in item (1) in casing A (101).

⚠CAUTION

Place boom conflux spool assembly in casing A (101) carefully. Do not squeeze it into place.

(3) Attach spring cover (202) with O-ring (261) attached to the spring side of boom conflux spool assembly and tighten socket bolt (273) to the specified torque.

33.2.2.4.16 Assembling travel spool (travel right and left)

(1) Hold the mid section of travel spool (306) with vise provided with protection plate (aluminum plate, etc.), fit spring seat (331), springs (323), (324) and stopper (336) and tighten bolt (333) to the specified torque.

⚠CAUTION

- Apply Loctite #262 when tightening bolt (333).
- Take care not to deform travel spool (306) because of careless over clamping.

(2) Place travel spool assembly in item (1) in casing A (101) or casing B (102).

⚠CAUTION

Place travel spool assembly in casing A (101) or casing B (102) carefully. Do not squeeze it into place.

(3) Attach spring cover (201) with O-ring (261) attached to the spring side of travel spool assembly and tighten socket bolt (273) to the specified torque.

(11)Pull out push rod (212) from plug (211).

(12)Remove O-ring (214) from plug (211).

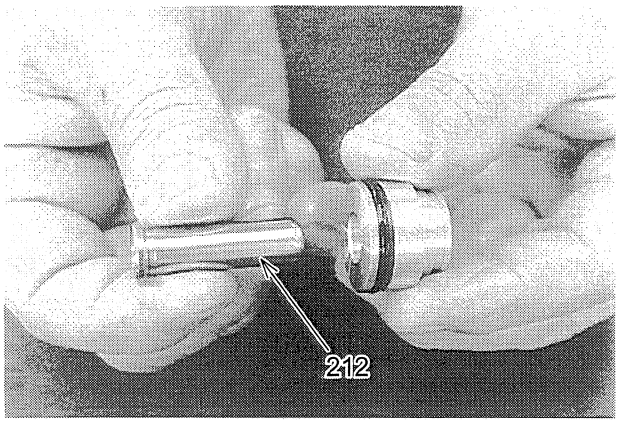


Fig. 33-195 Removing push rod (212)

(13)Remove inside seal (213) from plug (211) with small driver.

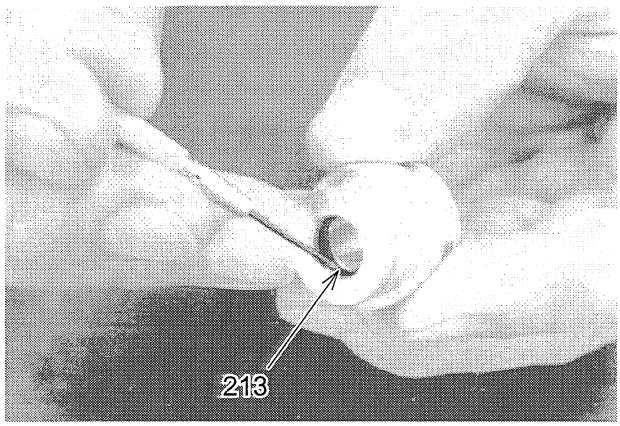


Fig. 33-196 Removing seal (213)

33.2.3.3 CLEANING PARTS

(1) Clean parts with wash oil roughly.

(2) Clean parts with wash oil completely.

(3) Dry parts by swabbing clean rag.

(4) Apply rust preventives on parts.

33.2.3.4 ASSEMBLING

(1) Fit washer 2 (217), springs (241-1), (241-2), spring seats (216-1), (216-2) to spool (201-1), (201-2).

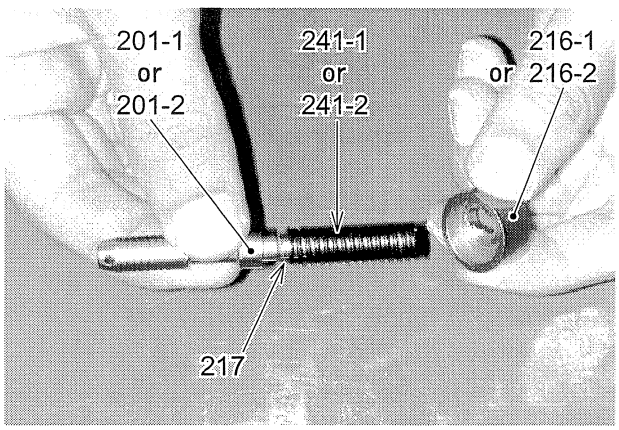


Fig. 33-197 Assembling pressure reducing valve

- Squeeze the seal between your fingers to obtain a 8-shape.
  (See Fig. 33-217 No.5)
- Insert the seal within the groove with your fingers (lip in bottom position).
  (See Fig. 33-217 No.6, 7)
- Push the seal against the side using the round head of a small socket wrench. (Fig. 33-217 No.8)

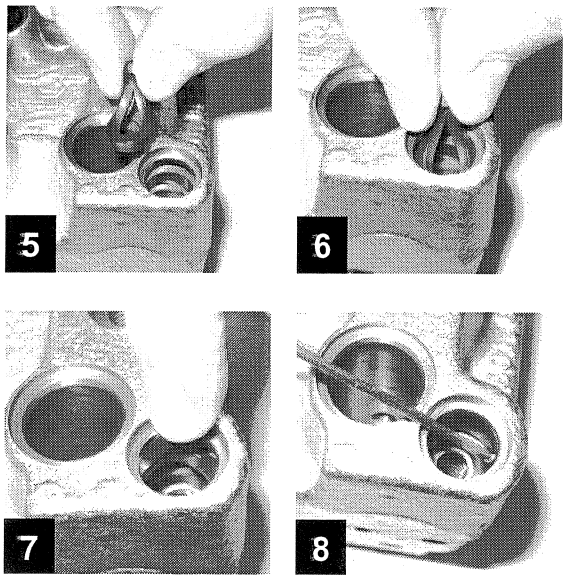


Fig. 33-217

⚠CAUTION

During the reassembly, make sure the seal is correctly positionned, and pay attention not to damage nor twist it.

5) Repeat the operation for the other 3 assemblies.

6) Extract the damping springs from the body (using flat nose pliers).

7) Inspect the damping springs. If defects are detected, replace the 4 springs.

8) Reassemble parts in reverse order.

(6) Guide/plunger and regulation unit replacement

1) Remove

- The pilot control unit from the machine.
- Both rubber boots (See 33.2.4.2 (1))
- Both switch plates (See 33.2.4.2 (2))
- The retaining plate (See 33.2.4.2 (4))

2) Guide/plunger replacement :

- Insert the end of a thin screwdriver between the guide and the body, carefully lift the guide to remove it from the body.

