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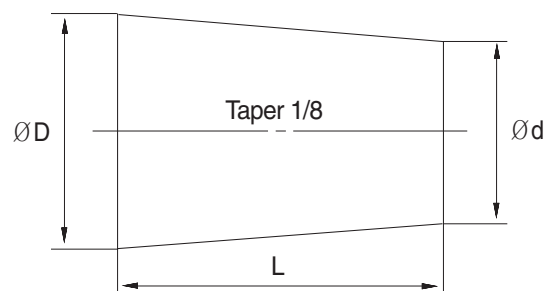
SECTION 8 DISASSEMBLY AND ASSEMBLY

GROUP 1 PRECAUTIONS

1. REMOVAL WORK

- 1) Lower the work equipment completely to the ground.
If the coolant contains antifreeze, dispose of it correctly.
- 2) After disconnecting hoses or tubes, cover them or fit blind plugs to prevent dirt or dust from entering.
- 3) When draining oil, prepare a container of adequate size to catch the oil.
- 4) Confirm the match marks showing the installation position, and make match marks in the necessary places before removal to prevent any mistake when assembling.
- 5) To prevent any excessive force from being applied to the wiring, always hold the connectors when disconnecting the connectors.
- 6) Fit wires and hoses with tags to show their installation position to prevent any mistake when installing.
- 7) Check the number and thickness of the shims, and keep in a safe place.
- 8) When raising components, be sure to use lifting equipment of ample strength.
- 9) When using forcing screws to remove any components, tighten the forcing screws alternately.
- 10) Before removing any unit, clean the surrounding area and fit a cover to prevent any dust or dirt from entering after removal.
- 11) When removing hydraulic equipment, first release the remaining pressure inside the hydraulic tank and the hydraulic piping.
- 12) If the part is not under hydraulic pressure, the following corks can be used.

Nominal number	Dimensions		
	D	d	L
06	6	5	8
08	8	6.5	11
10	10	8.5	12
12	12	10	15
14	14	11.5	18
16	16	13.5	20
18	18	15	22
20	20	17	25
22	22	18.5	28
24	24	20	30
27	27	22.5	34



2. INSTALL WORK

- 1) Tighten all bolts and nuts (Sleeve nuts) to the specified torque.
- 2) Install the hoses without twisting or interference.
- 3) Replace all gaskets, O-rings, cotter pins, and lock plates with new parts.
- 4) Bend the cotter pin or lock plate securely.
- 5) When coating with adhesive, clean the part and remove all oil and grease, then coat the threaded portion with 2-3 drops of adhesive.
- 6) When coating with gasket sealant, clean the surface and remove all oil and grease, check that there is no dirt or damage, then coat uniformly with gasket sealant.
- 7) Clean all parts, and correct any damage, dents, burrs, or rust.
- 8) Coat rotating parts and sliding parts with engine oil.
- 9) When press fitting parts, coat the surface with antifriction compound (LM-P).
- 10) After installing snap rings, check that the snap ring is fitted securely in the ring groove (Check that the snap ring moves in the direction of rotation).
- 11) When connecting wiring connectors, clean the connector to remove all oil, dirt, or water, then connect securely.
- 12) When using eyebolts, check that there is no deformation or deterioration, and screw them in fully.
- 13) When tightening split flanges, tighten uniformly in turn to prevent excessive tightening on one side.
- 14) When operating the hydraulic cylinders for the first time after repairing and reassembling the hydraulic cylinders, pumps, or other hydraulic equipment or piping, always bleed the air from the hydraulic cylinders as follows:
 - (1) Start the engine and run at low idling.
 - (2) Operate the control lever and actuate the hydraulic cylinder 4-5 times, stopping 100 mm before the end of the stroke.
 - (3) Next, operate the piston rod to the end of its stroke to relieve the circuit. (The air bleed valve is actuated to bleed the air.)
 - (4) After completing this operation, raise the engine speed to the normal operating condition.
 - ※ If the hydraulic cylinder has been replaced, carry out this procedure before assembling the rod to the work equipment.
 - ※ Carry out the same operation on machines that have been in storage for a long time after completion of repairs.

3. COMPLETING WORK

- 1) If the coolant has been drained, tighten the drain valve, and add water to the specified level. Run the engine to circulate the water through the system. Then check the water level again.
- 2) If the hydraulic equipment has been removed and installed again, add engine oil to the specified level. Run the engine to circulate the oil through the system. Then check the oil level again.
- 3) If the piping or hydraulic equipment, such as hydraulic cylinders, pumps, or motors, have been removed for repair, always bleed the air from the system after reassembling the parts.
- 4) Add the specified amount of grease(Molybdenum disulphied grease) to the work equipment related parts.

GROUP 2 TIGHTENING TORQUE

1. MAJOR COMPONENTS

No.	Descriptions	Bolt size	Torque		
			kgf · m	lbf · ft	
1	Engine	Engine mounting bolt (FR, engine-bracket)	M24 × 3.0	90 ± 9.0	650 ± 65.1
2		Engine mounting bolt (RR, engine-bracket)	M14 × 2.0	18 ± 1.8	130 ± 13.0
3		Engine mounting bolt (bracket-frame)	M24 × 3.0	90 ± 9.0	651 ± 65.1
4		Radiator mounting bolt	M10 × 1.5	55 ± 5.0	398 ± 36.1
5		Coupling mounting socket bolt	M24 × 3.0	87.5 ± 2.5	633 ± 108
6		Fuel tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
7	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.7 ± 1.0	48.4 ± 7.2
8		Main pump mounting bolt	M24 × 3.0	80 ± 8.0	579 ± 57.9
9		Main control valve mounting nut	M20 × 2.5	69.5 ± 10.5	503 ± 76
10		Hydraulic oil tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
11		Turning joint mounting bolt, nut	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
12	Power train system	Swing motor mounting bolt	M24 × 3.0	120 ± 18	868 ± 130
13		Swing bearing upper part mounting bolt	M30 × 3.0	199 ± 20	1439 ± 145
14		Swing bearing lower part mounting bolt	M30 × 3.0	199 ± 20	1439 ± 145
15		Travel motor mounting bolt	M30 × 3.5	199 ± 30	1439 ± 217
16		Sprocket mounting bolt	M30 × 3.5	199 ± 20	1439 ± 144.7
17	Under carriage	Carrier roller mounting bolt, nut	M20 × 2.5	57.9 ± 6.0	419 ± 62.9
18		Track roller mounting bolt	M27 × 3.0	135 ± 13	977 ± 94
19		Track tension cylinder mounting bolt	M20 × 2.5	57.9 ± 6.0	419 ± 43.4
20		Track shoe mounting bolt, nut	1 1/8"-12UNF	196 ± 15	1418 ± 108.5
21		Track guard mounting bolt	M27 × 3.0	135 ± 15	977 ± 109
22	Others	Counterweight mounting bolt	M42 × 3.0	390 ± 40	2821 ± 289
23		Center frame support and lower track mtg bolt	M36 × 3.0	280 ± 30	2025 ± 21.7
24		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
25		Operator's seat mounting bolt	M8 × 1.25	4.05 ± 0.8	293 ± 5.8

※ For tightening torque of engine and hydraulic components, see each component disassembly and assembly.

2. TORQUE CHART

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6×1.0	0.8 ~ 1.2	5.8 ~ 8.6	1.2 ~ 1.8	8.7 ~ 13.0	1.5 ~ 2.1	10.9 ~ 15.1
M 8×1.25	2.0 ~ 3.0	14.5 ~ 21.6	2.8 ~ 4.2	20.3 ~ 30.4	3.4 ~ 5.0	24.6 ~ 36.1
M10×1.5	4.0 ~ 6.0	29.0 ~ 43.3	5.6 ~ 8.4	40.5 ~ 60.8	6.8 ~ 10.0	49.2 ~ 72.3
M12×1.75	6.8 ~ 10.2	50.0 ~ 73.7	9.6 ~ 14.4	69.5 ~ 104	12.3 ~ 16.5	89.0 ~ 119
M14×2.0	10.9 ~ 16.3	78.9 ~ 117	16.3 ~ 21.9	118 ~ 158	19.5 ~ 26.3	141 ~ 190
M16×2.0	17.9 ~ 24.1	130 ~ 174	25.1 ~ 33.9	182 ~ 245	30.2 ~ 40.8	141 ~ 295
M18×2.5	24.8 ~ 33.4	180 ~ 241	34.8 ~ 47.0	252 ~ 340	41.8 ~ 56.4	302 ~ 407
M20×2.5	34.9 ~ 47.1	253 ~ 340	49.1 ~ 66.3	355 ~ 479	58.9 ~ 79.5	426 ~ 575
M22×2.5	46.8 ~ 63.2	339 ~ 457	65.8 ~ 88.8	476 ~ 642	78.9 ~ 106	570 ~ 766
M24×3.0	60.2 ~ 81.4	436 ~ 588	84.6 ~ 114	612 ~ 824	102 ~ 137	738 ~ 991
M30×3.5	120 ~ 161	868 ~ 1164	168 ~ 227	1216 ~ 1641	202 ~ 272	1461 ~ 1967

(2) Fine thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8×1.0	2.1 ~ 3.1	15.2 ~ 22.4	3.0 ~ 4.4	21.7 ~ 31.8	3.6 ~ 5.4	26.1 ~ 39.0
M10×1.25	4.2 ~ 6.2	30.4 ~ 44.9	5.9 ~ 8.7	42.7 ~ 62.9	7.0 ~ 10.4	50.1 ~ 75.2
M12×1.25	7.3 ~ 10.9	52.8 ~ 78.8	10.3 ~ 15.3	74.5 ~ 110	13.1 ~ 17.7	94.8 ~ 128
M14×1.5	12.4 ~ 16.6	89.7 ~ 120	17.4 ~ 23.4	126 ~ 169	20.8 ~ 28.0	151 ~ 202
M16×1.5	18.7 ~ 25.3	136 ~ 182	26.3 ~ 35.5	191 ~ 256	31.6 ~ 42.6	229 ~ 308
M18×1.5	27.1 ~ 36.5	196 ~ 264	38.0 ~ 51.4	275 ~ 371	45.7 ~ 61.7	331 ~ 446
M20×1.5	37.7 ~ 50.9	273 ~ 368	53.1 ~ 71.7	384 ~ 518	63.6 ~ 86.0	460 ~ 622
M22×1.5	51.2 ~ 69.2	370 ~ 500	72.0 ~ 97.2	521 ~ 703	86.4 ~ 116	625 ~ 839
M24×2.0	64.1 ~ 86.5	464 ~ 625	90.1 ~ 121	652 ~ 875	108 ~ 146	782 ~ 1056
M30×2.0	129 ~ 174	933 ~ 1258	181 ~ 245	1310 ~ 1772	217 ~ 294	1570 ~ 2126

2) PIPE AND HOSE (FLARE type)

Thread size (PF)	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size (UNF)	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

GROUP 3 PUMP DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Lower the work equipment to the ground and stop the engine.

(2) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

(3) Loosen the drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

· Hydraulic tank quantity : 450 ℓ

(4) Remove socket bolts(5) and disconnect hose (1,2).

(5) Disconnect pilot line hoses (6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16).

(6) Remove bolts (4) and disconnect pump suction tube (3).

※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(7) Sling the pump assembly and remove the pump mounting bolts (20).

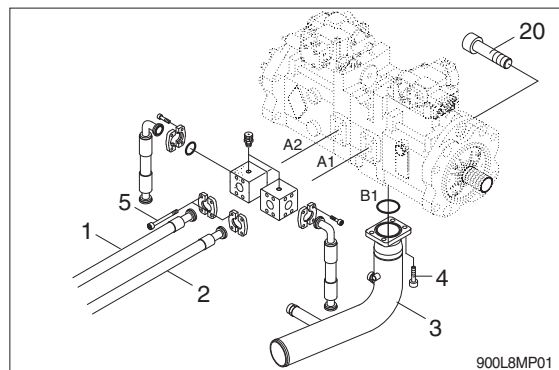
· Weight : 300 kg (660 lb)

· Tightening torque : $80 \pm 8.0 \text{ kgf} \cdot \text{m}$
($579 \pm 57.9 \text{ lbf} \cdot \text{ft}$)

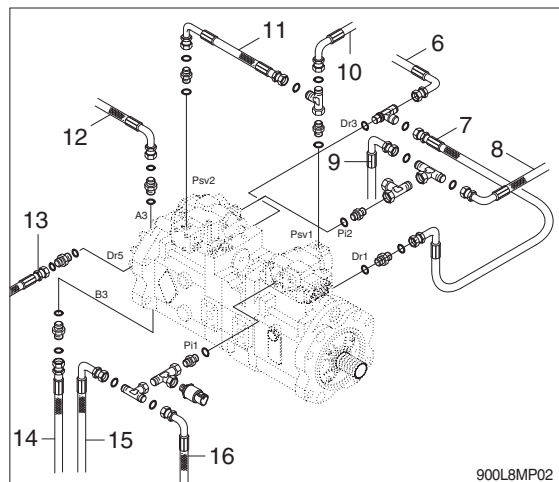
※ Pull out the pump assembly from housing. When removing the pump assembly, check that all the hoses have been disconnected.



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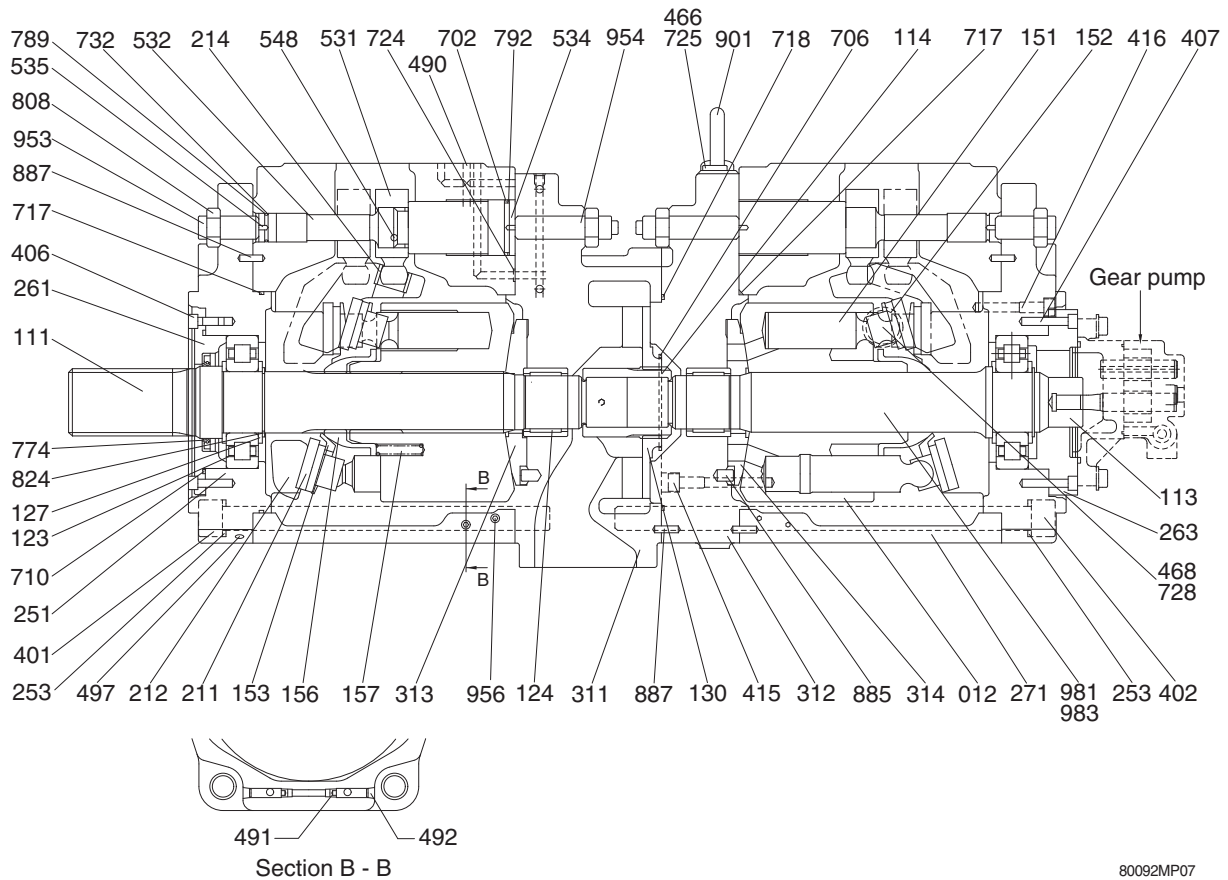
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2) INSTALL

- (1) Carry out installation in the reverse order to removal
- (2) Remove the suction strainer and clean it.
- (3) Replace the return filter with a new one.
- (4) Remove breather and clean it.
- (5) After adding oil to the hydraulic tank to the specified level.
- (6) Bleed the air from the hydraulic pump.
 - ① Remove the air vent plug (2EA)
 - ② Tighten plug lightly
 - ③ Start the engine, run at low idling, and check oil come out from plug.
 - ④ Tighten plug.
- (7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.
- (8) Confirmed the hydraulic oil level and check the hydraulic oil leaks or not.

2. MAIN PUMP (1/2)

1) STRUCTURE



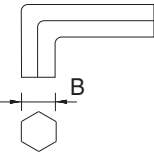

102	Cylinder block	311	Valve cover (F)	702	O-ring
111	Drive shaft (F)	312	Valve cover (R)	706	O-ring
113	Driven shaft (R)	313	Valve plate (R)	710	O-ring
114	Coupling	314	Valve plate (L)	717	O-ring
123	Roller bearing	401	Hexagon socket bolt	718	O-ring
124	Needle bearing	402	Hexagon socket bolt	724	O-ring
127	Spacer	406	Hexagon socket bolt	725	O-ring
130	Booster	407	Hexagon socket bolt	728	O-ring
151	Piston	415	Hexagon socket bolt	732	O-ring
152	Shoe	416	Hexagon socket bolt	774	Oil seal
153	Plate	466	VP Plug	789	Back up ring
156	Bushing	468	VP Plug	792	Back up ring
157	Cylinder spring	490	VP Plug	808	Hexagon head nut
211	Shoe plate	491	Restorictor	824	Snap ring
212	Swash plate	492	VP Plug	885	Pin
214	Bushing	497	VP Plug	887	Spring pin
251	Support plate	531	Tilting pin	901	Eye bolt
253	Washer	532	Servo piston	953	Set screw
261	Seal cover (F)	534	Stopper (L)	954	Set screw
263	Seal cover (R)	535	Stopper (S)	956	Set screw
271	Pump casing	548	Feed back pin		

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2) TOOLS AND TIGHTENING TORQUE

(1) Tools

The tools necessary to disassemble/reassemble the pump are shown in the follow list.