Note

Hold the guides with the other hand during the extraction operation to limit the effect of the return spring.

3) Remove the guide / plunger assembly.

4) Repeat the operation for the other 3 sub-assemblies.

5) Visually check that the guides / plungers are in good condition. If defects are present, replace the 4 sub-assemblies.

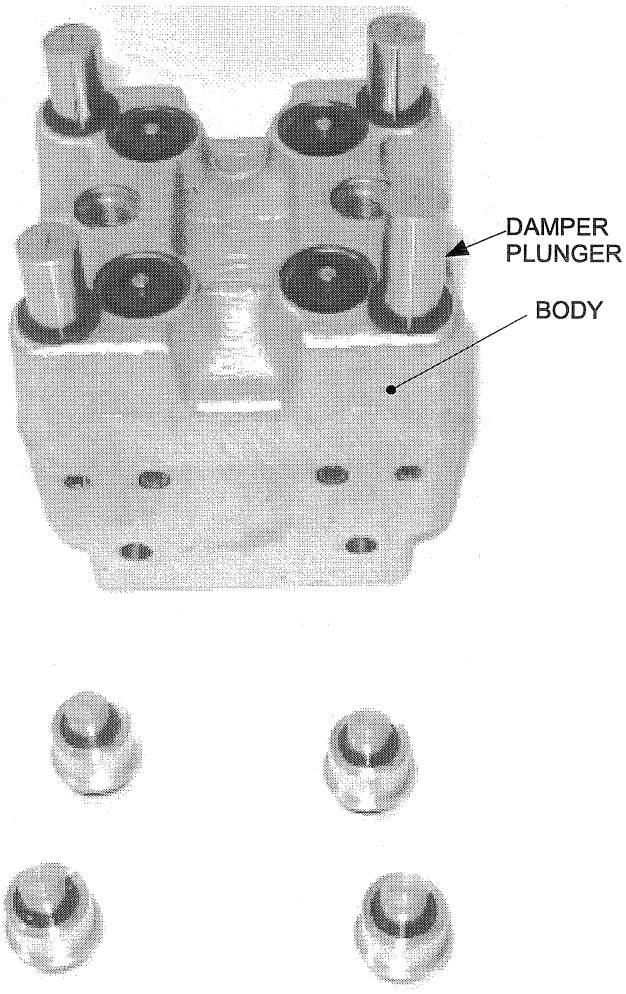


Fig. 33-218

3) Loosen relief valve (051) and separate it from valve casing (303).

: 41 mm

4) Loosen anti-reaction valve sub assy (052) and remove from valve casing (303). (See Fig. 33-232)

: 6 mm

5) Separate ROMH plug (469) from valve casing (303) and draw out spring (355) and plunger (351).

: 14 mm

6) Loosen socket bolt (401) and separate valve casing (303) from casing (301). If the socket bolt (401) are loosened, the valve casing floats off casing (301) by the force of brake spring (712). Then separate valve plate (131) from valve casing (303).

: 17 mm

7) Draw out brake spring (712) from brake piston (702).

8) Put the claw of the brake piston removing jig in the concaved part of brake piston (702). Tighten 2 bolts of jig simultaneously, and draw out the brake piston (702) with the jig, from the casing.

9) Lay the motor on its side again and draw out cylinder block (111) from drive shaft (101). Then draw out piston (121), set plate (123), spring (114) and shoe plate (124).

CAUTION

Handle the parts with care so as not to score the sliding surfaces of cylinder block (111) and shoe (122).

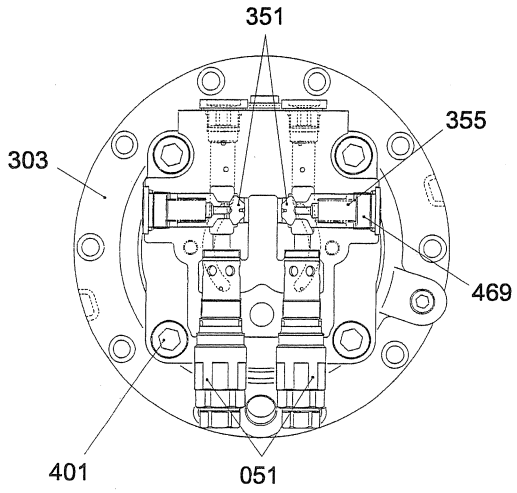


Fig. 33-233 Removing relief valve (651), anti-reactionvalve (052), anti-cavitation plunger (351) and valve casing (303)

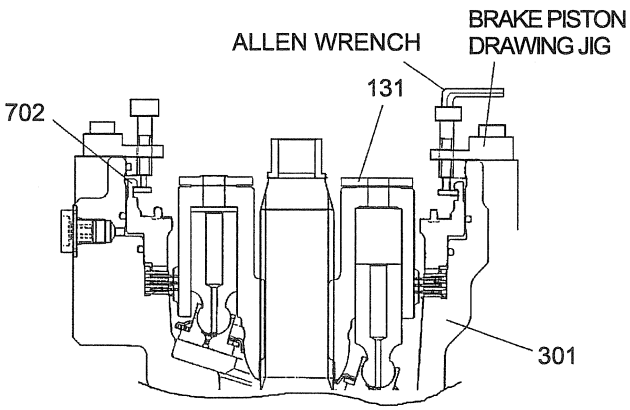


Fig. 33-234 Removing brake piston (702)

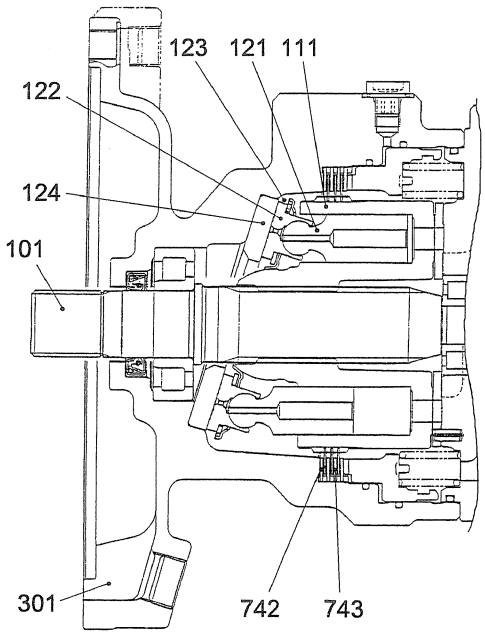


Fig. 33-235 Drawing cylider block (111), piston sub assy, friction plate (742) and separator plate

33.2.5.3.3 Assembly

(1) Preparation

1) Sufficiently clean every part with wash oil and dry it with compressed air.