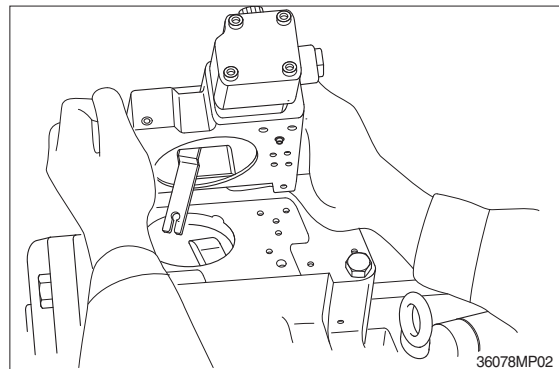
Tool name & size		Part name			
Allen wrench 	B	Hexagon socket head bolt	PT plug (PT thread)	PO plug (PF thread)	Hexagon socket head setscrew
	4	M 5	BP-1/16	-	M 8
	5	M 6	BP1/ 8	-	M10
	6	M 8	BP-1/ 4	PO-1/4	M12, M14
	8	M10	BP-3/ 8	PO-3/8	M16, M18
	17	M20, M22	BP-1	PO-1, 1 1/4, 1 1/2	-
Double ring spanner, socket wrench, double (Single) open end spanner 	-	Hexagon head bolt	Hexagon head bolt	VP plug (PF thread)	
	19	M12	M12	VP-1/4	
	24	M16	M16	-	
	27	M18	M18	VP-1/2	
	30	M20	M20	-	
	36	-	-	VP-3/4	
Adjustable angle wrench	Medium size, 1 set				
Screw driver	Minus type screw driver, Medium size, 2 sets				
Hammer	Plastic hammer, 1 set				
Pliers	For snap ring, TSR-160				
Steel bar	Steel bar of key material approx. 10×8×200				
Torque wrench	Capable of tightening with the specified torques				

(2) Tightening torque

Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt (Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	115.7	0.47	12
	M16	24.0	173.6	0.55	14
	M18	34.0	245.9	0.55	14
	M20	44.0	318.3	0.67	17
	M22	64.0	462.9	0.67	17
PT plug (Material : S45C) ※ Wind a seal tape 1 1/2 to 2 turns round the plug	PT 1/16	0.7	5.1	0.16	4
	PT 1/ 8	1.05	7.59	0.20	5
	PT 1/ 4	1.75	12.66	0.24	6
	PT 3/ 8	3.5	25.3	0.31	8
	PT 1/ 2	5.0	36.2	0.39	10
PF plug (Material : S45C)	PF 1/ 4	3.0	21.7	0.24	6
	PF 1/ 2	10.0	72.3	0.39	10
	PF 3/ 4	15.0	108.5	0.55	14
	PF 1	19.0	137.4	0.67	17
	PF 1 1/4	27.0	195.3	0.67	17
	PF 1 1/2	28.0	202.5	0.67	17

3) DISASSEMBLY

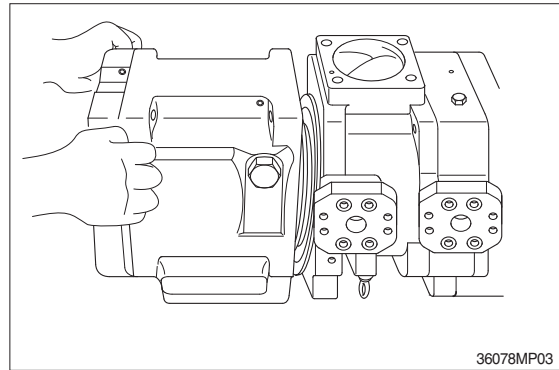
- (1) Select place suitable to disassembling.
 - ※ Select clean place.
 - ※ Spread rubber sheet, cloth or so on on overhaul workbench top to prevent parts from being damaged.
- (2) Remove dust, rust, etc, from pump surfaces with cleaning oil or so on.
- (3) Remove drain port plug (468) and let oil out of pump casing (Front and rear pump).
- (4) Remove hexagon socket head bolts (412, 413) and remove regulator.



- (5) Loosen hexagon socket head bolts (401) which tighten swash plate support (251), pump casing (271) and valve cover (F, 311).
 - ※ If gear pump and so on are fitted to rear face of pump, remove them before starting this work.
- (6) Loosen hexagon socket head bolts (402) which tighten swash plate support (251), pump casing (271) and valve cover (R, 312).

(7) Place pump horizontally on workbench with its regulator-fitting surface down, and separate pump casing (271) from valve cover (F, 311).

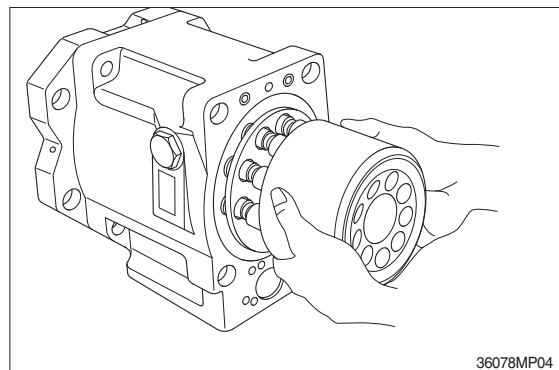
- ※ Before bringing this surface down, spread rubber sheet on workbench without fail to prevent this surface from being damaged.



(8) Separate valve cover (F, 311) from valve cover (R, 312) and pull out booster (130), spline coupling (114).

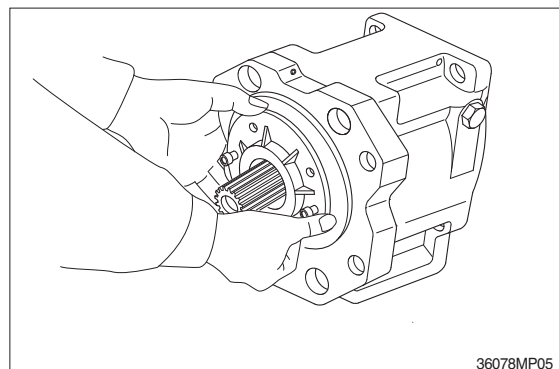
(9) Separate valve cover (R, 312) from pump casing and then pull out the cylinder block (012) of pump casing (271) straightly over drive shaft (R, 113). Pull out also pistons (151), set plate (153), spherical bush(156) and cylinder springs (157) simultaneously.

- Take care not to damage sliding surfaces
- ※ of cylinder, spherical bushing, shoes, swash plate, etc.

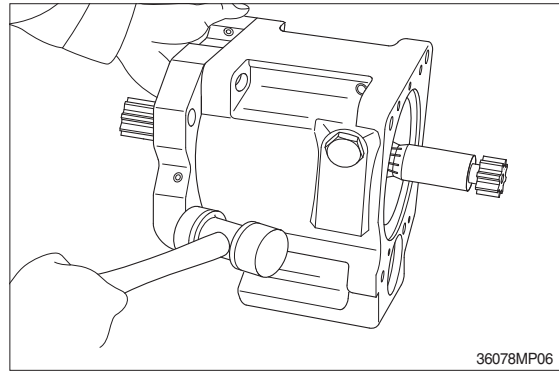


(10) Remove hexagon socket head bolts (406) and then seal cover (F, 261).

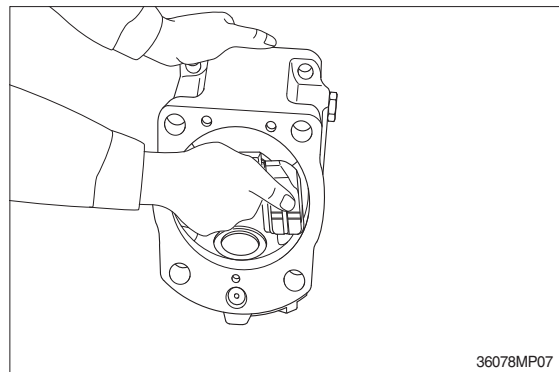
- ※ Fit bolt into pulling-out tapped hole of seal cover (F), and cover can be removed easily.
- ※ Since oil seal is fitted on seal cover (F), take care not to damage it when removing cover.



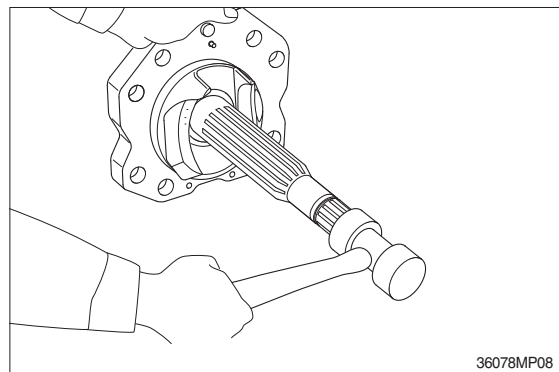
(11) Tapping lightly fitting flange section of swash plate support (251) on its pump casing side, separate swash plate support from pump casing.



(12) Remove shoe plate (211) and swash plate (212) from pump casing (271).

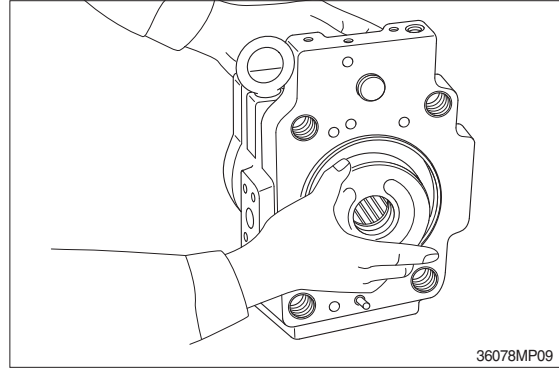


(13) Tapping lightly shaft ends of drive shafts (111, 113) with plastic hammer, take out drive shafts from swash plate supports.



(14) Remove valve plates (313, 314) from valve cover (311, 312).

- ※ These may be removed in work 7, 9.



(15) If necessary, remove stopper (L, 534), stopper (S, 535), servo piston (532) and tilting pin (531) from pump casing (271), and needle bearing (124) from valve cover (311, 312).

- ※ In removing tilting pin, use a protector to prevent pin head from being damaged.
- ※ Since loctite is applied to fitting areas of tilting pin and servo piston, take care not to damage servo piston.
- ※ Do not remove needle bearing as far as possible, except when it is considered to be out of its life span.
- ※ Do not loosen hexagon nuts of valve cover and swash plate support.
If loosened, flow setting will be changed.

(16) This is the end of disassembling procedures.

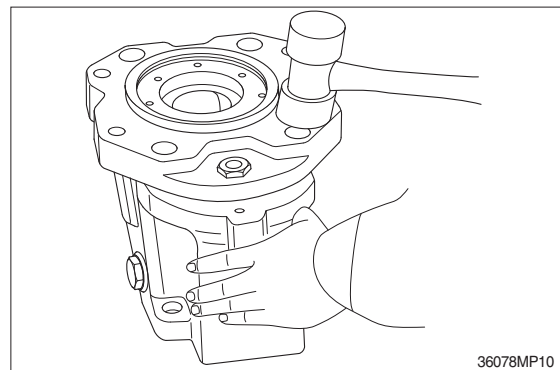
4) ASSEMBLY

(1) For reassembling reverse the disassembling procedures, paying attention to the following items.

- ① Do not fail to repair the parts damaged during disassembling, and prepare replacement parts in advance.
- ② Clean each part fully with cleaning oil and dry it with compressed air.
- ③ Do not fail to apply clean working oil to sliding sections, bearings, etc. before assembling them.
- ④ In principle, replace seal parts, such as O-rings, oil seals, etc.
- ⑤ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with torques shown in page 8-10, 11.
- ⑥ For the double-pump, take care not to mix up parts of the front pump with those of the rear pump.

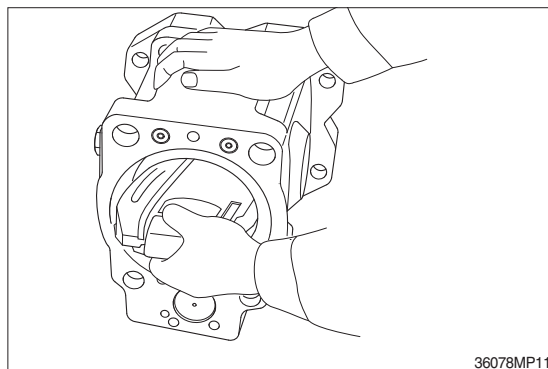
(2) Fit swash plate support (251) to pump casing (271), tapping the former lightly with a hammer.

- ※ After servo piston, tilting pin, stopper (L) and stopper (S) are removed, fit them soon to pump casing in advance for reassembling.
- ※ In tightening servo piston and tilting pin, use a protector to prevent tilting pin head and feedback pin from being damaged. In addition, apply loctite (Medium strength) to their threaded sections.



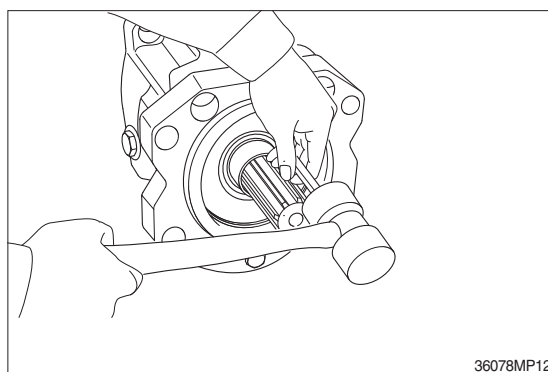
(3) Place pump casing with its regulator fitting surface down, fit tilting bush of swash plate to tilting pin (531) and fit swash plate (212) to swash plate support (251) correctly.

- ※ Confirm with fingers of both hands that swash plate can be removed smoothly.
- ※ Apply grease to sliding sections of swash plate and swash plate support, and drive shaft can be fitted easily.



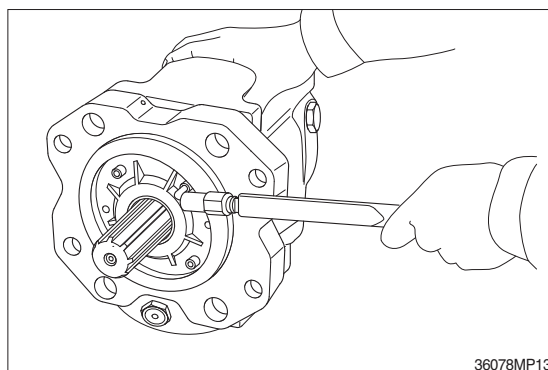
To (4) swash plate support (251), fit drive shaft (111) set with bearing (123), bearing spacer (127) and snap ring (824).

- ※ Do not tap drive shaft with hammer or so on.
- ※ Assemble them into support, tapping outer race of bearing lightly with plastic hammer.
- Fit them fully, using steel bar or so on.



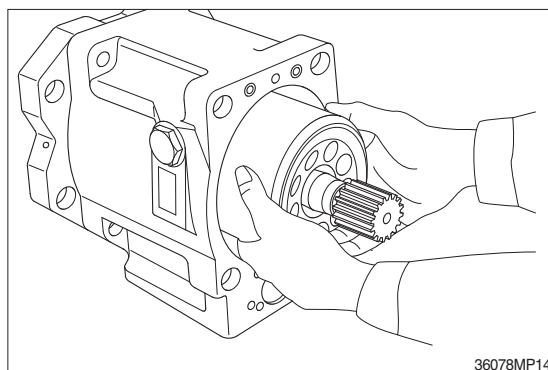
(5) Assemble seal cover (F, 261) to pump casing (271) and fix it with hexagon socket head bolts (406).

- ※ Apply grease lightly to oil seal in seal cover (F).
- ※ Assemble oil seal, taking full care not to damage it.
- ※ For tandem type pump, fit rear cover (263) and seal cover (262) similarly.



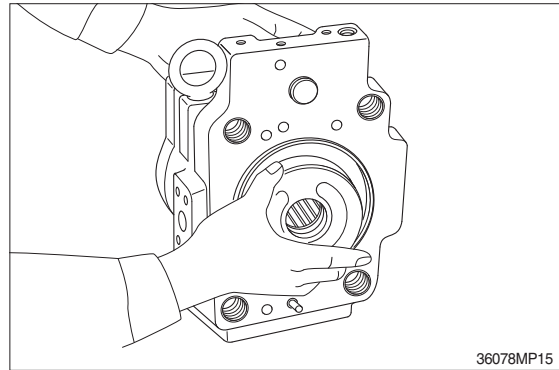
(6) Assemble piston cylinder subassembly [cylinder block (012), piston subassembly (151, 152), set plate (153), spherical bushing (156) and cylinder spring (157)] .

Fit spline phases of retainer and cylinder. Then, insert piston cylinder subassembly into pump casing (271).



(7) Fit valve plate (313) to valve cover (F, 311), and fit valve plate (314) to valve cover (R, 312), entering pin into pin hole.

※ Take care not to mistake suction / delivery directions of valve plate.



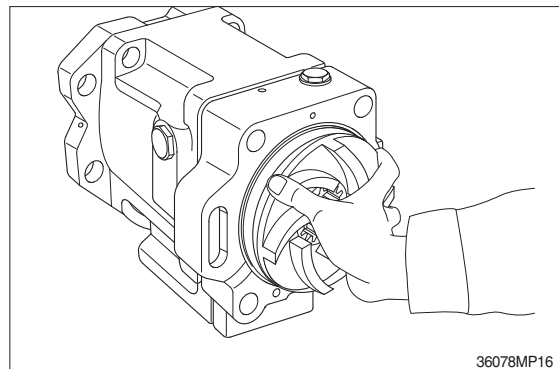
(8) Fit valve block (R, 312) to pump casing (271) and fit spline coupling (114) and booster (130) to shaft (R, 113).

※ Take care not to mistake direction of valve cover.

Fit valve cover with regulator up and with delivery flange left, viewed from front side.

※ Take care not to mistake direction of booster (130).

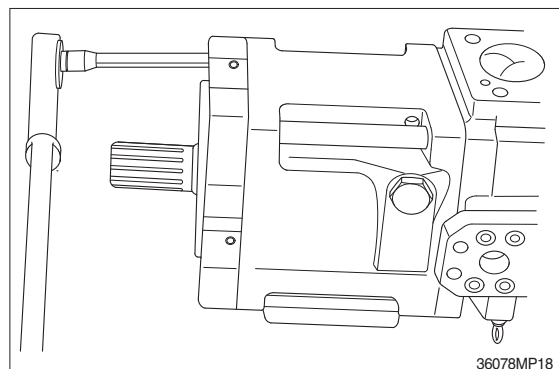
(Refer to the sectional drawing)



(9) Fit valve cover (F, 311) to valve cover (R) and tighten hexagon socket head bolts (402).

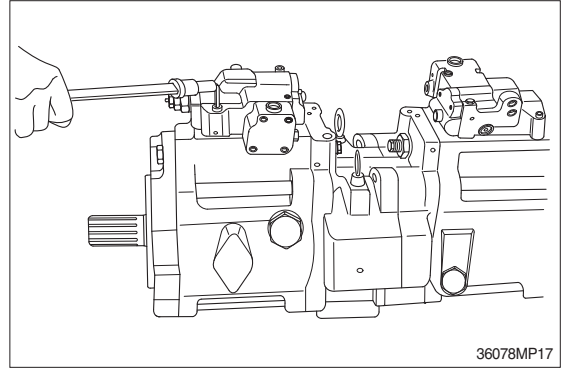
(10) Fit pump casing (271) with shaft (F, 111) to valve cover (F, 311) and tighten hexagon socket head bolts (401).

※ Mate spline phases of shaft (F) and spline coupling, with shaft (F) been rotating.



(11) Putting feedback pin of tilting pin into feedback lever of regulator, fit regulator and tighten hexagon socket head bolts (412,413).

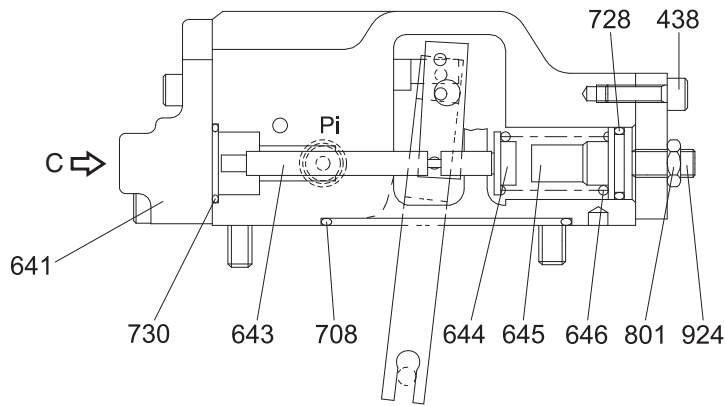
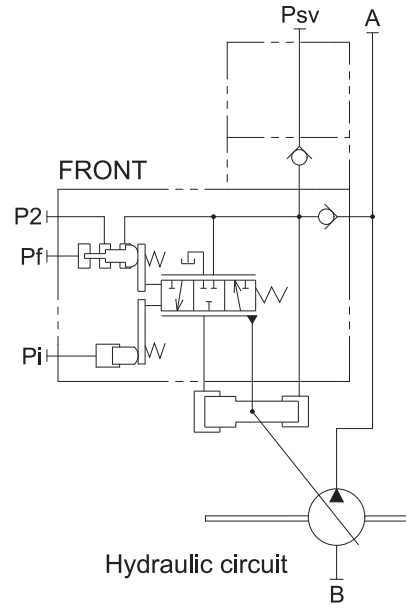
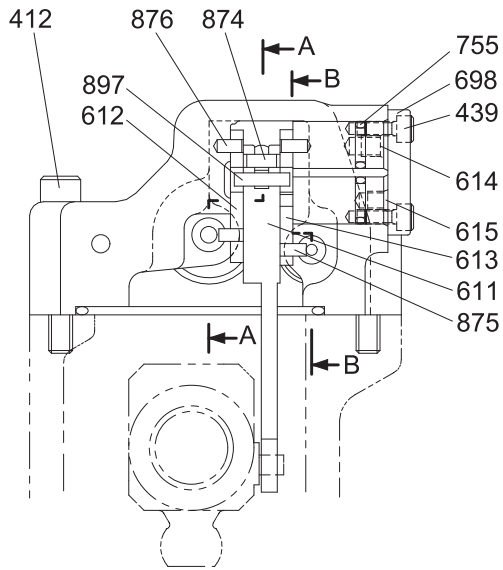
※ Take care not to mistake regulator of front pump for that of rear pump.



(12) Fit drain port plug (468).

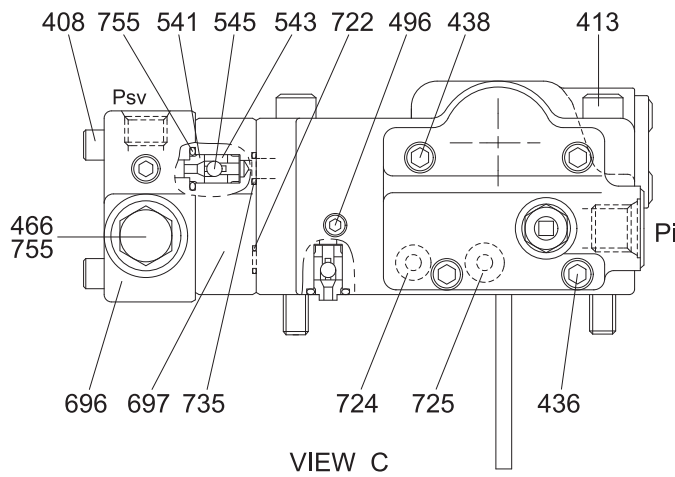
This is the end of reassembling procedures.

5) REGULATOR (1/2)



SECTION B-B

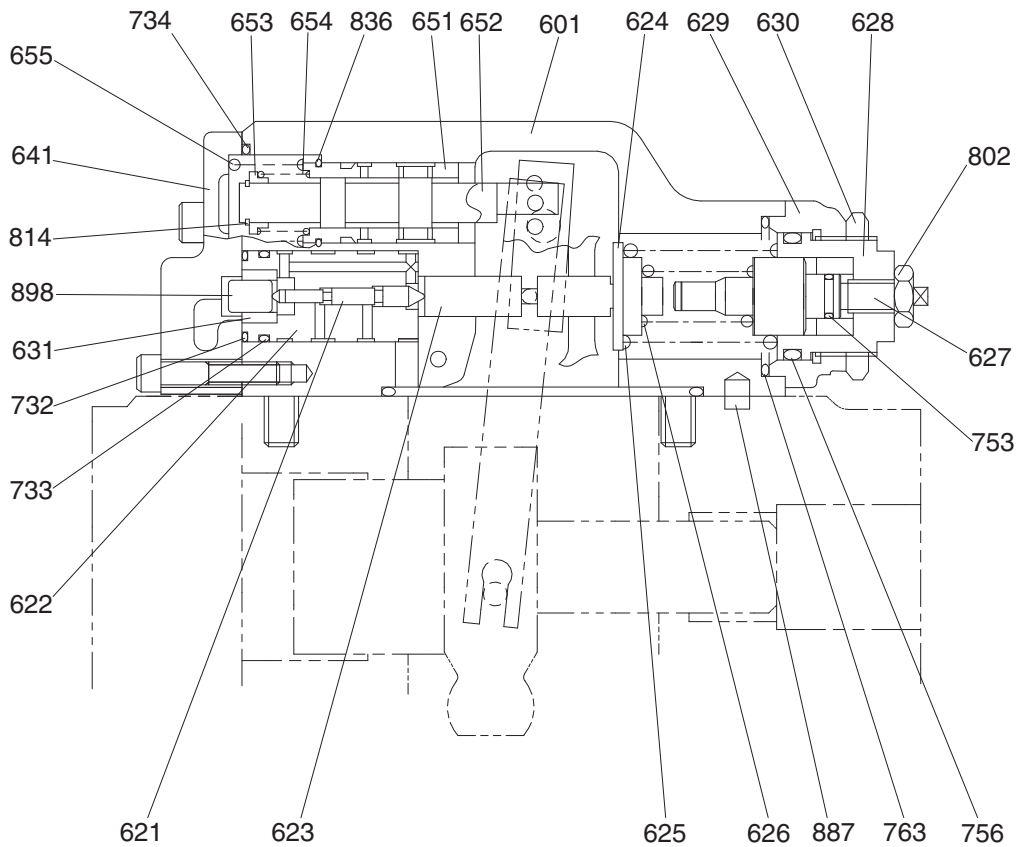
80092RG01



VIEW C

Port	Port name	Port size
Pi	Pilot port	PF 1/4 - 15
Psv	Servo assist port	PF 1/4 - 15
P2	Companion delivery pressure	-
Pf	Powershift pressure	-

REGULATOR (2/2)



SECTION A-A

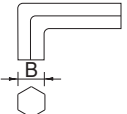

8007A2RG02

408 Hexagon socket screw	627 Adjust stem(C)	725 O-ring
412 Hexagon socket screw	628 Adjust screw(C)	728 O-ring
413 Hexagon socket screw	629 Cover(C)	730 O-ring
436 Hexagon socket screw	630 Lock nut	732 O-ring
438 Hexagon socket screw	631 Sleeve, pf	733 O-ring
439 Hexagon socket screw	641 Pilot cover	734 O-ring
466 Plug	643 Pilot piston	735 O-ring
496 Plug	644 Spring seat(Q)	753 O-ring
541 Seat	645 Adjust stem(Q)	755 O-ring
543 Stopper 1	646 Pilot spring	756 O-ring
545 Steel ball	647 Stopper	763 O-ring
601 Casing	648 Piston(QMC)	801 Nut
611 Feed back lever	651 Sleeve	802 Nut
612 Lever(1)	652 Spool(A)	814 Snap ring
613 Lever(2)	653 Spring seat	836 Snap ring
614 Center plug	654 Return spring	874 Spring pin
615 Adjust plug	655 Set spring	875 Pin
621 Compensator piston	696 Port cover	876 Pin
622 Piston case	697 Check valve plate	887 Pin
623 Compensator rod	698 Cover	897 Pin
624 Spring seat(C)	708 O-ring	898 Pin
625 Outer spring	722 O-ring	924 Set screw
626 Inner spring	724 O-ring	

6) TOOLS AND TIGHTENING TORQUE

(1) Tools

The tools necessary to disassemble/reassemble the pump are shown in the follow list.

Tool name & size		Part name			
Name	B	Hexagon socket head bolt	PT plug (PT thread)	PO plug (PF thread)	Hexagon socket head setscrew
Allen wrench 	4	M 5	BP-1/16	-	M 8
	5	M 6	BP-1/8	-	M10
	6	M 8	BP-1/4	PO-1/4	M12, M14
Double ring spanner, socket wrench, double (Single) open end spanner 	-	Hexagon head bolt	Hexagon nut	VP plug (PF thread)	
	6	M 8	M 8	-	
Adjustable angle wrench	Small size, Max 36mm				
Screw driver	Minus type screw driver, Medium size, 2 sets				
Hammer	Plastic hammer, 1 set				
Pliers	For snap ring, TSR-160				
Steel bar	4 × 100 mm				
Torque wrench	Capable of tightening with the specified torques				
Pincers	-				
Bolt	M4, Length : 50 mm				

(2) Tightening torque

Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt (Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	116	0.47	12
	M16	24.0	174	0.55	14
	M18	34.0	246	0.55	14
	M20	44.0	318	0.67	17
PT Plug (Material : S45C) ※Wind a seal tape 1 1/2 to 2 turns round the plug	PT1/16	0.7	5.1	0.16	4
	PT 1/8	1.05	7.59	0.20	5
	PT 1/4	1.75	12.7	0.24	6
	PT 3/8	3.5	25.3	0.31	8
	PT 1/2	5.0	36.2	0.39	10
PF Plug (Material : S35C)	PF 1/4	3.0	21.7	0.24	6
	PF 1/2	10.0	72.3	0.39	10
	PF 3/4	15.0	109	0.55	14
	PF 1	19.0	137	0.67	17
	PF 1 1/4	27.0	195	0.67	17
	PF 1 1/2	28.0	203	0.67	17

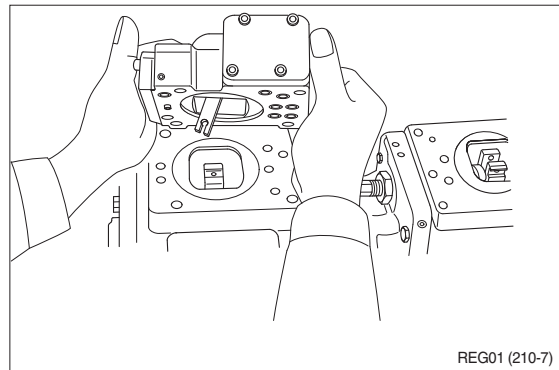
3) DISASSEMBLY

Since the regulator consists of small precision finished parts, disassembly and assembly are rather complicated.

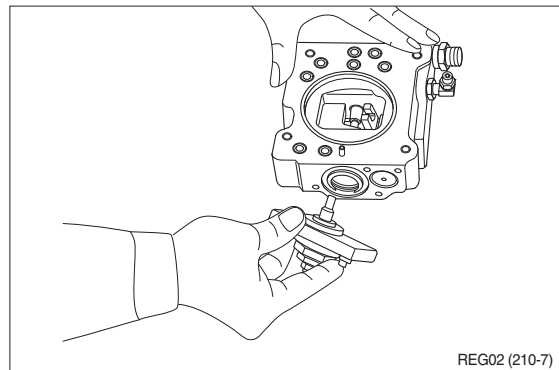
For this reason, replacement of a regulator assembly is recommended, unless there is a special reason, but in case disassembly is necessary for an unavoidable reason, read through this manual to the end before starting disassembly.

- (1) Choose a place for disassembly.
 - ※ Choose a clean place.
 - ※ Spread rubber sheet, cloth, or so on on top of work-bench to prevent parts from being damaged.
- (2) Remove dust, rust, etc. from surfaces of regulator with clean oil.

- (3) Remove hexagon socket head screw (412, 413) and remove regulator main body from pump main body.
 - ※ Take care not to lose O-ring.



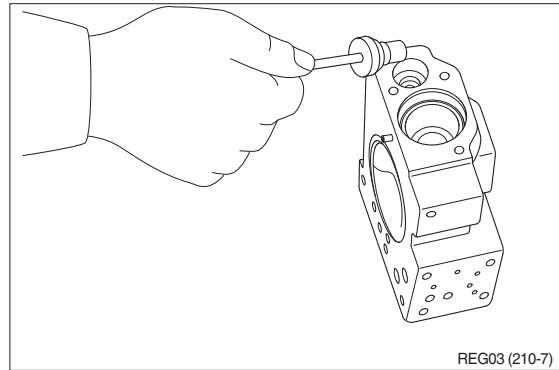
- (4) Remove hexagon socket head screw (438) and remove cover (C,629)
 - ※ Cover (C) is fitted with adjusting screw (C,QI) (628, 925), adjusting ring (C, 627), lock nut (630), hexagon nut (801) and adjusting screw (924).Do not loosen these screws and nuts.
If they are loosened, adjusted pressure-flow setting will vary.



(5) After removing cover(C, 629) subassembly, take out outer spring (625), inner spring (626) and spring seat (C, 624) from compensating section.

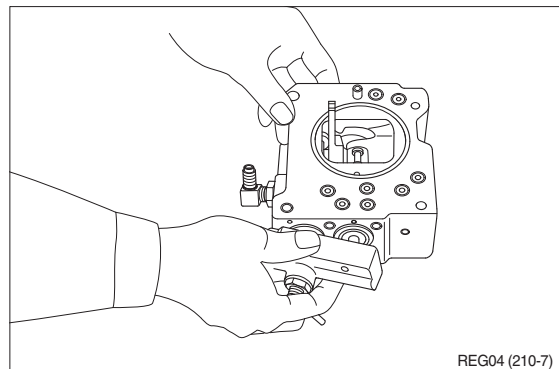
Then draw out adjusting ring (Q, 645), pilot spring (646) and spring seat (644) from pilot section.

※ Adjusting ring (Q,645) can easily be drawn out with M4 bolt.



(6) Remove hexagon socket head screws (436, 438) and remove pilot cover (641).

After removing pilot cover, take out set spring (655) from pilot section.

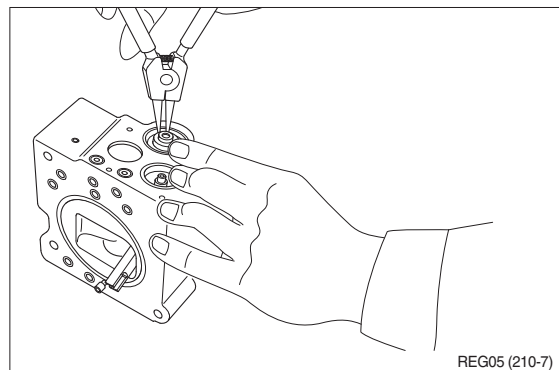


(7) Remove snap ring (814) and take out spring seat (653), return spring (654) and sleeve (651).

※ Sleeve (651) is fitted with snap ring (836).

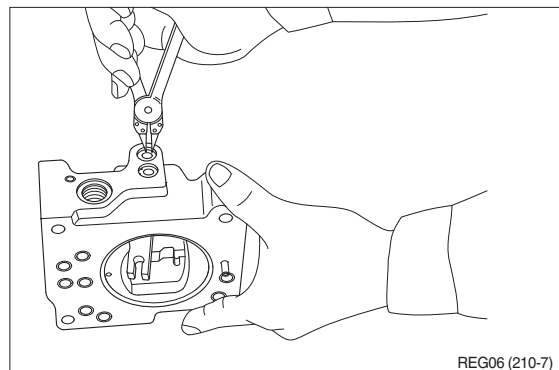
※ When removing snap ring (814), return spring (654) may pop out.