2) Check on every part for failure.

(2) Assembling pinion shaft assy

1) Attaching oil seal
Attach oil seal (30) to sleeve (21) by means of jig (e).

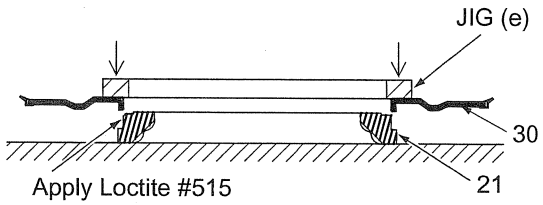


Fig. 33-254 Attaching oil seal (30)

2) Inserting sleeve
Insert sleeve (21) and oils seal (30) assy in pinion shaft (1).

3) Applying gear oil
Apply gear oil to the perimeter of axis of pinion shaft (1) lightly to prevent seizure.

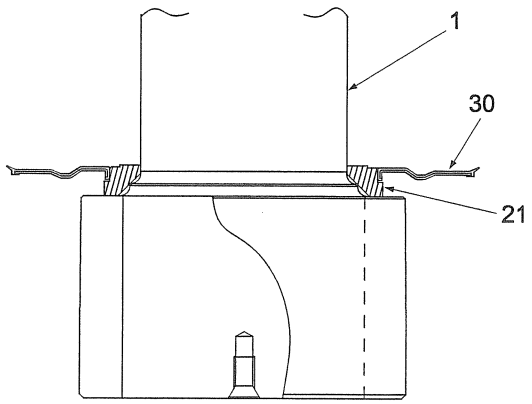


Fig. 33-255 Inserting sleeve in pinion shaft

4) Fitting spherical bearing (lower)
Seal sufficient grease in spherical bearing (lower)(11) and force it in pinion shaft (1) by means of jig (f).
Press force : 4~5t

- Since the bearing is formed with a partition at the center section, seal grease in it from both sides.

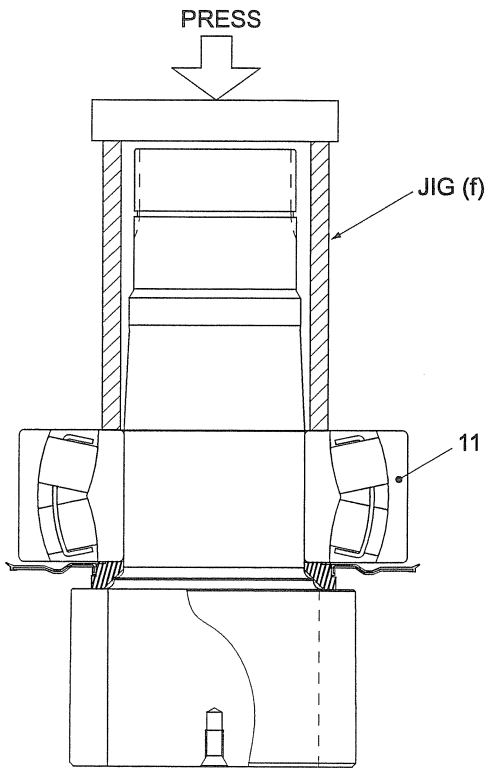


Fig. 33-256 Fitting spherical bearing (lower)

(4) Brake torque is insufficient.

Trouble	Cause	Remedy
Brake torque isinsufficient.	1. Friction plate is worn.	1. Disassemble and check. Replace if wear is beyond standard value.
	2. Brake piston is stuck.	2. Disassemble and check.
	3. Brake release pressure is not released.	3. Check and correct circuit.
	4. Break release spool is stuck.	4. Disassemble and check.
	5. Spline of friction plate is damaged.	5. Disassemble and check. Replace damaged part.

(5) The swing motor drifts much.
Check the drain rate of the hydraulic motor. If it is less than 4 L/min (1.1 gal/min), you should think that the motor is not faulty.

Trouble	Cause	Remedy
The swing motor drifts much when it is actuated by external torques. (e.g. Machine is on a slope.)	1.Relief valve malfunctions. Same as (1).	1. Replace. Same as (1).
	2. Plunger seat is faulty.	2. Replace.
	3. Seat of the anti-reaction valve is no good.	3. Replace the anti-reaction valve cartridge or block.

(6) Oil leaks

1) Oil leak from oil seal

Trouble	Cause	Remedy
Oil leaks from oil seal	1. Lip of seal catches contaminant and damaged.	1. Replace oil seal.
	2. Shaft is damaged or worn.	2. Shift the lip and shaft positions or replace oil seal.
	3. Casing inner pressure has risen abnormally high, with the result that lip of oil seal is flipped.	3. Repair drain piping if clogged up.
	4. Shaft is rusted.	4. Disassemble and correct.

2) Oil leak from matching surface

Trouble	Cause	Remedy
Oil leak from matching surface	1. O-ring is missing.	1. Set O-ring correctly and assemble it.
	2. O-ring has a scratch.	2. Replace.
	3. Seal surface has a scratch.	3. Disassemble and correct.
	4. Bolt is loose or damaged.	4. Tighten to specified torque or replace.

33.2.6.3.3 Inspection after assembly

After completion of assembly, inspection for oil leakage, pressure resistance, etc., using a device as shown in Fig. 33-281.

(1) High pressure port (A,B,C,D and F port)
Install a directional valve and pressure gauge to the stem side port and body side port respectively, and while watching the pressure gauge (for high pressure) installed on the body side and also by regulating high pressure relief valve (7), gradually increase the pressure and when the pressure has reached 1.5 times the maximum working pressure, close stop valve (3) and lock in the hydraulic oil in the swivel. Keep stop valve (6) on the low pressure relief valve side closed at this time.
Check that it is free from looseness, deformation, breakage, etc. under three minutes pressurizing. And, the oil leakage must be checked for the first 1 minute, and if there be a pressure drop for any reason, the pressure drop should be in 10% of the trapped pressure.
This checking must be carried out for every circuit.

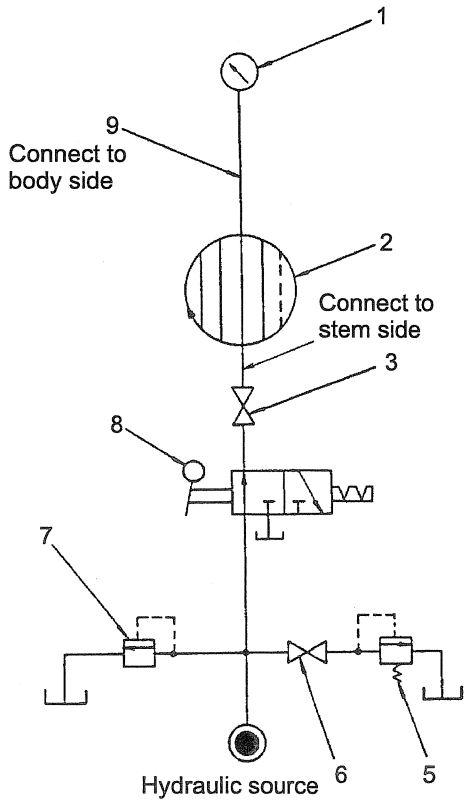


Fig. 33-281 Hydraulic circuit for inspection equipment

(2) Low pressure port (E port)
Similar to the high pressure port, install a directional valve and pressure gauge on each port of the stem side and body side.
Open stop valve (6) on the side of low pressure relief valve (5) and while watching the pressure gauge (for low pressure) connected to the body side and also by regulating low pressure relief valve (5), gradually increase the pressure and check for outside leakage with a color check at a pressure of 0.49MPa (71psi).

Item	Description	Remarks
1	Pressure Gauge	High and Low Pressures are required.
2	Swivel Joint	
3	Stop Valve	
5	Relief Valve for low pressure	Setting Pressure : 0.49MPa (71psi)
6	Stop Valve	
7	Relief Valve for high pressure	Setting Pressure (Working pressure X 1.5times)
8	Directional Valve	
9	Piping, etc.	

33.2.6.3.4 Troubleshooting

Trouble	Cause	Remedy
1. External leakage of hydraulic oil	Defective O-ring & seal	Replace all seals.
2. Internal leakage of hydraulic oil	1) Defective slipper seal	1) Replace all seals.
	2) Sliding face worn excessively	2) Replace assy.
3. Swivel stem seized	1) Stem and body seized	1) Grind and hone. Replace assy, if stem and body are too loose and causing oil leakage.
	2) Inappropriate swivel stopper bracket	2) Reinstall Secure 2~3mm (0.08~0.12in) allowance for bolt stopper.
4. Loose swivel stem and cover	Socket bolt tightened insufficiently.	Retighten.

7) Removing floating seal (7).
Take out floating seal (7) from roller (1).

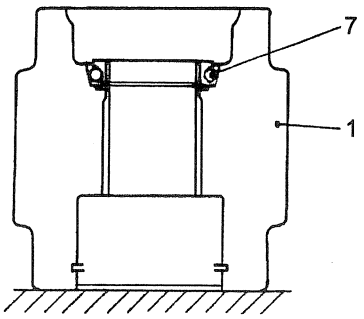


Fig. 34-16 Taking out floating seal

8) Removing floating seal (7).
Remove from collar (3), floating seal (7) that is located on the side from which shaft (2) was disassembled.

Note

Collar (3) is press fitted into shaft (2). Therefore do not disassemble it.

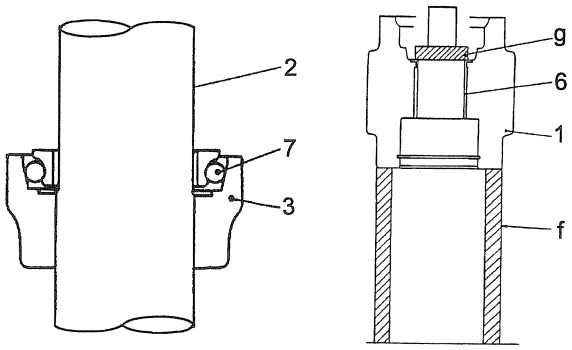


Fig. 34-17 Removing floating seal and extruding bushing

9) Removing bushing (6)
Since the bushing is thin, machine it on a lathe or scrape it off, take care so as not to damage the bore of roller (1).
If the bushing is not worn much, mount upper roller (1) on jig (f), insert jig (g) into the end face of bushing (6) and push it out with a press.

(2) Assembly
Assembly of the upper roller is done in the reverse order of disassembly.

1) Place upper roller (1) on the top end face of jig (f), with its floating seal setting side facing down.

2) Confirm that the outer surface of bushing (6) is not scuffed and coat the outer surface of the inserting side of the bushing, with molybdenum disulfide grease.

3) Put jig (i) into bushing (6) and press it in, using the bore of the bushing and the bore of the roller as guides.

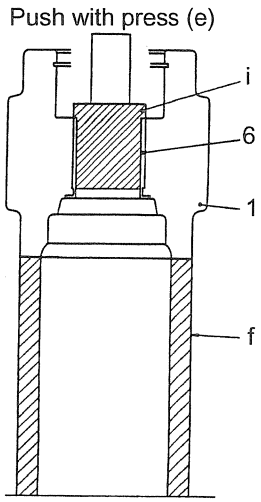


Fig. 34-18 Pushing in bushing

Note

If you fail in this operation by pressing the bushing unevenly, the bushing is distorted and gets unserviceable. In that case, do not re-use the bushing as it may develop malfunctioning after assembly.