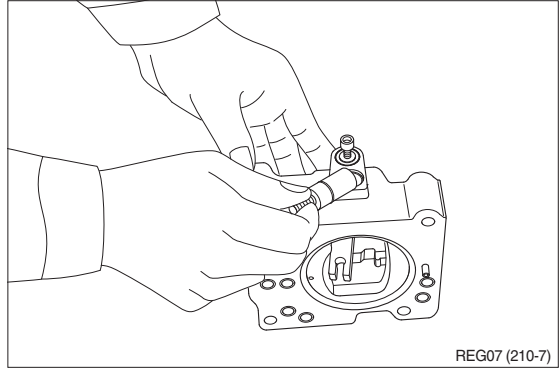
Take care not to lose it.



(8) Remove locking ring (858) and take out fulcrum plug (614) and adjusting plug (615).

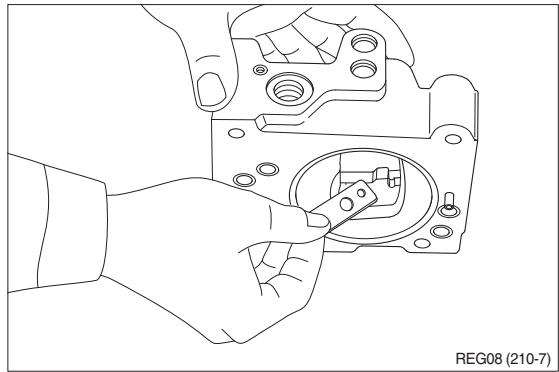
※ Fulcrum plug (614) and adjusting plug (615) can easily be taken out with M6 bolt.





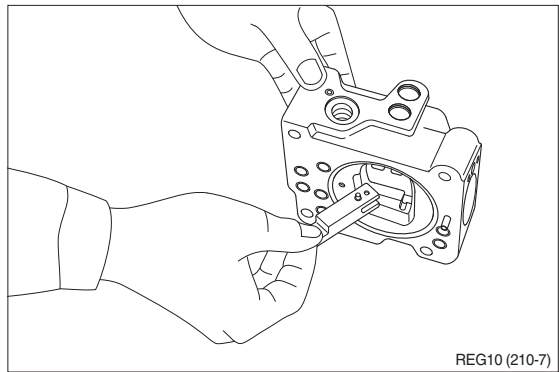
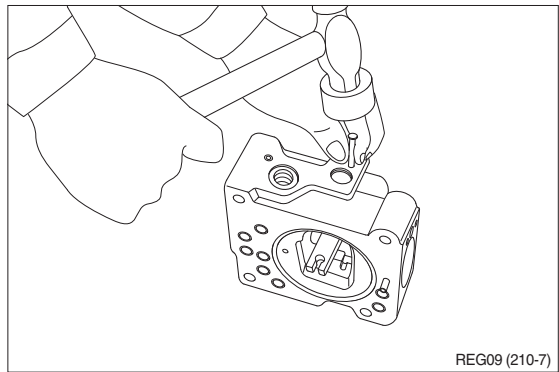
(9) Remove lever (2, 613). Do not draw out pin (875).

※ Work will be promoted by using pincers or so on.



(10) Draw out pin (874) and remove feedback lever (611).

Push out pin (874, 4 mm in dia.) from above with slender steel bar so that it may not interfere with lever (1, 612).



(11) Remove lever(1, 612). Do not draw out pin (875).

(12) Draw out pilot piston(643) and spool(652).

(13) Draw out piston case(622), compensating piston(621) and compensating rod(623).

※ Piston case(622) can be taken out by pushing compensating rod(623) at opposite side of piston case.

This completes disassembly.

4) ASSEMBLY

(1) For assembly, reverse disassembly procedures, but pay attention to the following items.

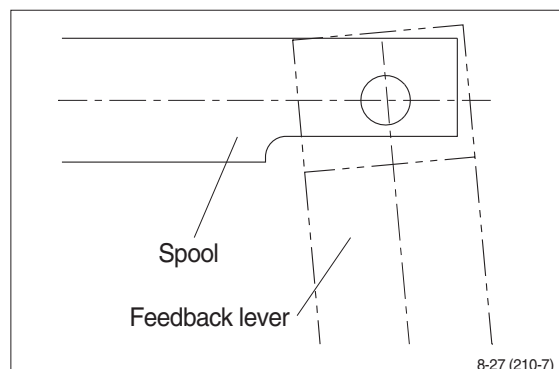
- ① Always repair parts that were scored at disassembly.
- ② Get replacement parts ready beforehand.
Mixing of foreign matter will cause malfunction.
Therefore, wash parts well with cleaning oil, let them dry with jet air and handle them in clean place.
- ③ Always tighten bolts, plugs, etc. to their specified torques.
- ④ Do not fail to coat sliding surfaces with clean hydraulic oil before assembly.
- ⑤ Replace seals such as O-ring with new ones as a rule.

(2) Put compensating rod (623) into compensating hole of casing (601).

(3) Put pin force-fitted in lever (1, 612) into groove of compensating rod and fit lever (1) to pin force-fitted in casing.

(4) Fit spool (652) and sleeve (651) into hole in spool of casing.

- ※ Confirm that spool and sleeve slide smoothly in casing without binding.
- ※ Pay attention to orientation of spool.

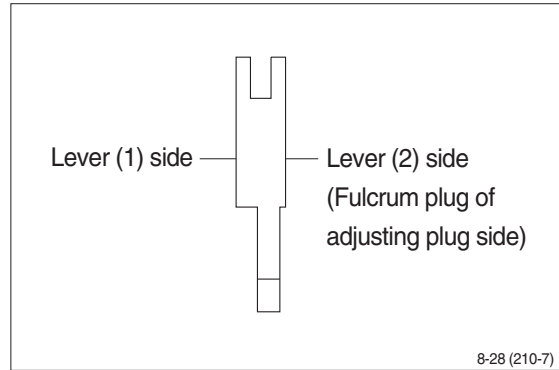


(5) Fit feedback lever (611), matching its pin hole with pin hole in spool.

Then insert pin (874).

※ Insert pin in feedback lever a little to ease operation.

※ Take care not to mistake direction of feedback lever.

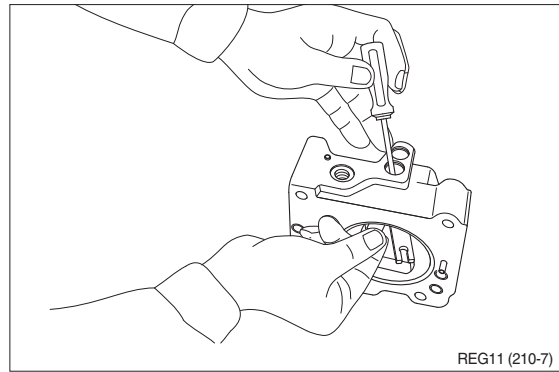


(6) Put pilot piston (643) into pilot hole of casing.

※ Confirm that pilot piston slides smoothly without binding.

(7) Put pin force-fitted in lever (2, 613) into groove of pilot piston.

Then fix lever (2).



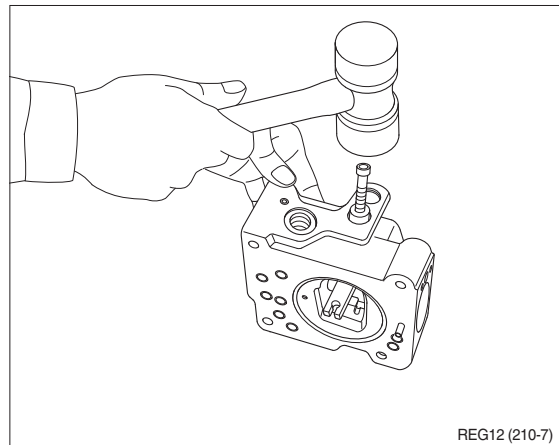
(8) Fit fulcrum plug (614) so that pin force-fitted in fulcrum plug (614) can be put into pin hole of lever (2).

Then fix locking ring (858).

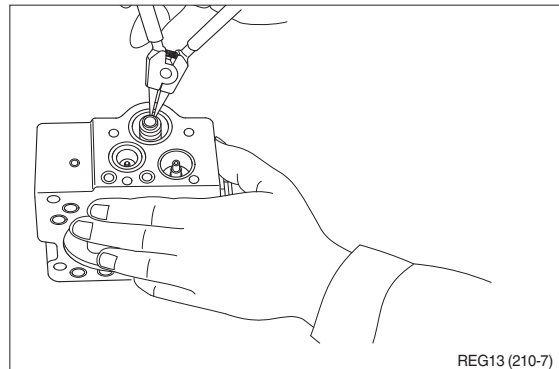
(9) Insert adjusting plug (615) and fit locking ring.

※ Take care not to mistake inserting holes for fulcrum plug and adjusting plug.

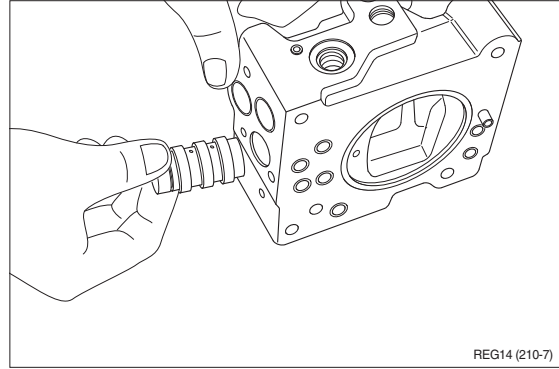
At this point in time move feedback lever to confirm that it has no large play and is free from binding.



(10) Fit return spring (654) and spring seat (653) into spool hole and attach snap ring (814).

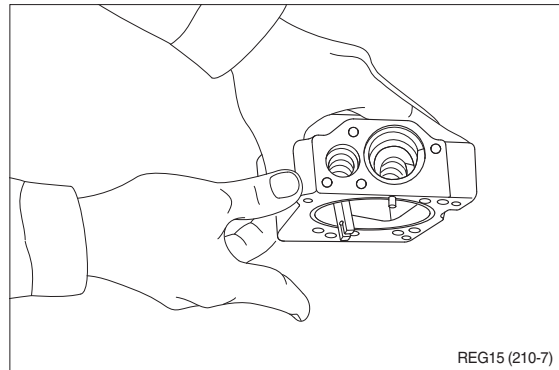


- (11) Fit set spring (655) to spool hole and put compensating piston (621) and piston case (622) into compensating hole.
Fit pilot cover (641) and tighten it with hexagonal socket head screws (436, 438).



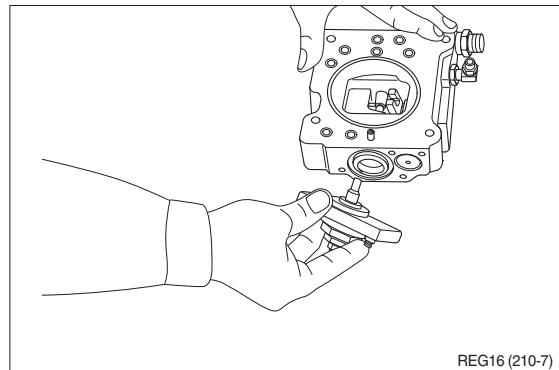
- (12) Put spring seat (644), pilot spring (646) and adjusting ring (Q, 645) into pilot hole.
Then fix spring seat (624), inner spring (626) and outer spring (625) into compensating hole.

※ When fitting spring seat, take care not to mistake direction of spring seat.



- (13) Install cover (C, 629) fitted with adjusting screws (628, 925), adjusting ring (C, 627), lock nut (630), hexagon nut (801) and adjusting screw (924).

Then tighten them with hexagonal socket head screws (438).



This completes assembly.

GROUP 4 MAIN CONTROL VALVE

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

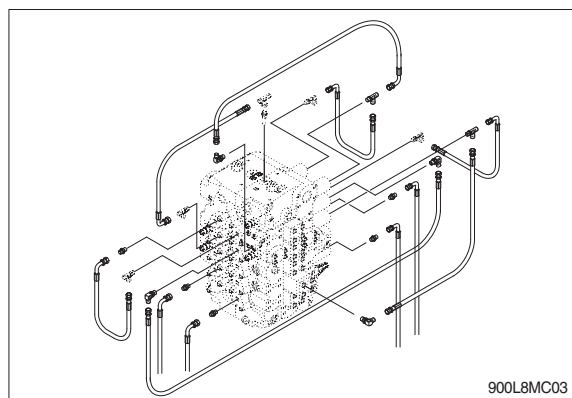
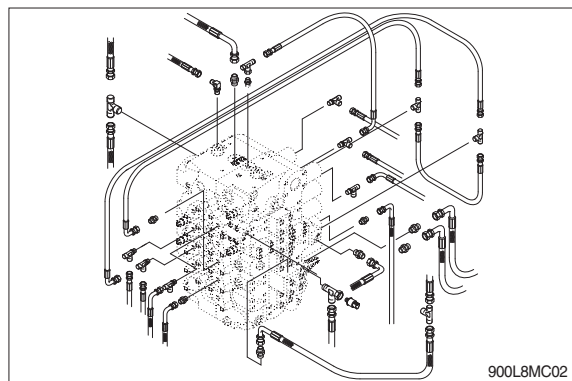
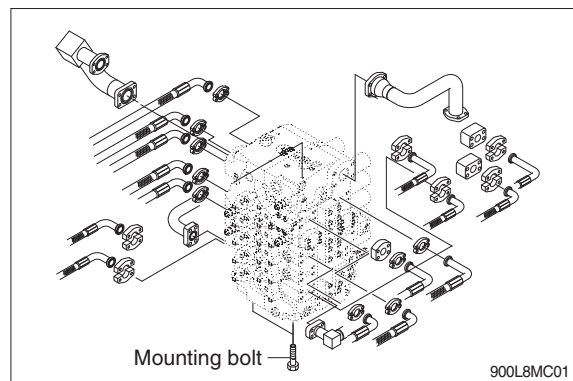
▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

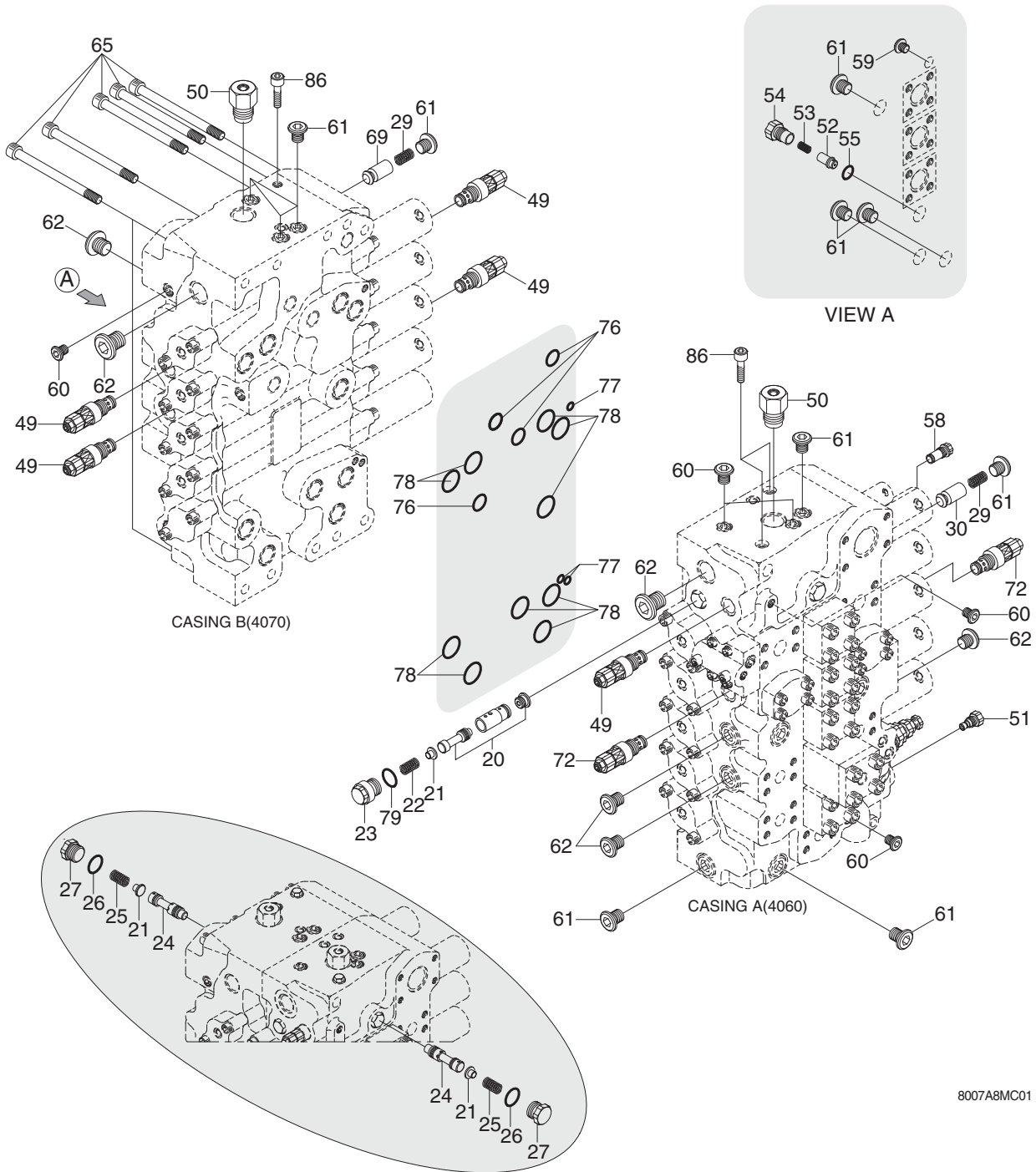
- (4) Remove bolts and disconnect pipe.
Remove bolts and disconnect pipe.
- (5) Disconnect pilot line hoses.
- (6) Disconnect pilot piping.
- (7) Sling the control valve assembly and
- (8) remove the control valve mounting bolt.
 - Weight : 424 kg (935 lb)
 - Tightening torque : 69.5 ± 10.5 kgf · m
(503 ± 76 lbf · ft)
- (9) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.