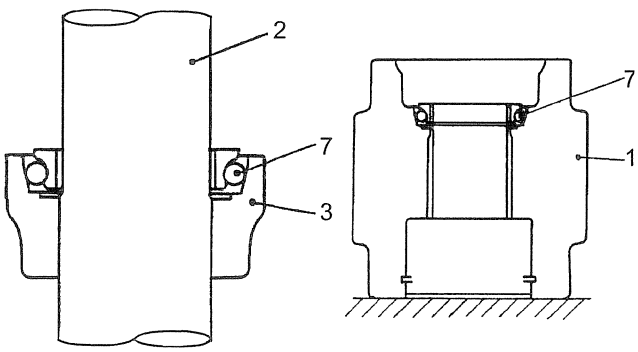


Fig. 34-19 Fixing floating seal

34.1.4.6 MAINTENANCE STANDARD

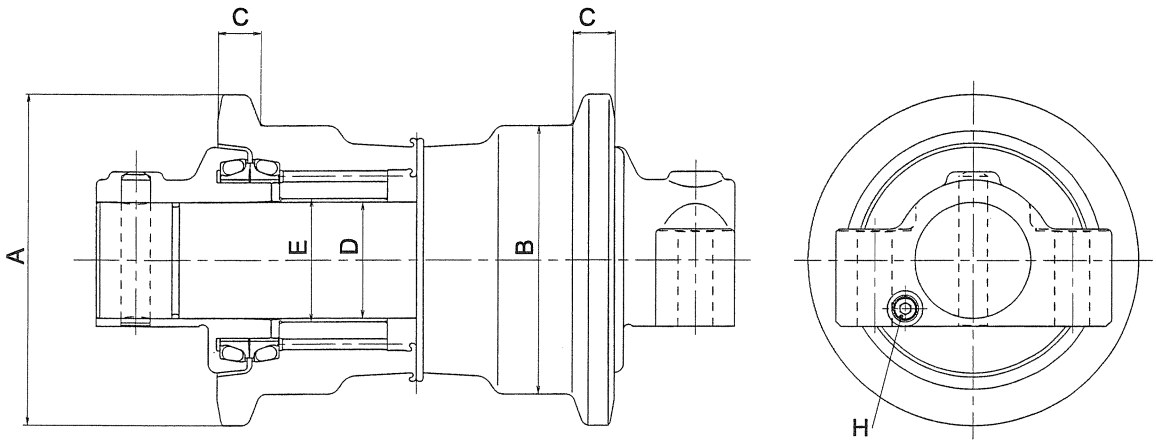


Fig. 34-40 Lower roller (Track roller)

Unit : mm (in)

No.	ITEM	STANDARD VALUE			REPAIRABLE LEVEL	SERVICE LIMIT	REMEDY
A	O.D. of flange	ø 185 (7.28)			—	—	Reinforcement weld, repair or replace
B	Tread dia.	ø 150 (5.91)			ø 134 (5.28)	ø 128 (5.04)	
C	Flange width	23.5 (0.925)			18 (0.709)	16.5 (0.65)	Replace bushing
D	Clearance between shaft and bushing (Wrapped bushing)	Basic dimension	Tolerance		Fit	Fit	
		ø 65 (2.55905)	Shaft	- 0.060 (-0.00236) - 0.090 (-0.00354)	Clearance 0.7 (0.276)	Clearance 1.0 (0.394)	
E	Interference between roller and bushing	ø 69 (2.71653)	Hole	+ 0.030 (+0.00118) - 0.020 (-0.00079)	Interference 0	Clearance 0.01 (0.0004)	
F	Oil	Engine oil API grade CD #30, 160cc (9.8 cu•in)					Refill
H	Plug (8)	Execute air leak test at 0.2MPa (28psi) before tightening the plug.					
	Roller rotation	Rotates smoothly by hand.					Reassembly

6) Installing U-packing (9), O-ring (8)
Fit U-packing (9) and O-ring (8) to grease cylinder (1).

- Grease oil seal (9) and O-ring (8).

7) Filling grease cylinder(1) with grease.
Fill up grease in cylinder (1), remove the grease nipple from piston (6) to discharge the inside air, and press in the piston by hand.

- Direct grease nipple hole downward to make air discharge easier.

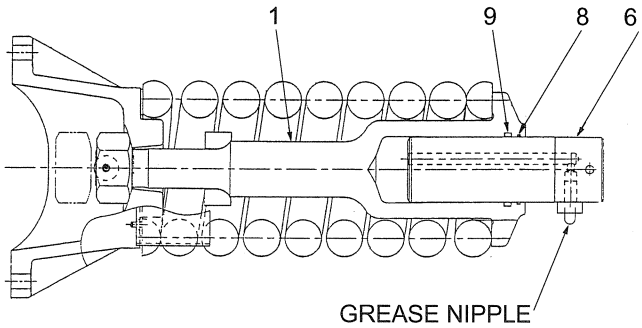


Fig. 34-64 Grease cylinder (1)

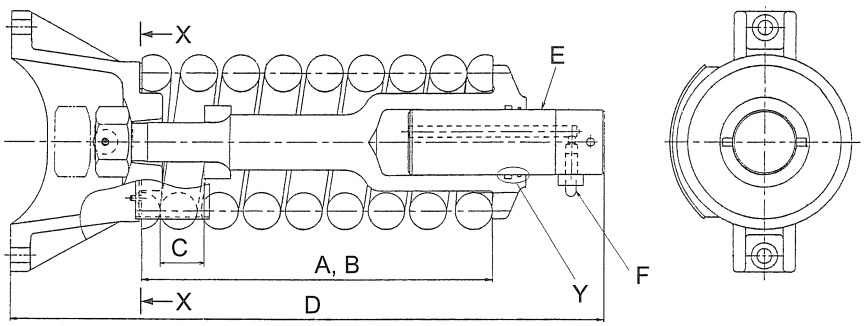
8) Installing grease nipple
Tighten grease nipple to piston (6).

: 19 mm,

Tightening torque : 59 N•m (43 lbf•ft)

34.1.5.4.3 MAINTENANCE STANDARD

No.	ITEM	STANDARD VALUE
A	Installed length of spring	429mm (16.9 in)
B	Free length of spring	Approx. 540.1mm (21.3 in)
C	Stroke	51.8mm (2.04in)
D	Set length	716mm (28.2in)
E	Outside view of piston	Nor scoring and rusting
F	Tightening torque of grease nipple	59N•m (43 lbf•ft)



INSTALL A SPRING WHOSE STARTING POINT AT BRACKET SIDE TO BE 35 DEGREE.