2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from below items.
 - ① Cylinder (boom, arm, bucket)
 - ② Swing motor
 - ③ Travel motor※ See each item removal and install.
- (3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.



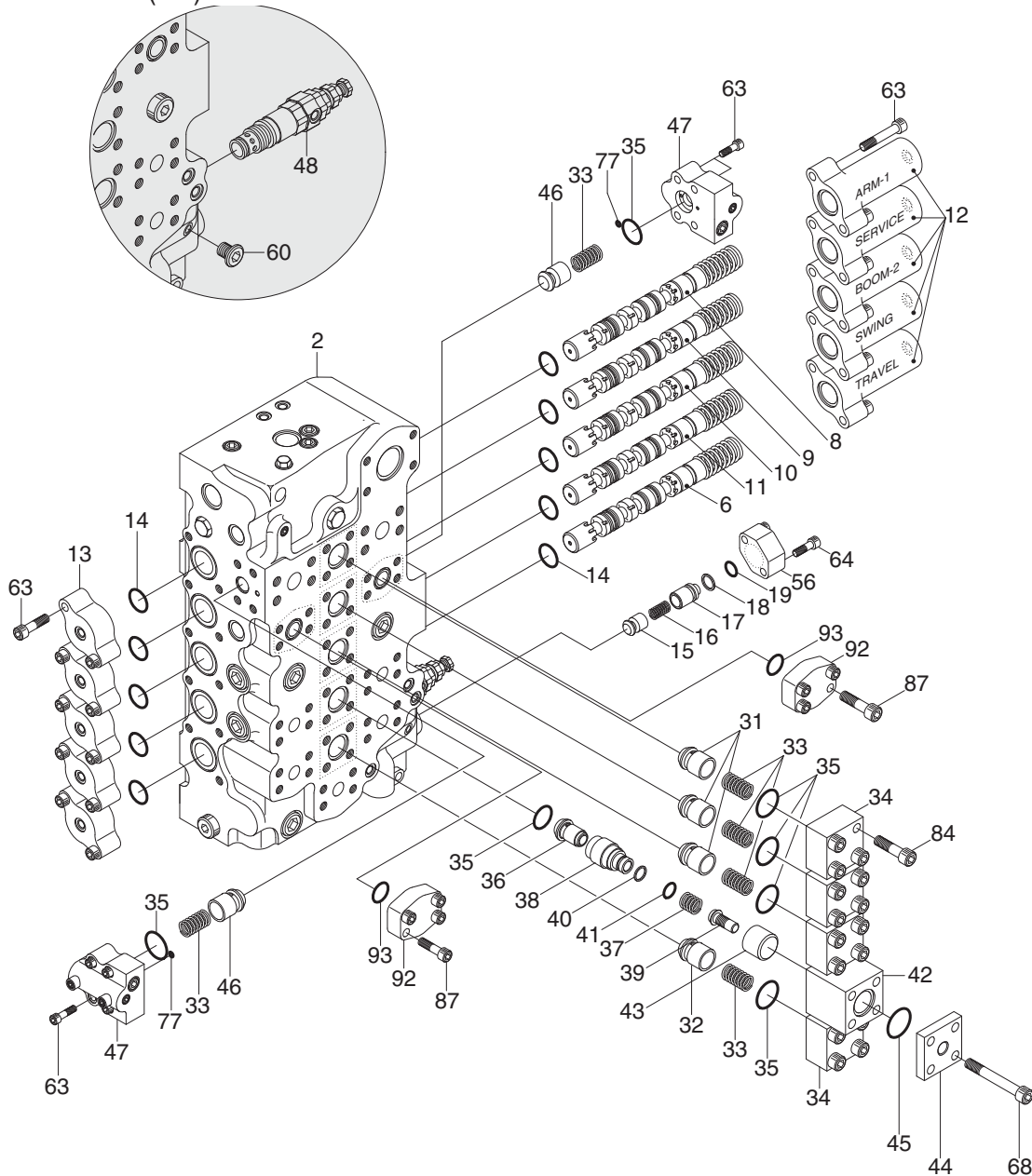
2. STRUCTURE (1/3)



20	Spool assy	49	Relief valve kit	61	Plug assy
21	Spring seat	50	Relief valve assy	62	Plug assy
22	Spring	51	Plug assy	65	Bolt
23	Plug	52	Poppet	69	Poppet
24	O-ring	53	Spring	72	Relief valve kit
25	Spool assy	54	Plug	76	O-ring
26	O-ring	55	O-ring	77	O-ring
27	Plug	58	Plug assy	78	O-ring
29	Spring	59	Plug assy	79	O-ring
30	Poppet	60	Plug assy	86	Socket head bolt

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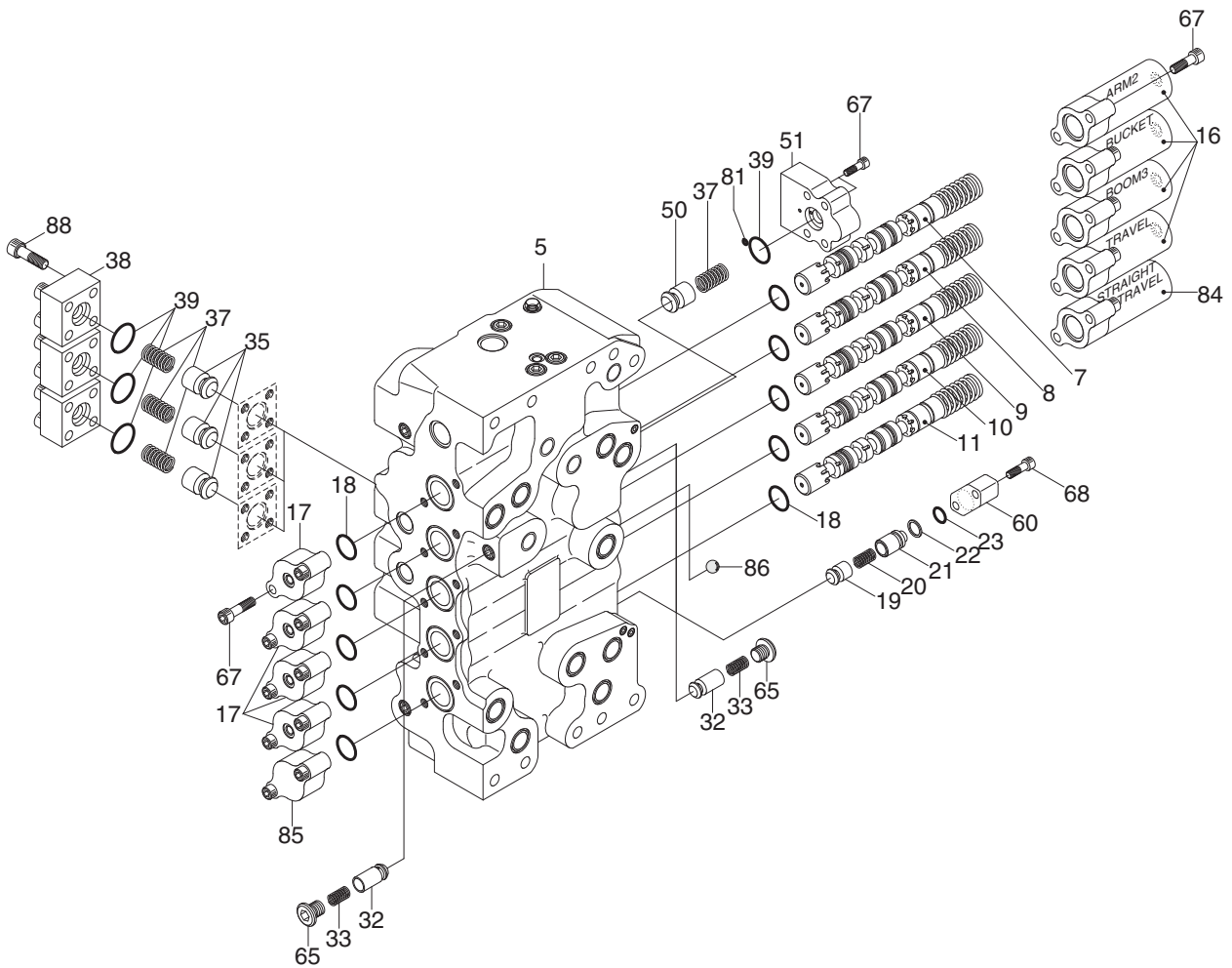
STRUCTURE (2/3)



8007A8MC02

- | | | | | | |
|----|--------------|----|--------|----|-------------------|
| 2 | Housing | 31 | Flange | 45 | O-ring |
| 6 | Spool assy | 32 | Flange | 46 | Poppet |
| 8 | Spool assy | 33 | Poppet | 47 | Body assy |
| 9 | Spool assy | 34 | Poppet | 48 | Relief valve assy |
| 10 | Spool assy | 35 | Poppet | 56 | Flange |
| 11 | Spool assy | 36 | Poppet | 63 | Bolt |
| 12 | Cap | 37 | Spacer | 64 | Bolt |
| 13 | Cap | 38 | Spring | 68 | Bolt |
| 14 | O-ring | 39 | Spring | 77 | O-ring |
| 15 | Poppet | 40 | O-ring | 84 | Bolt |
| 16 | Spring | 41 | O-ring | 87 | Bolt |
| 17 | Spacer | 42 | O-ring | 92 | Flange |
| 18 | O-ring | 43 | O-ring | 93 | O-ring |
| 19 | Back up ring | 44 | O-ring | | |

STRUCTURE (3/3)

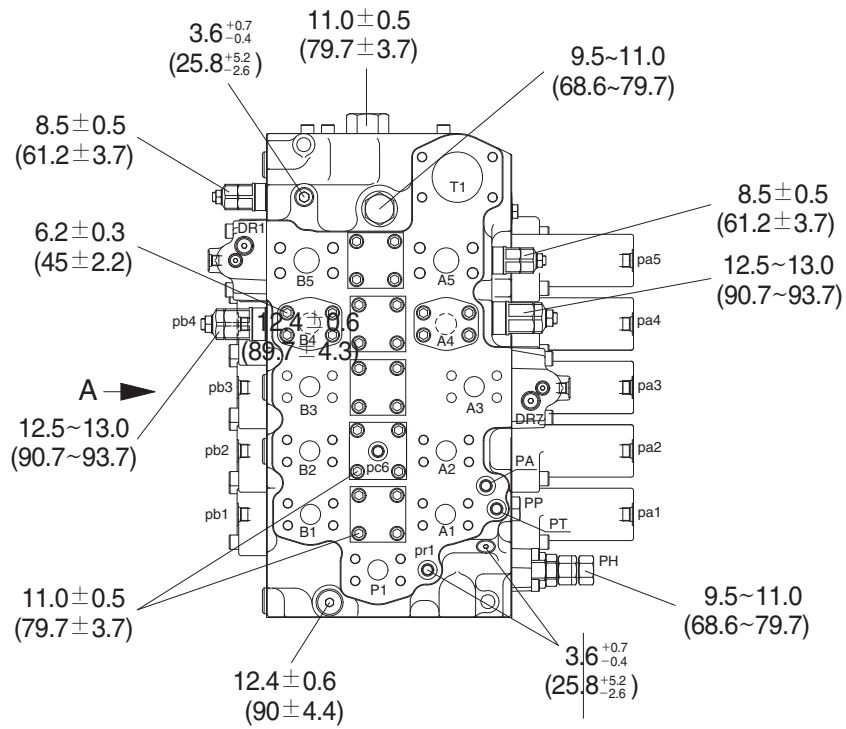
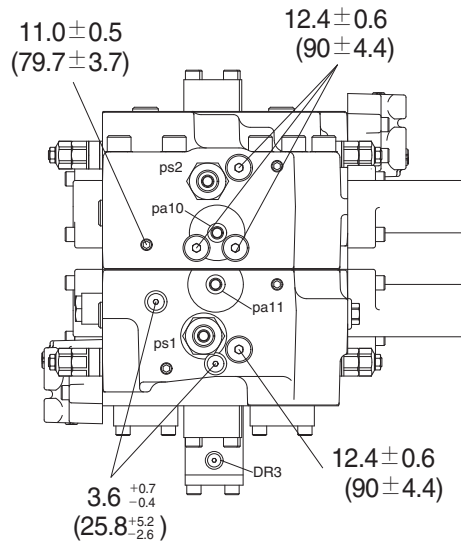


8007A8MC03

- | | | | | | |
|----|------------|----|--------------|----|------------|
| 1 | Housing | 17 | Spacer | 47 | Body assy |
| 3 | Spool assy | 18 | O-ring | 56 | Flange |
| 4 | Spool assy | 19 | Back up ring | 61 | Plug assy |
| 5 | Spool assy | 28 | Poppet | 63 | Bolt |
| 6 | Spool assy | 29 | Spring | 64 | Bolt |
| 7 | Spool assy | 31 | Poppet | 77 | O-ring |
| 12 | Cap | 33 | Spring | 80 | Cap |
| 13 | Cap | 34 | Flange | 81 | Cap |
| 14 | O-ring | 35 | O-ring | 82 | Steel ball |
| 15 | Poppet | 46 | Poppet | 84 | Bolt |
| 16 | Spring | | | | |

3. TIGHTENING TORQUE (1/2)

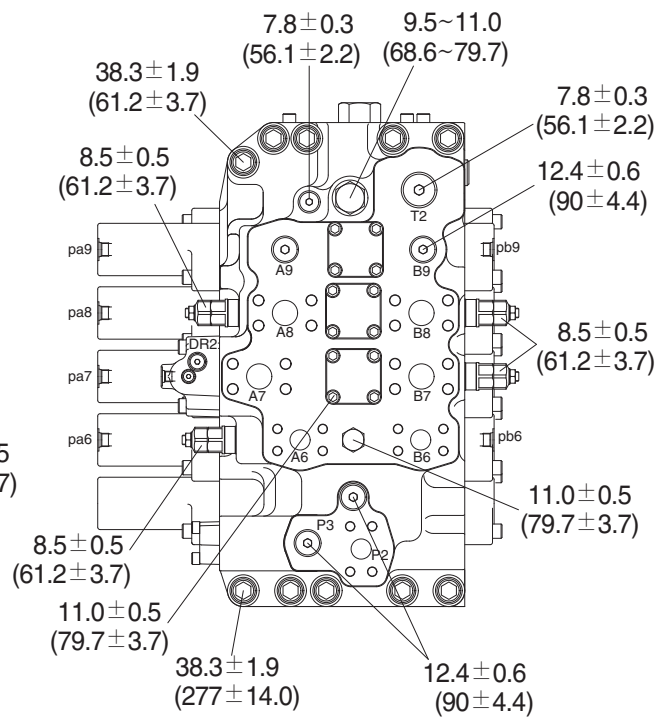
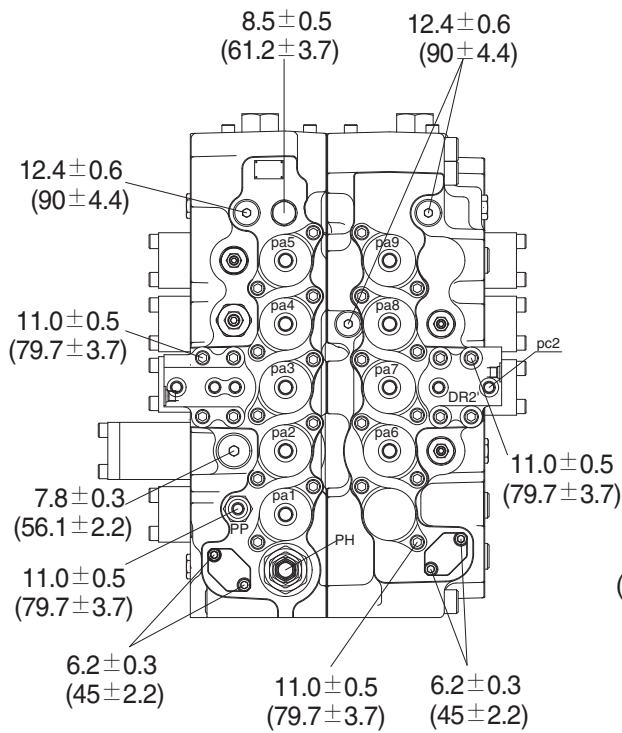
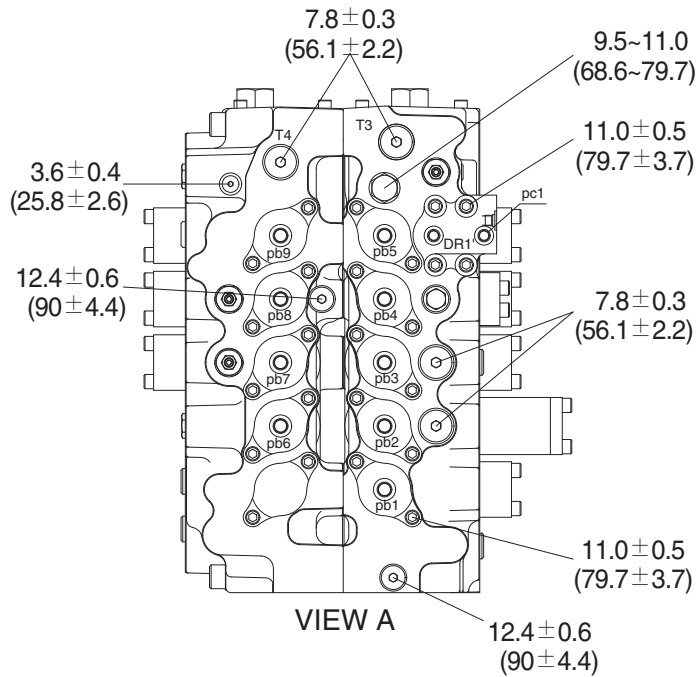
※ Unit : kgf · m (lbf · ft)



480L8MV07

TIGHTENING TORQUE (2/2)

※ Unit : kgf · m (lbf · ft)



8007A8MC05

4. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

- (1) All hydraulic components are manufactured to a high precision. Consequently, before disassembling and assembling them, it is essential to select an especially clean place.
- (2) In handling a control valve, pay full attention to prevent dust, sand, etc. from entering into it.
- (3) When a control valve is to be removed from the machine, apply caps and masking seals to all ports. Before disassembling the valve, recheck that these caps and masking seals are fitted completely, and then clean the outside of the assembly. Use a proper bench for working. Spread paper or a rubber mat on the bench, and disassemble the valve on it.
- (4) Support the body section carefully when carrying or transferring the control valve. Do not lift by the exposed spool, end cover section etc.
- (5) After disassembling and assembling of the component it is desired to carry out various tests (for the relief characteristics, leakage, flow resistance, etc.), but the hydraulic test equipment is necessary for these tests. Therefore, even when its disassembling can be carried out technically, do not disassemble such components that cannot be tested, adjusted, and so on. Additionally one should always prepare clean cleaning oil, hydraulic oil, grease, etc. beforehand.