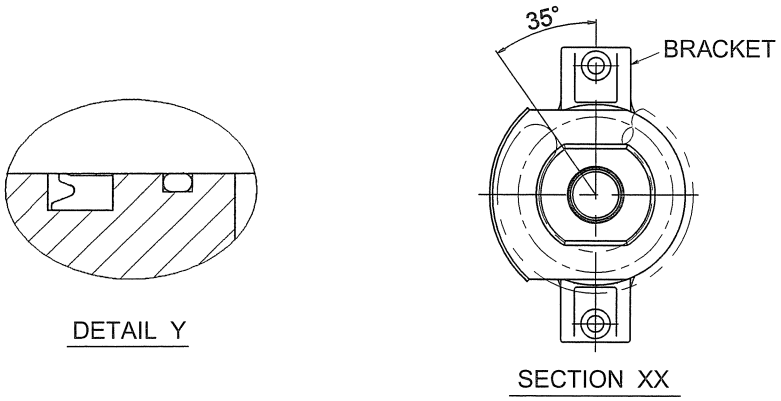


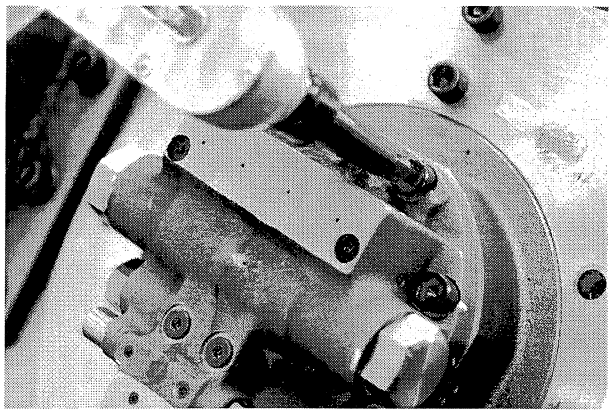
Fig. 34-65

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Hub	1		Piston assembly	1		Rear flange assembly	
3	Carrier [1]	1	161	• Piston	1	301	• Rear flange	1
4	Sun gear [1]	1	163	• Seal	1			
5	Planetary gear [1]	3	162	Steel ball	1		• Spool assembly	1
6	Carrier pin [1]	3	102	Shaft	1	323	•• Spool	1
7	Carrier [2]	1				326	•• Plug	2
8	Sun gear [2]	1		Swash plate kit	1	327	•• Valve	2
9	Planetary gear [2]	3	103	• Swash plate	1	328	•• Spring	2
10	Carrier pin [2]	3	167	• Pivot	2	331	•• O-ring	2
11	Thrust washer [1]	6	107	Retainer plate	1	324	• Plug	2
12	Thrust washer [2]	6	108	Thrust ball	1	325	• Spring retainer	2
13	Thrust plate	1	109	Timing plate	1	329	• O-ring	2
14	Cover	1	112	Piston	1	330	• Spring	2
15	Coupling	1	113	Spring	8	363	• Spool	1
16	Parallel pin [1]	3	114	Spring	9	364	• Connector	1
17	Parallel pin [2]	3	115	Friction plate	3	365	• Pin	1
22	Lock washer	2	116	Separator plate	4	366	• Spring	1
23	Shim	1	119	Shim	1~2	367	• Spring retainer	1
24	Angular ball bearing	2	132	Oil seal	1	368	• G (PF) 1/4 plug	2
27	Needle-roller bearing	3	133	Snap ring (for hole)	1	369	• O-ring	2
28	Needle-roller bearing	3	135	D ring	1	370	• G (PF) 3/8 plug	1
29	Floating seal	1	139	D ring	1	371	• O-ring	2
30	Plug	3	149	Taper roller bearing	1	372	• Orifice	2
31	O-ring	3	150	Taper roller bearing	1	373	• Orifice spring	2
35	Socket bolt	18				374	• G (PF) 1/8 plug	5
36	Snap ring (for hole)	1		Relief valve assembly		375	• O-ring	6
			201	• Valve seat	2	376	• M6 orifice	3
101	Spindle	1	202	• Valve	1	377	• Check valve	3
137	Socket plug	1	203	• Sleeve	1	378	• Check valve spring	3
138	Expander	1	204	• Plug	1	379	• O-ring	1
			205	• Spring retainer	1	380	• O-ring	1
	Piston kit	1	206	• Piston	1	341	• Parallel pin	1
	• Piston assembly	9	207	• Spring	1	343	• Socket bolt	8
105	•• Piston	1	208	• Piston seal	1	345	• Socket plug	15
106	•• Shoe	1	209	• Piston seal	1			
104	Cylinder block	1	210	• O-ring	1	399	Name plate	1

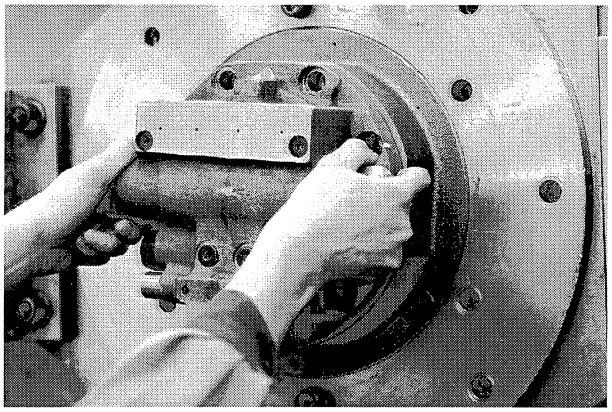
(12) Removing rear flange assembly

1) Directs rear flange (301) upward.

2) Loosen 8 socket bolts (348) and remove rear flange.



3) Remove rear flange from spindle (101).

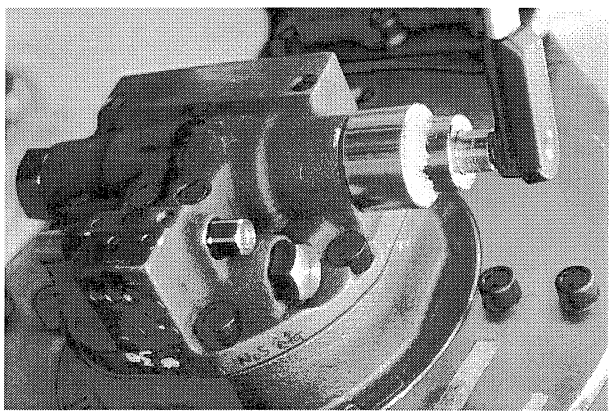


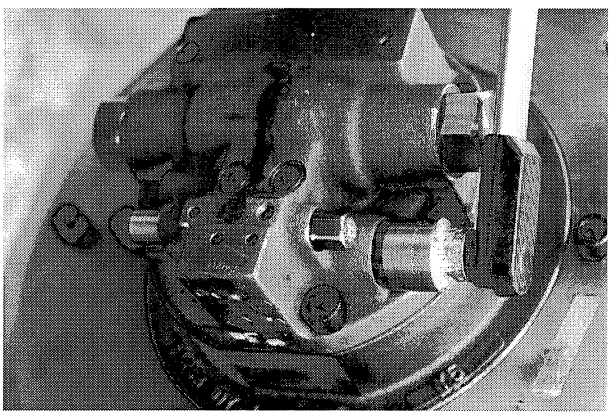
Note

When the rear flange is removed by both hands, pay attention to timing plate (109) and spring (113) so as not to drop.

Note

When disassembling the parts of rear flange section, loosen each plug before loosening socket bolts used to secure rear flange [operation of (12) 2] to facilitate going ahead with the disassembly which is carried out later.