2) DISASSEMBLY

The figure in () shown after the part name in explanation sentence shows its number in the construction figures.

(1) Place control valve on working bench

- ※ Disassemble the valve in a clean and dry environment and pay careful attention not to damage the sealing flange faces.

(2) Main spool

- ① Loosen socket head bolts (63) and remove the pilot cap (12, 80).
Pull out O-ring (14) from valve housing.



45078MC07

- ② Remove all spool (3~11) of subassembly itself from valve housing.
 - ※ Be careful not to be damaged while pulling out spools. Identify them with a tag to prevent from being mistaken at disassembly.



45078MC08

- ③ Spools sub assy (3, 4, 6, 7, 9, 10, 11).



45078MC10

④ Spool sub assy (5).



45078MC11

⑤ Spool sub assy (8).

- ※ When disassemble the spool assembly, fix the spool with vise. On this occasion attach wood between vise blades to prevent the spool from damaging.
- ※ Heat the outer race of spool with industrial drier and then loosen easily. (Temperature : 200~250°C)



45078MC12

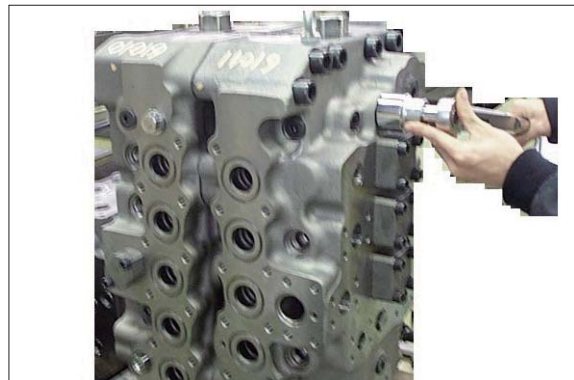
- ⑥ Loosen the socket head bolt (63) and remove the small pilot cap (13, 81). Pull out O-ring (14) from valve housing.



45078MC09

(3) Center bypass cut spool assy (24)

- ① Loosen the plug (27) and remove spring (25), spring seat (21) and the spool (24).

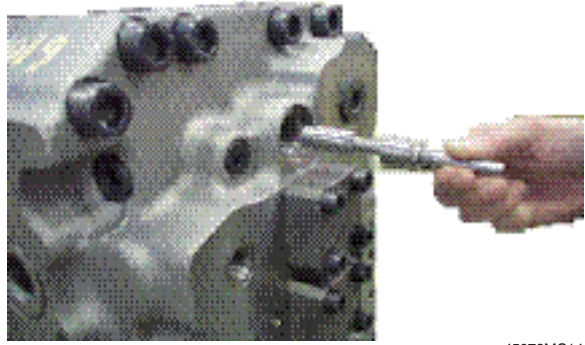


45078MC13

② Pull out O-ring(20).

※ When disassemble the spool assembly, fix the spool with vise. On this occasion attach wood between vise blades to prevent the spool from damaging.

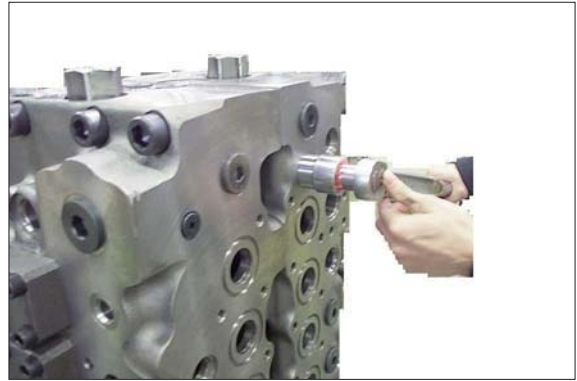
※ Heat the outer race of spool with industrial drier and then loosen easily.
(Temperature : 200~250°C)



45078MC14

(4) Arm1 regeneration spool assy (20)

① Loosen the plug(23) and pull out Oring(79).



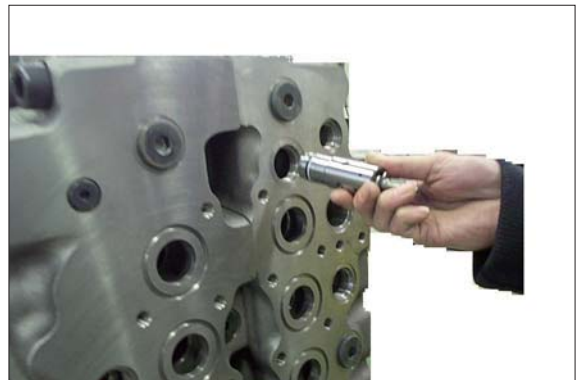
45078MC15

② Disassemble spring(22), spring seat(21) and spool(20).



45078MC16

③ Pull out sleeve of hole inside at same time, disassemble sleeve and piston.



45078MC18

(5) General precautions

Clean all disassembled parts with clean mineral oil fully, and dry them with compressed air. Then, place them on clean papers or cloths for inspection.

① Control valve

- a. Check whole surfaces of all parts for burrs, scratches, notches and other defects.
- b. Confirm that seal groove faces of casing and block are smooth and free of dust, dent, rust etc.
- c. Correct dents and damages and check seat faces within the casing, if any, by lapping.
※ Pay careful attention not to leave any lapping agent within the casing.
- d. Confirm that all sliding and fitting parts can be moved manually and that all grooves and paths are free from foreign matter.
- e. If any spring is broken or deformed, replace it with new one.
- f. When a relief valve does not function properly, repair it, following the prescribed disassembly and assembly procedures.
- g. Replace all seals and O-rings with new ones.

② Relief valve

- a. Confirm that all seat faces at ends of all poppets and seats are free of defects and show uniform and consistent contact faces.
- b. Confirm manually that main poppet and seat can slide lightly and smoothly.
- c. Confirm that outside face of main poppet and inside face of seat are free from scratches and so on.
- d. Confirm that springs are free from breakage, deformation, and wear.
- e. Confirm that orifices of main poppet and seat section are not clogged with foreign matter.
- f. Replace all O-rings with new ones.
- g. When any light damage is found in above inspections, correct it by lapping.
- h. When any abnormal part is found, replace it with a completely new relief valve assembly.

3) ASSEMBLY

(1) General comments

- ① In this assembly section, explanation only is shown.
For further understanding, please refer to the figures and photographs shown in the previous disassembly section.
- ② Figure in () shown after the part name in the explanation refers to the reference identity number shown on the construction figure shown in the spares section.
- ③ **Cautions in assembling seal**
 - a. Pay close attention to keeping all seals free from handling damage and inspect carefully for damage before using them.
 - b. Apply clean grease or hydraulic oil to the seal so as to ensure it is fully lubricated before assembly.
 - c. Do not stretch seals so much as to deform them permanently.
 - d. In fitting O-rings, pay close attention not to roll them into their final position in addition, a twisted O-ring cannot easily untwist itself naturally and could thereby cause inadequate sealing and thereby both internal and external oil leakage.
 - e. Tighten fitting bolts for all sections with a torque wrench adjusted to the respective tightening torque as shown on the cross section drawings of the spares section.

(2) Main spool

- ① Apply loctite to thread of spools (3, 4, 6, 7, 9, 10, 11) and assemble spring seat, spring and spool end. Assemble spool end to spool after fixing spool with a vise attached wood.
※ Be careful not to applying loctite too much.
 - Tightening torque : 2.4 ~ 2.6 kgf · m (17.4 ~ 18.8 lbf · ft)Fit O-ring into housing and assemble spools (3, 4, 6, 7, 9, 10, 11) into housing.
Assemble lock cap on housing and tighten hex socket bolt.
 - Tightening torque : 11 ± 0.5 kgf · m (79.7 ± 3.7 lbf · ft)
- ② Insert poppet, spring into spool (5) and then apply loctite to thread of spool.
Fit O-ring and backup ring on the plug and then tighten plug.
Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.
 - Tightening torque : 2.4 ~ 2.6 kgf · m (17.4 ~ 18.8 lbf · ft)Fit O-ring into housing and assemble spool (5) into housing.
Assemble lock cap on housing and tighten hex socket bolt.
 - Tightening torque : 11 ± 0.5 kgf · m (79.7 ± 3.7 lbf · ft)
- ③ Insert poppet, spring into spool (8) and then apply loctite to thread for spool.
Fit O-ring and backup ring on the plug and then tighten plug.
Assemble spring seat, spring, and spool end and then assemble spool end sub assy to spool after fixing spool with a vise attached wood.
 - Tightening torque : 2.4 ~ 2.6 kgf · m (17.4 ~ 18.8 lbf · ft)Fit O-ring into housing and assemble spool (8) into housing.
Assemble lock cap on housing and tighten hex socket bolt.
 - Tightening torque : 11 ± 0.5 kgf · m (79.7 ± 3.7 lbf · ft)
- ④ Assemble short cap on housing and tighten hex socket bolt.
 - Tightening torque : 11 ± 0.5 kgf · m (79.7 ± 3.7 lbf · ft)

(3) Center bypass cut spool assy (24)

- ① Apply loctite to thread of spool, assemble spool end to spool.
- ※ Be careful not to applying loctite too much.
- ② Assemble spool assy, spring seat, spring and tighten plug with O-ring.
 - Tightening torque : 9.5 ~ 11.0 kgf · m (68.6 ~ 79.7 lbf · ft)

(4) Arm1 regeneration spool assy (20)

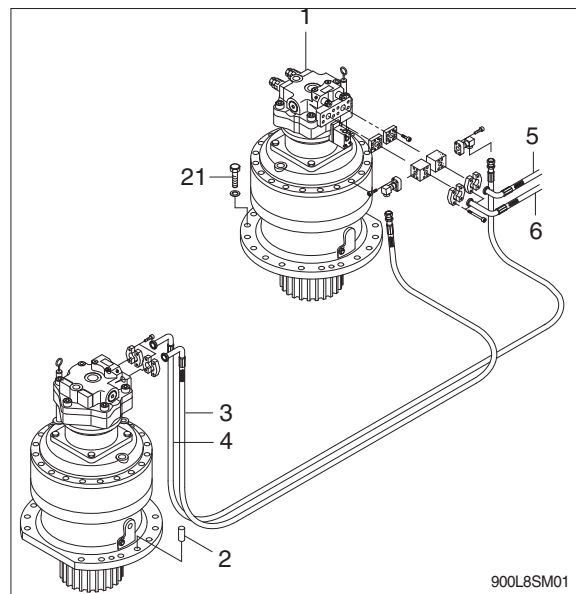
- ① Assemble backup rings and O-rings to sleeve respectively.
- ② Assemble piston to sleeve which seal is assemble, and insert spool into sleeve.
- ③ Assemble spool assy, spring seat, spring and tighten plug with O-ring.
 - Tightening torque : 9.5 ~ 11.0 kgf · m (68.6 ~ 79.7 lbf · ft)

GROUP 5 SWING DEVICE

1. REMOVAL AND INSTALL OF MOTOR

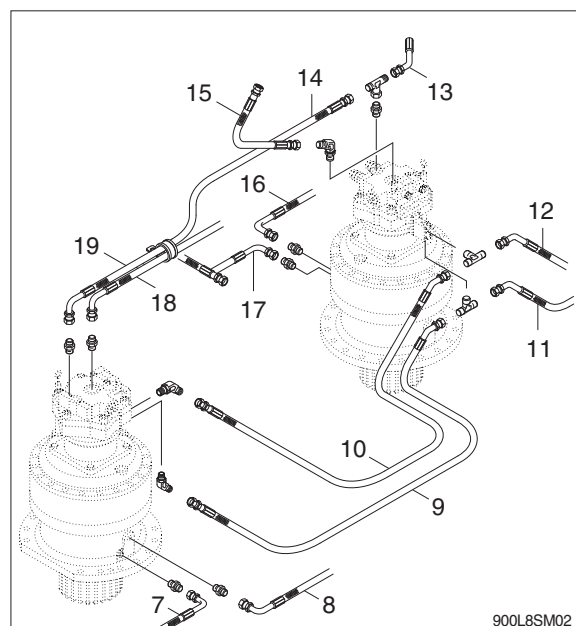
1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Loosen the breather slowly to release the pressure inside the hydraulic tank.
▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.
- (3) Disconnect pilot line hoses (3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19).
- (4) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (21) and dowel pin (2).
 - Motor device weight : 90 kg (200 lb)
 - Tightening torque : $120 \pm 18 \text{ kgf} \cdot \text{m}$
($868 \pm 130 \text{ lbf} \cdot \text{ft}$)
- (5) Remove the swing motor assembly.
※ When removing the swing motor assembly, check that all the piping have been disconnected.



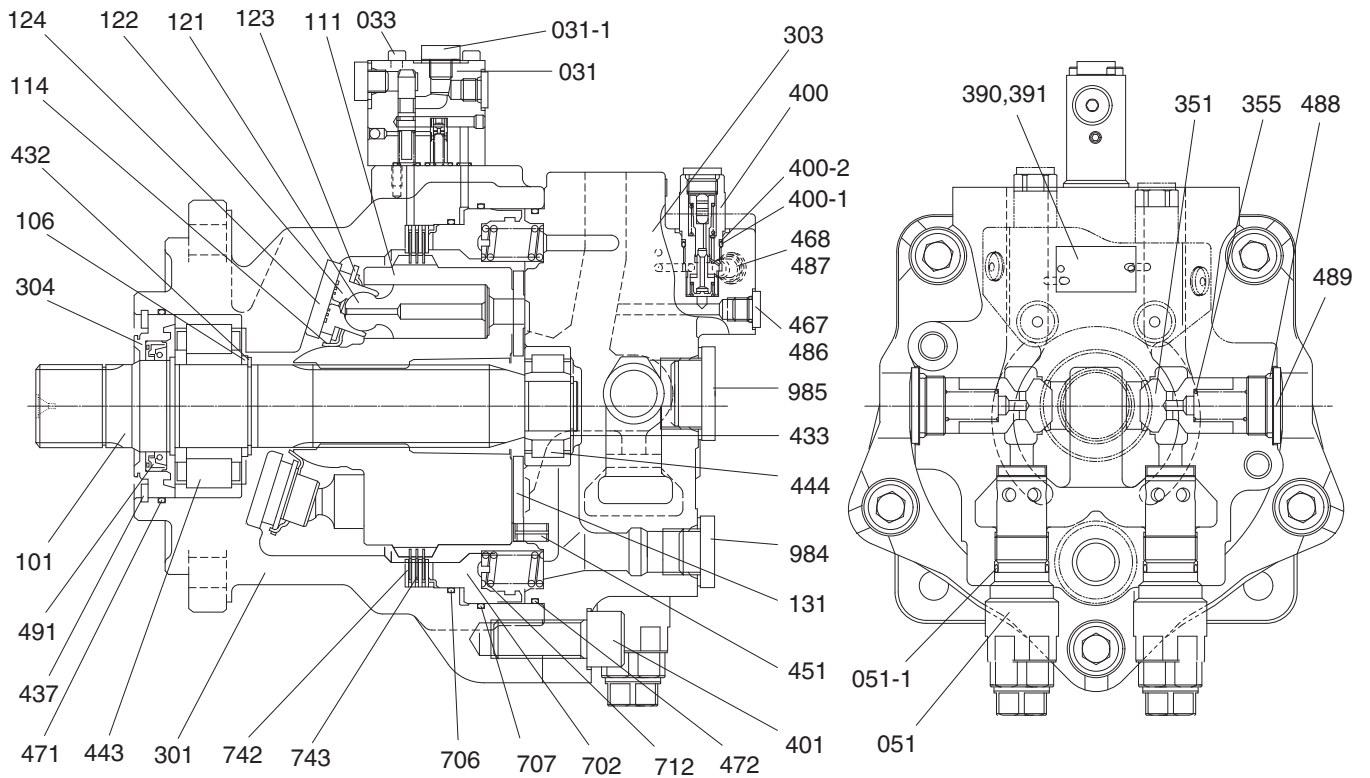
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Bleed the air from the swing motor.
 - ① Remove the air vent plug.
 - ② Pour in hydraulic oil until it over flows from the port.
 - ③ Tighten plug lightly.
 - ④ Start the engine, run at low idling, and check oil come out from plug.
 - ⑤ Tighten plug fully.
- (3) Confirmed the hydraulic oil level and check the hydraulic oil leak or not.



2. SWING MOTOR

1) STRUCTURE



XJBN-01948

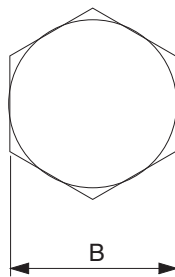
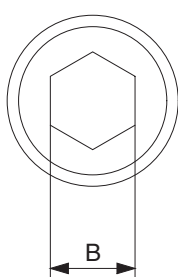
031	Time delay valve	304	Front cover	469	Plug bolt
0311	Masking plug	351	Plunger	471	O-ring
033	Hex screw	355	Spring	472	O-ring
051	Relief valve	390	Name plate	486	O-ring
0511	O-ring	391	Pin	487	O-ring
101	Drive shaft	400	Swing valve	488	O-ring
106	Spacer	4001	O-ring	491	Oil seal
111	Cylinder	4002	Back up ring	702	Brake piston
114	Shoe plate	401	Hex screw	706	O-ring
121	Piston	432	Snap ring	707	O-ring
122	Shoe	433	W clip	712	Brake spring
123	Set plate	437	Snap ring	742	Friction plate
124	Shoe plate	443	Roller bearing	743	Separator plate
131	Valve plate	444	Roller bearing	984	Making plug
301	Casing B	467	Plug	985	Masking plug
303	Valve casing	468	Plug		

2) TOOLS AND TIGHTENING TORQUE

(1) Necessary tools

The tool necessary for disassembling and reassembling and their dimensions are shown below.