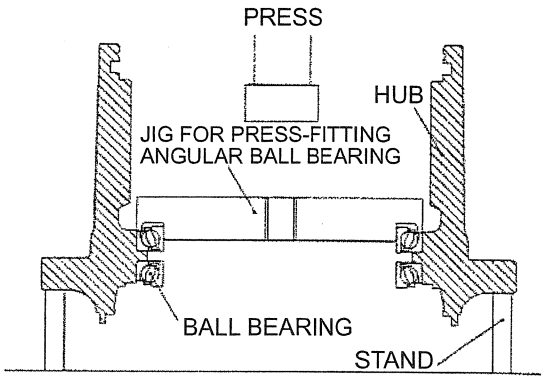
(7) Assembling hub

1) Place hub (1) on press work bench.

2) Install angular ball bearing (24) in the hub, place ball bearing press fitting jig on the outer race of angular ball bearing, and press fit it in the hub by means of press.

3) Turn over the hub.

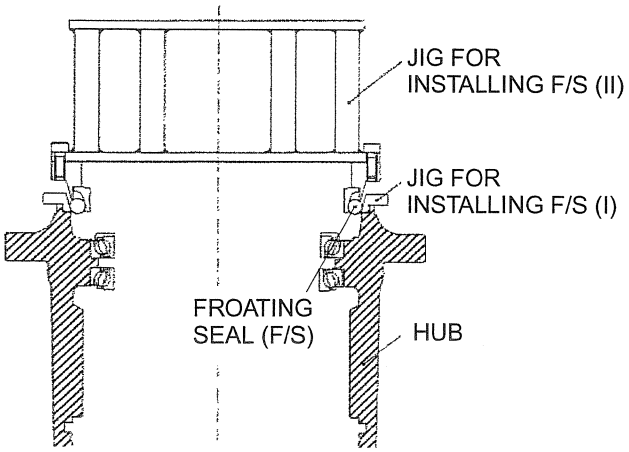
4) Press fit angular ball bearing in the hub by the same procedure as that described in above 2).



Note

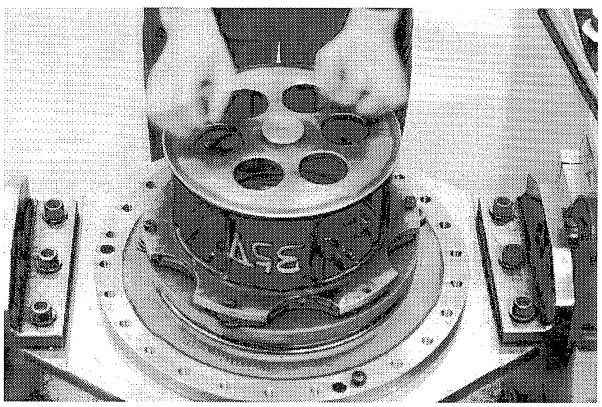
Pay attention to the direction of ball bearing (24) to be attached.

5) Place the hub on work bench and fix it.



6) Apply grease to O-ring of floating seal (29), and fit floating seal into floating seal groove of hub (1).

7) Similarly, fit floating seal into floating seal groove of spindle (101).



Note

- When applying grease to O-ring of floating seal, take O-ring out of floating seal and apply thin coat of grease to perimeter of O-ring.
- Remove jig F/S (I) for installing floating seal and make sure that spindle groove end face is in parallel with floating seal surface within the range of 1mm. When it is not in parallel, it might cause leaking oil and seizure. Perform the procedure from the first again.

46.3 THE BLOWN FUSE OF MECHATRO CONTROLLER

If the fuse of the mechatro controller has blown, the following display appears on the gauge cluster.

(1) The blown fuse of mechatro controller

a. Blown fuse 5A of mechatro controller:
"DATA COMMUNICATION ERROR" is displayed on the gauge cluster in the condition where the controller program is not executed.

b. Blown fuse 20A of mechatro controller:
The controller functions normally but the power supply applied when the controller drives the solenoid, etc. stops.
Many error codes are displayed on the gauge cluster.
D013, D023, D033, D063,
E013, E023, F021

Table 46-13

Error code		B024		
Trouble		Boom down pressure sensor's power source is shortcut.		
Judging condition		The input voltage from boom down pressure sensor is 4.7V or more.		
Symptom		The boom down operability becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to constant current. (Current when all operation is in neutral.) Only on independent operation of boom-up, set output of P1 unload proportional valve to 750mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	5	B-2 BOOM LOWER
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Boom down pressure sensor SE-4			When B024 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between boom down pressure sensor and controller CN-127F CN-101F			When B024 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller			Check that the error is corrected after replacement of controller.

Table 46-14

Error code		B032		
Trouble		Arm-in pressure sensor outputs error		
Judging condition		After starter switch ON and engine does not start yet. And the input voltage from the sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom		The arm-out operability becomes poor.		
Control in the event of failure		Normal control		
Returned in normal condition		Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen		Screen No.	5	B-3 ARM OUT
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Arm-out pressure sensor SE-8			When B032 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between arm-out pressure sensor and controller CN-131F CN-101F			When B032 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller			Check that the error is corrected after replacement of controller.

Table 46-30

Error code		B093		
Trouble		Travel right pressure sensor's wiring is disconnected.		
Judging condition		The input voltage from Travel right pressure sensor is 0.1V or less.		
Symptom		The Travel right operability becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to constant current. (Current when all operation is in neutral.) Only on independent operation of boom-up, set output of P1, P2 unload proportional valves to 750mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	B-9 TRAVEL (R)
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Travel right pressure sensor SE-9			When B093 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between travel right pressure sensor and controller CN-301F CN-102F			When B093 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller			Check that the error is corrected after replacement of controller.

Table 46-31

Error code		B094		
Trouble		Travel right pressure sensor's power source is shortcut.		
Judging condition		The input voltage from Travel right pressure sensor is 4.7V or more.		
Symptom		The Travel right operability becomes poor.		
Control in the event of failure		Set proportional valve output rate of P1 and P2 pumps to constant current. (Current when all operation is in neutral.) Only on independent operation of boom-up, set output of P1, P2 unload proportional valves to 750mA.		
Returned in normal condition		It returns automatically in normal condition.		
Service diagnosis checking screen		Screen No.	6	B-9 TRAVEL (R)
		Screen No.		
		Screen No.		
Checking object				Checking contents and remedy
1	-Travel right pressure sensor SE-9			When B094 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between travel right pressure sensor and controller CN-301F CN-102F			When B094 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller			Check that the error is corrected after replacement of controller.