Name of tools	Dimension B (mm)	Name of parts applied and remarks
Hexagon bar wrenches (JIS B 4686)	17	ROMH plug (469)
		Hexagon socket head cap screw (401)
Spanner, socket wrenches	19	Plug (468)
	24	Anti-reaction valve (400)
	41	Relief valve (051)
Hammers	Plastic hammer	Wooden hammer allowed.
	Iron hammer	Norminal 1 or so.
Steel rod approx. 10 x 8 x 200 mm		Bearing (443 & 444), Pin (451)
Torque wrench		5 to 10 N-m
		10 to 45 N-m
		40 to 275 N-m
		75 to 550 N-m
		100 to 1000 N-m
Screw driver		2 pieces
Bearing pliers		Bearings (443 & 444)
Plier		Snaping (437)
Brake piston removal tool		Brake piston (702)

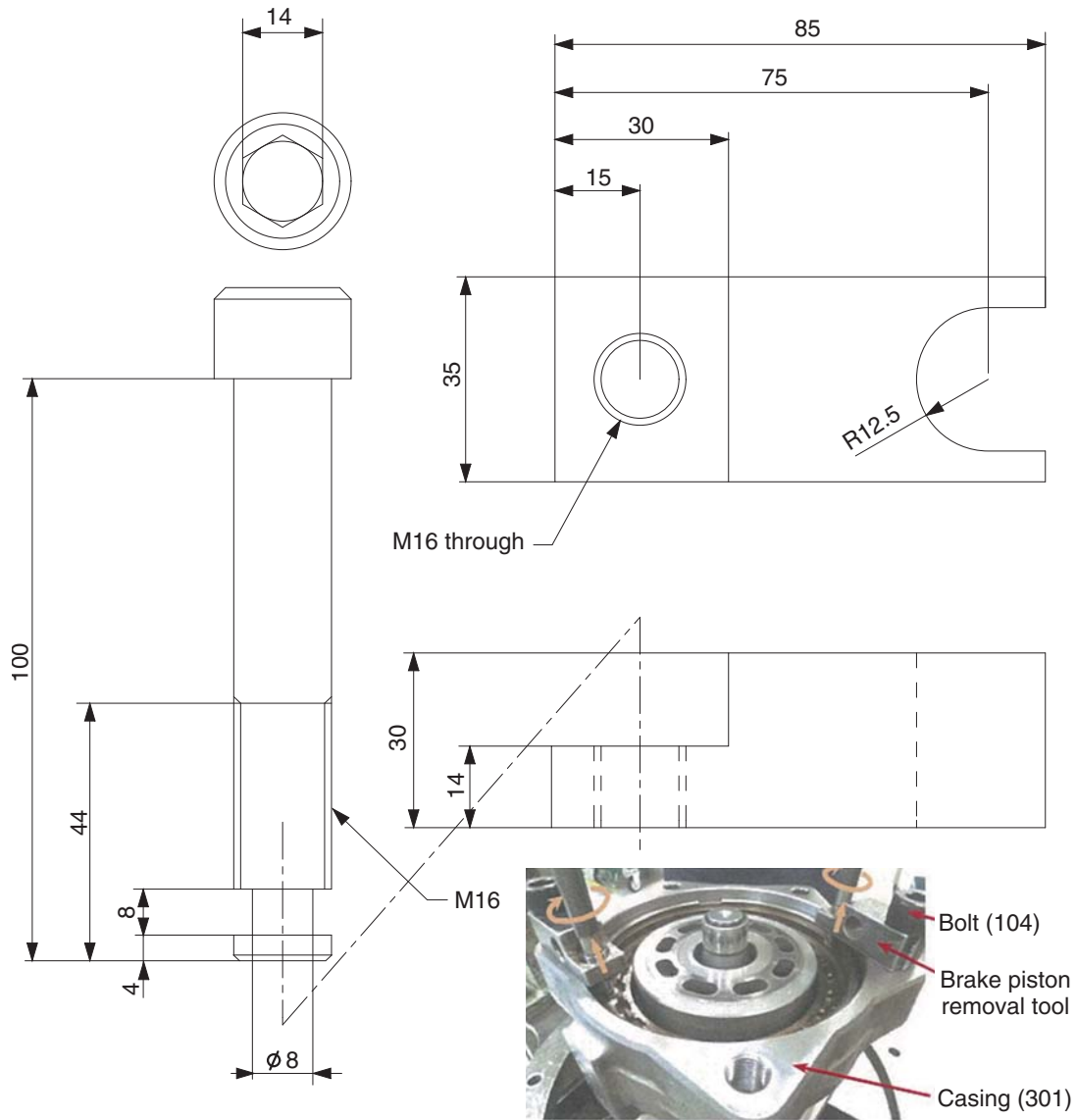


900L8SM05

(2) Thread size used and tightening torque

Part name	Item No.	Sizes	Dimensions B (mm)	Torque	
				kgf · m	lbf · ft
Hexagon socket head cap screw	401	M22 (ISO724)	17	64.2	465
ROMH plug	469	M36 (ISO724)	17	55.0	398
Plug	468	9/16-18UNF-2B (SAE)	19	4.9	35.4
Anti-reaction valve	400	M22 (ISO724)	24	7.0	50.9
Relief valve	051	M33 (ISO724)	41	18.0	131

(3) Brake piston removal tool



900L8SM06

3) DISASSEMBLING

Disassemble the motor, following the procedures described below.

(1) Ensure that the motor is clean and free from dirt and debris to any disassembly.

※ All parts are to be plugged to prevent ingress of dirt during external cleaning.

(2) Remove the oil from drain port.

(3) Be sure to fix motor to the working bench and put identification marks on each parts to show its location in the motor.

※ Prevent damage to disassembled parts, by keeping them protected and in a clean area.



900L8SM10

(4) Remove anti-reaction valve (400) from the valve casing (303).

※ Be careful not to lose the parts of anti-reaction valves since some parts of this valves can be easily pull out of its body.



900L8SM11

(5) Remove plug (468) from the valve casing (303).



900L8SM12

(6) Remove relief valves (051) from the valve casing (303).

- ※ Be sure to replace O-rings of relief valves because they are frequently damaged during disassembly.



900L8SM13

(7) Remove ROMH plugs (469), spring (355) and plungers (351) from the valve casing (303).

- ※ Handle carefully to prevent damage to the seat on the plunger (351).



900L8SM14



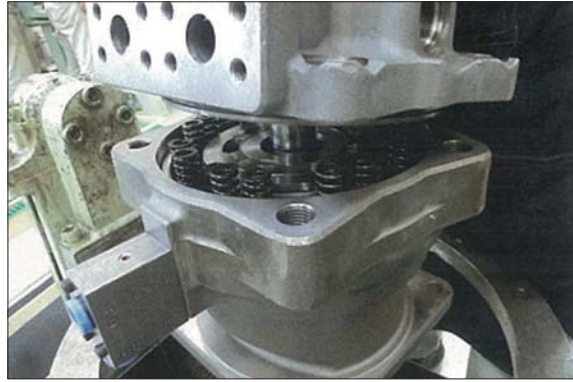
900L8SM15

(8) Remove socket head bolts (401) and remove valve casing (303) from casing (301) then remove valve plate (131).

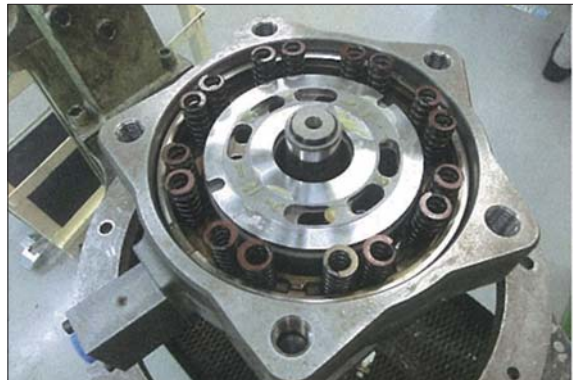
- ※ Valve plate (131) may often remain on cylinder (111).



900L8SM16



900L8SM17

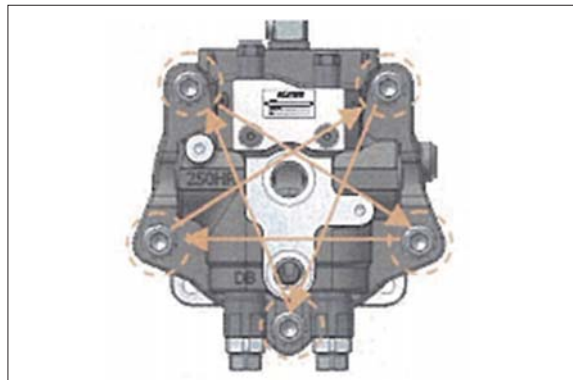


900L8SM18



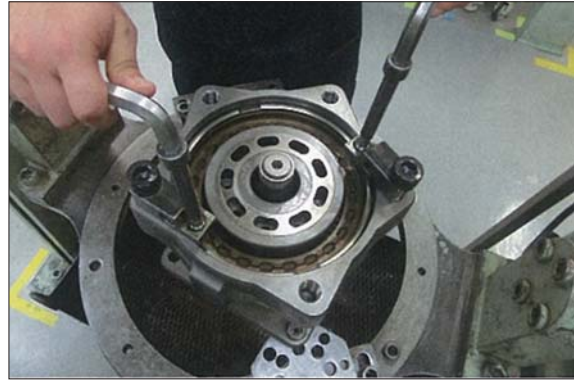
900L8SM19

※ Be sure to loose the bolt (401) according to the following order so as not to damage the bearing (444).



900L8SM20

- (9) Remove springs (712) from the brake piston (702).
- (10) Remove brake piston (702) from casing (301) by using special tooling.
 - ※ Pull brake piston vertically by using the special tooling.



900L8SM21



900L8SM22



900L8SM23

- (11) Put the motor on its side as shown in figure. Remove rotation group from the drive shaft (101).
 - ※ During the removal of the rotation group from the swing motor, do not let the pistons fall out of the cylinder.
 - All pistons in the rotation group must be re-installed in their original locations.



900L8SM24

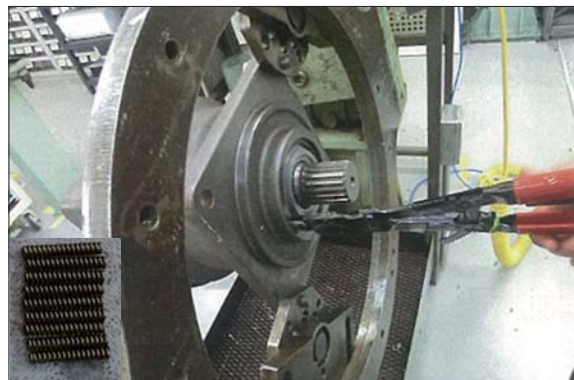
- (12) Disassemble rotation group as follows :
- Put identification marks on nine pistons (121), showing their location in the plate (123) and the plate (123) as a unit from the cylinder.
 - Separate the piston assemblies from the plate.
 - ※ Handle carefully so as not to damage sliding face on the retainer (113) or shoes (122).



900L8SM25

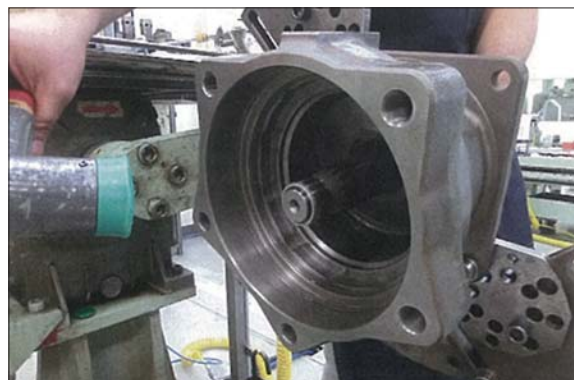
- (13) Remove friction plates (742) and separator plates (743) from casing (301).
- ※ Pay attention to the position of friction and separator plates.

- (14) Remove the snap ring (437) with a plier and then remove the front cover (304) and oil seal (491) from the casing (301).
- ※ Pay attention to the position of friction and separator plates.
 - ※ Be sure to warp the output spline of driving shaft (101) with a cover or plastic tape to protect a lip of oil seal.



900L8SM26

- (15) Remove shaft assembly from casing (301) with hammering at the other shaft end.
- ※ Be careful not to damage sliding face on the shaft.



900L8SM27

(16) Remove bearing inner race (443) from the shaft (101) with press machine if necessary.

※ The bearing inner race (444) cannot be removed from the shaft (101).

Be careful not to damage sliding face on the shaft. If bearing center cone is removed do not use in re-assembly of motor.

(17) Remove bearing outer race (444) from the valve casing (303) with bearing pliers, only if necessary.

※ Do not use in re-assembly of motor if bearing is removed.



900L8SM28

※ That is all of disassembling work.

4) REASSEMBLING

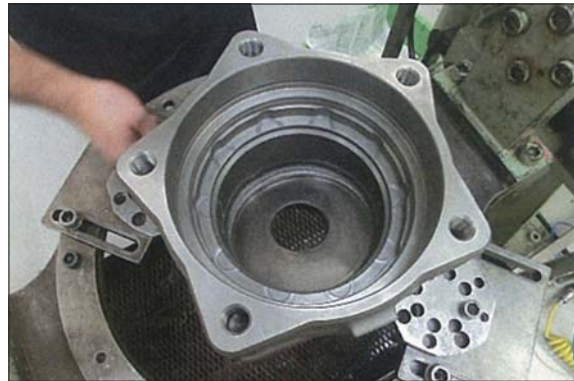
Cleanliness is a primary means of insuring satisfactory motor life, on either new or repaired units. Cleaning parts by using a solvent wash and air-drying is adequate, providing clean solvent is used. As with any precision equipment, the internal mechanism and related items must be kept free of foreign materials and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material.

It is recommended that all oil seals and O-rings be replaced. Lightly lubricate all oil seals and O-rings with clean oil prior to assembly. Lubricate all sliding sections, bearings, and cylinders with clean oil prior to assembly.

Reassemble the motor, following the procedures described below.

- (1) Place the motor in a vertical position with bell housing face down. Be sure to fix the motor casing (301) before assembling.



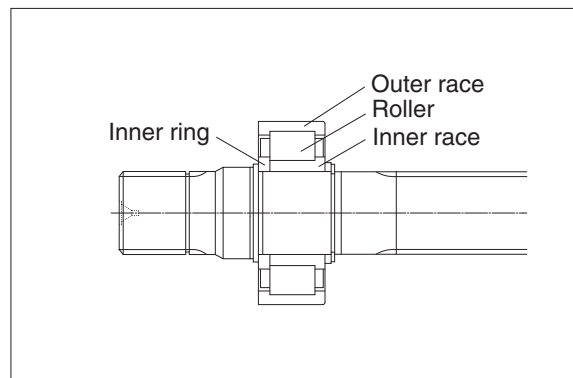
900L8SM30

- (2) Heat the inner race of the bearing (443) (444) to 110 °C (230 °F) max and insert to the drive shaft.

And then attach the spacer (106) and the snap rings (432) (433) to the driving shaft (101).

▲ Do not exceed temperature 110°C (230 °F).

- ※ Be sure to assemble the bearing (443) According to the following direction.
- ※ Be sure to erase the inner race of the bearing (443) (444) before assembling.



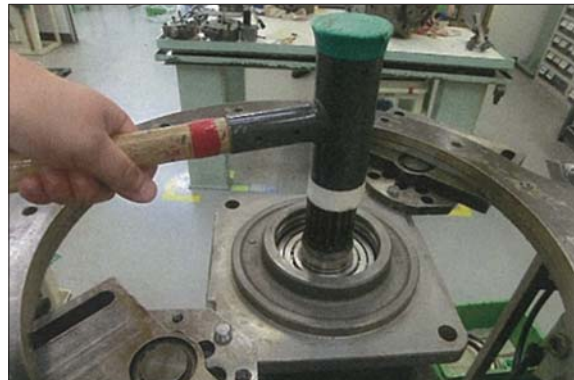
900L8SM31

(3) Insert the shaft assembly into the motor casing (301) by hammering at the shaft end.

※ Use the plastic hammer not to damage the driving shaft.



900L8SM32



900L8SM33

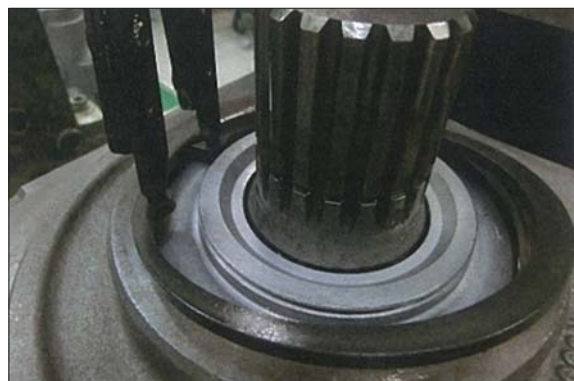
(4) Grease to the oil seal (491) and install it to the front cover (304).

Then, attach the O-ring (471) to the motor casing (301) and install the front cover and the snap ring (432) into the motor casing (301).

※ Be sure to warp the output spline of driving shaft (101) with a cover or plastic tape to protect a lip of oil seal.



900L8SM34



900L8SM35

- (5) Install shoe plate (124) into the motor casing (301).
※ Shoe plate to be fitted lapped side outwards.



900L8SM36

- (6) Put set plate (123) on plate spring (114) and install assembly (121 & 122) into set plate (123).
※ Be sure to reassemble with identification marks on parts corresponding to each order.



900L8SM37

- (7) Insert piston assemblies into cylinder (111).
Install rotation group into casing (301).
※ Be sure to reassemble with identification marks on parts corresponding to each order.



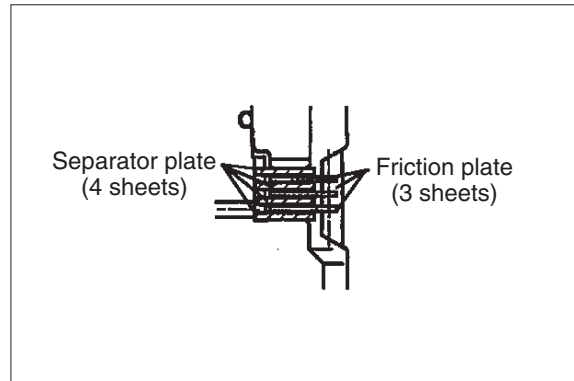
900L8SM38

- (8) Place the motor in a vertical position with bell housing face down.
※ Be careful of the assembling order.