Table 46-45

Error code	C014		
Trouble	P1 pump pressure sensor's power source is shortcut.		
Judging condition	The input voltage from P1 pump pressure sensor is 4.7V or more.		
Symptom	The delicate operability of P1 pump related attachment becomes poor.		
Control in the event of failure	Set P1 pump pressure to 25MPa and control pump.		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	C-1 PUMP P1
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	-P1 pump pressure sensor SE-22	When C014 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between P1 pump pressure sensor and controller CN-139F CN-103F	When C014 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller	Check that the error is corrected after replacement of controller.

Table 46-46

Error code	C022		
Trouble	P2 pump pressure sensor outputs error.		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P2 pump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P2 pump operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	-P2 pump pressure sensor SE-23	When C022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.
2	-Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.
3	-Mechatro controller	Check that the error is corrected after replacement of controller.

Table 46-64

Error code	E013		
Trouble	P1 pump proportional valve's wiring is disconnected.		
Judging condition	The feed-back value from proportional valve is 100mA or less. (If output is 100mA or less, judging is not done.)		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	E-1 PUMP P1
	Screen No.		
	Screen No.		

	Checking object	Checking contents and remedy
1	-P1 pump proportional valve PSV-P1	When E013 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it. When replacing of connector is executed, turn off power source once.
2	-Wiring between P1 pump proportional valve and controller CN-141F CN-105F	When E013 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. When replacing of connector is executed, turn off power source once.
3	-Mechatro controller	Check that the error is corrected after replacement of controller.

Table 46-81

Error code	G042		
Trouble	Mechatro controller direct input speed sensor and received data from engine controller are overrun.		
Judging condition	Engine rpm input is 3000rpm or more. (Only trouble history)		
Symptom	Operate without problem.		
Control in the event of failure	Normal control		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	2	G-3 MEAS 1 (for mechatro controller)
	Screen No.	2	G-3 MEAS 2 (receive from engine controller)
	Screen No.		

Checking object		Checking contents and remedy
1	-Engine speed sensor SE-13	Measure the resistance between terminals of speed sensor. Normal value: 1.6 to 2.0 kilo-ohms
2	- Wiring between engine speed sensor and controller CN-136F CN-106F	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Especially check wiring for false disconnection and noise included.
3	-Wiring between ECU engine speed sensor and controller pressure sensor and controller	Check wiring for possible failure according to the wiring checking procedure and repair it if necessary. Especially check wiring for false disconnection and noise included.
4	-Mechatro controller	Check that the error is corrected after replacement of controller. (Controller is broken by only applying power to grounding of signal.)
5	-Engine controller	Check that the error is corrected after replacement of controller.

No.	Sections	Contents/normal value		Corrective action, others
12	Actual measuring current value of P1/ P2 pump proportional valve	Carry out service diagnosis.	-No.9 E-1 P1 pump E-2 P2 pump -See Service Diagnosis Data List Operation No.18 Travel right full lever & idling Operation No.19 Travel left full lever & idling	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
13	Secondary pressure of pump proportional valve	Measure the pump proportional valve secondary pressure directly in idling operation. (Ports a3, a4)	Check that pump proportional valve secondary pressure is 2.7MPa or more in right (left) travel full lever and high idling operation Right travel: P1 pump proportional valve Left travel: P2 pump proportional valve	Replace proportional valve
14	Main relief pressure	Carry out service diagnosis	-See Service Diagnosis Data List Operation No.3 Boom up full lever & relief	Measure the relief pressure actually
15	Check set pressure	Check that P1 and P2 pump pressures are 32MPa or more in boom up full lever, high idling and H mode operation.	Reset or replace	
16	Pump regulator	Visual check	When removing, free from abnormal resistance against sliding. Free from abnormal damage, etc on outside surface Spring free from breakage, damage, etc.	Replace
17	Pump	Visual check	When removing, inside parts (cylinder block, piston, valve plate, shaft, etc.) are free from abnormal resistance against sliding, abnormal damage, etc.	Replace

No.	Sections	Contents/normal value		Corrective action, others
17	Arm 2 spool <Trouble> P1, P2 pressure is high or low.	Visual check	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring is free from breakage.	Replace (Check on the casing side for damage)
18	Check arm 2 spool and recirculation <Trouble> Arm in power is poor.	Disassembly and investigation	Free from abnormal resistance against sliding Spring is free from breakage.	Replace spool assembly
19	Check lock valve poppet <Trouble> Both P1, P2 pressures are high.	Visual check	Free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface	Replace (Check on the casing side for damage)

(13) Swing drifts on a slope while swing control lever is in neutral position

No.	Sections	Contents/normal value		Corrective action, others
1	Swing pressure sensor	Carry out service diagnosis	-Engine stop & starter key ON All pilot low pressure sensors are within range of 0 to 0.1MPa.	Check and replace pressure sensor
2	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage	Replace
3	Swing parking brake solenoid	Carry out service diagnosis	No.3 F-2 SWING-BRAKE Lever neutral: COMP ON, MEAS ON Swing: COMP OFF, MEAS OFF	Check swing pressure sensor Check harness Check parking brake release switch
4		Measurement of solenoid valve A2 port	Lever neutral: 0MPa In operation: 4MPa or more	Replace solenoid valve
5	Swing motor (Brake valve/ friction plate)	Visual check	Disassemble and inspect abnormal wear and scuffing	Replace
6	Parking brake	Visual check	Piston and friction plate do not have abnormal resistance against sliding Free from spring damage	Replace

(14) Swing drifts at stopping

No.	Sections	Contents/normal value		Corrective action, others
1	Shuttle valve <Trouble> Pilot pressure is low	Visual check	No contamination on spool cover (short side) and orifice. No damage on spool cover (long side) and shuttle.	Clean or replace
2	Swing pressure sensor	Carry out service diagnosis	-Engine stop & starter key ON All pilot low pressure sensors are within range of 0 to 0.1MPa.	Replace pressure sensor
3	Swing relief valve <Trouble> Relief pressure is low.	Check set pressure	-See Service Diagnosis Data List Operation No.10 Swing full lever and relief	Reset or replace
4	Anti-reaction valve	Visual check	Free from dirt entering Sliding part should be free from foreign matter entering, abnormal damage and wear.	Clean or replace
5	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage	Replace
6	Swing motor	Visual check	Inner parts (cylinder block, piston, valve brake etc) are to be free from abnormal resistance against sliding. Free from abnormal damage, etc on outside surface (brake plate etc)	Replace