900L8SM39

- ※ At first, insert a separator plate (743), and then insert a friction plate (742) and separator plate alternately.



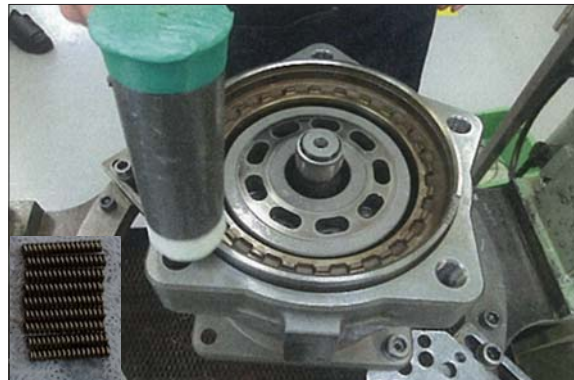
900L8SM40

- (9) Install O-ring (707) and O-ring (706) into casing (301).
- ※ Ensure that the seal is lightly greased not to be cut.



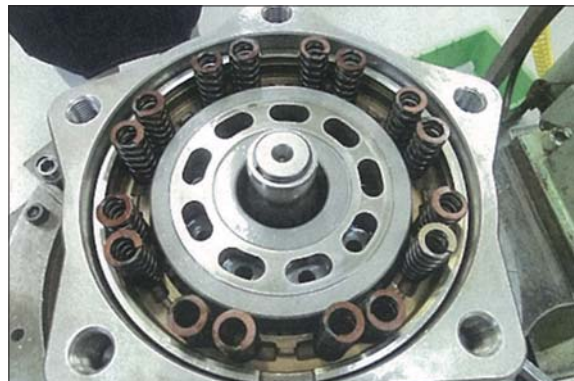
900L8SM41

- (10) Install brake piston (702) into casing (301) by tapping the piston into position using a plastic hammer, and then press to ensure brake piston is seated correctly.



900L8SM42

- (11) Install spring (712) into the brake piston (702).
- ※ Be sure to place the spring according to the displacement described in cross section of the motor.



900L8SM43

(12) Install the outer race of the bearing (444) into valve casing (303) by a hammer and a steel rod.

- ※ Insert to hit at the periphery of bearing evenly using steel rod and hammer.



900L8SM44

(13) Install valve plate (131) and O-ring (472) onto valve casing (303).
Brass face must be upwards.

- ※ Put multi purpose grease onto the face of the head to ensure contact.



900L8SM45



900L8SM46

(14) Install valve casing (303) and five socket head cap screw (401) into casing (301).

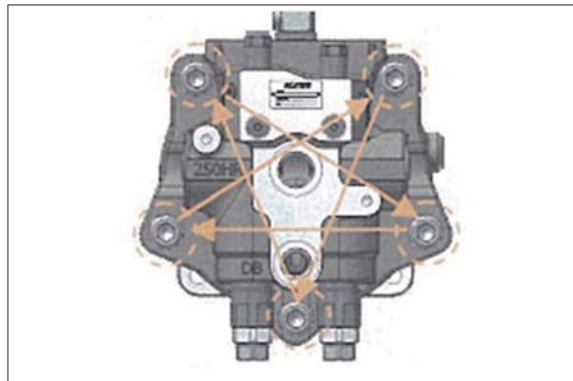


900L8SM47



900L8SM48

- ※ Be sure to tighten the bolts (401) according to the following order so as not to damage the bearing (444).



900L8SM20

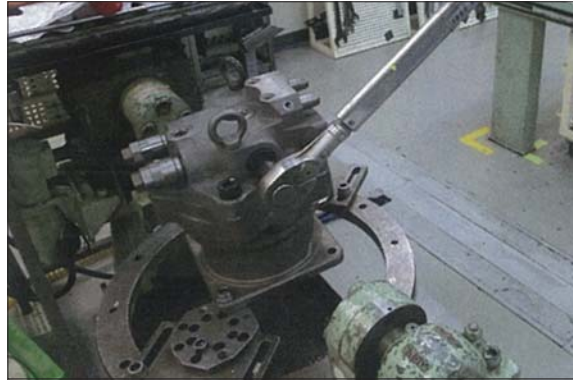
- (10) Insert plunger (351) and spring (355) into valve casing (303) and install plug (469) with O-ring (488) in valve casing (303).
- ※ Check plunger (351) to move smoothly.
- ※ Be sure to reassemble with identification marks on parts corresponding to each other.



900L8SM49



900L8SM50



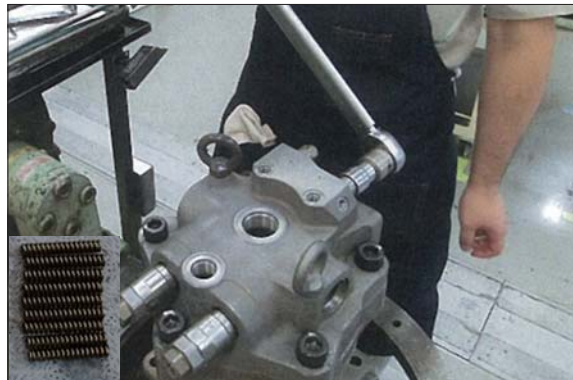
900L8SM51

(16) Put new O-ring on relief valve (051) and install relief valves (051) and anti-reaction valves (400) into valve casing (303).

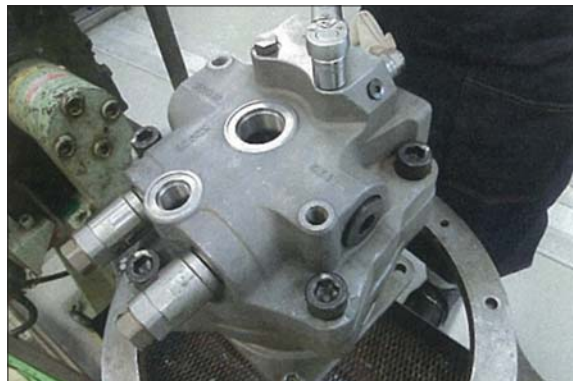
※ Be sure to reassemble with identification marks on parts corresponding to each other.



900L8SM52



900L8SM53



900L8SM54

※ That is all of reassembling work.



90L8SM55

3. REMOVAL AND INSTALL OF REDUCTION GEAR

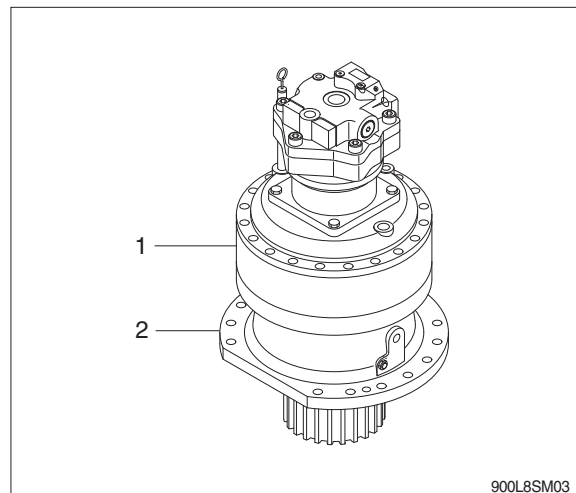
1) REMOVAL

- (1) Remove the swing motor assembly.
For details, see removal of swing motor assembly.
- (2) Sling reduction gear assembly (1) and remove mounting bolts (2).
- (3) Remove the reduction gear assembly.
 - Reduction gear device weight :
270kg (600lb)



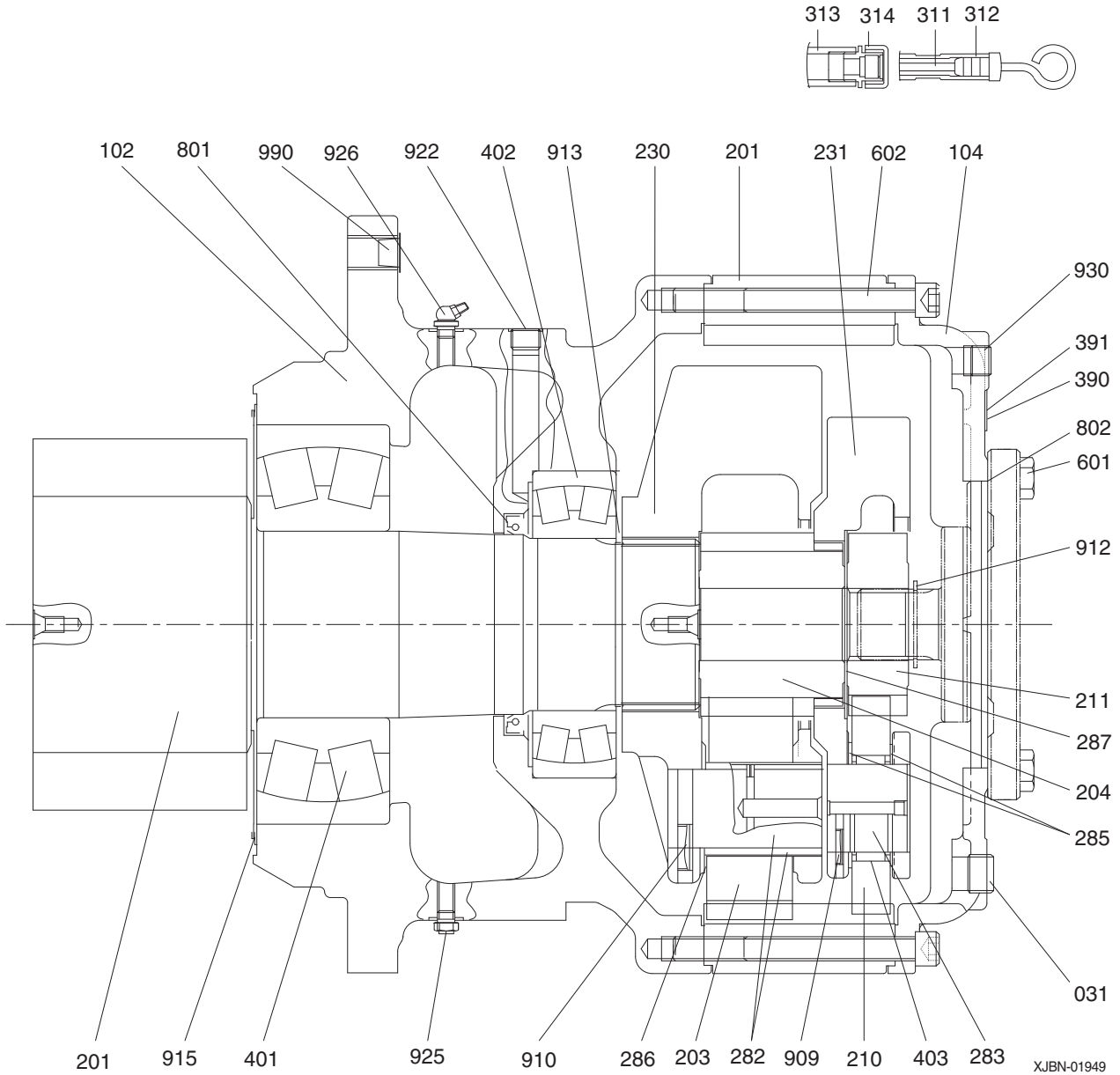
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
 - Tightening torque : 100 ± 15 kgf · m
(723 ± 109 lbf · ft)



4. REDUCTION GEAR

1) STRUCTURE



104	Rear casing	287	Thrust plate	802	O-ring
201	Drive shaft	311	Level bar	909	Spring pin
202	Ring gear	312	Y pipe	910	Spring pin
203	Planet gear B No.2	313	Oiling pipe	912	Snap ring
204	Sun gear B No.2	314	Oiling pipe	913	Stop ring
210	Planet gear B No.1	390	Name plate	915	Bearing seal C
211	Sun gear B No.1	391	Pin	922	Plug
230	Carrier No.2	401	Spherical roller bearing	925	Relief fitting
231	Carrier B No.1	402	Spherical roller bearing	926	Grease nipple
282	Pin A No.2	403	Needle cage	930	Plug
283	Pin No.1	601	Hex head bolt	931	Plug
285	Side plate	602	Hex head screw	990	Plug
286	Thrust washer	801	Oil seal		

2) TOOLS AND TIGHTENING TORQUE

(1) Thread size used and tightening torques

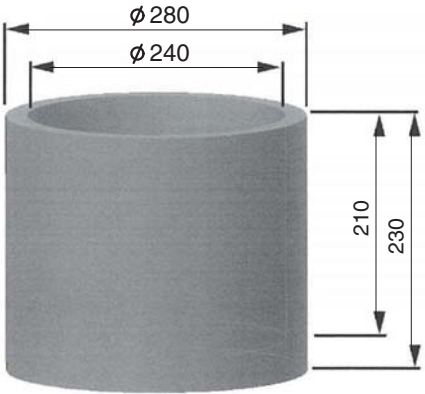
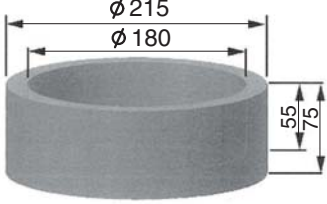

The thread sizes used in the reduction gear and their tightening torque is shown in table below.

No.	Part name	Size	Width across flat	Tightening torque	
				kgf · m	lbf · ft
601	Hex. head screw	M16 × 40	24 mm	24.0	173
602	Hex. socket head screw	M16 × 170	14 mm	24.0	173
922	Plug	PT 1/4	10 mm	6.6	47.9

(2) Tools used

- ① Allen wrench (width across flat : 24, 14, 10), socket wrench.
- ② Adjustable angle wrench, double (single) open-ended spanner.
- ③ Hammer, plastic hammer, screwdriver, punch, torque wrench & key.
- ④ Special jig, liquid panking (threebond no.1217).
- ⑤ Tank for shrinkage fit (80-100 degrees centigrade).

(3) Special jig

Detachment jig of spherical roller bearing (401)	Inserting jig of spherical roller bearing (402)	Inserting jig of oil seal
 <p>900L8SM60</p>	 <p>900L8SM61</p>	 <p>900L8SM62</p>

3) DISASSEMBLING

- Be careful not to damage parts.
 - Before reassembling, check parts, according to the part inspection.
 - Clean all parts with cleaning oil and dry them with compressed air.
 - If liquid packing has been applied, remove it with a chambering knife or so on and finish surfaces with an oilstone.
 - Follow the tightening torque.
- Disassemble the reduction gear, following the procedures described below.

(1) Light up reduction gear with its drive shaft horizontal with crane and remove gear oil through oil drain port.

※ Receive gear oil with clean vessel and check oil for wear particles.

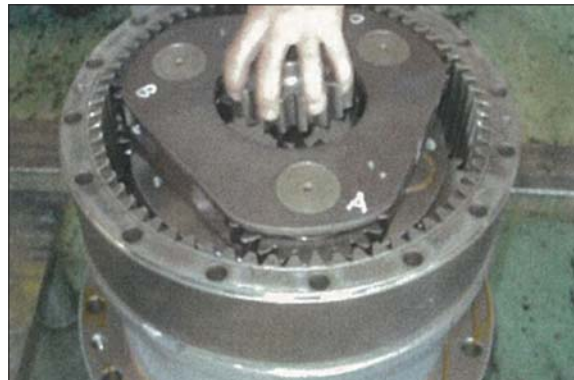
(2) Loosen hexagon head screws (601) and remove hydraulic motor

(3) Loosen hexagon socket head screws (602) and remove rear casing (104).



900L8SM70

(4) Remove No.1 sun gear (211).



900L8SM71

(5) Remove No.1 carrier assembly.



900L8SM72

(6) Disassembling of No.1 carrier assembly

※ During periodical inspection or so on, it is unnecessary to disassemble No.1 carrier assembly more.

In this state, check parts according to inspection shown in section 6.

As mentioned above, it is recommended to replace No.1 carrier assembly as set as far as possible.

However, if partial replacement is inevitable, follow procedures mentioned below.

① Press spring pin (909) in the more inner part and pull out pin No.1 (283).

※ If pin No.1 (283) is removed do not use in reassembly of reduction gear.

② Remove No.1 planetary gear (210), needle cage (403), side plate (285).

(7) Lift up ring gear (202) to remove.



900L8SM73

(8) Remove No. 2 sun gear (204).

(9) Remove No.3 carrier assembly.

(10) Disassembling of carrier No.2

※ During periodical inspection or so on, it is unnecessary to disassemble No.2 carrier assembly more.

In this state, check parts according to inspection shown in section 6.

As mentioned above, it is recommended to replace No.2 carrier assembly as set as far as possible.

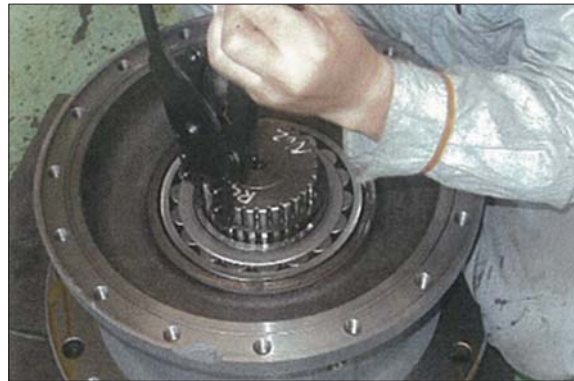
However, if partial replacement is inevitable, follow procedures mentioned below.

① Press spring pin (910) in the more inner part and pull out pin No.2 (282).

※ If pin No.2 (282) is removed do not use in reassembly of reduction gear.

② Pull out to remove planetary gear No.2 (203) and thrust washer (286).

(11) Remove snap ring (913) from driving shaft (201).



900L8SM74

(12) Place the reduction gear in a vertical with end of drive shaft, face down.

※ During periodical inspection or so on, it is unnecessary to disassemble drive shaft assembly more.

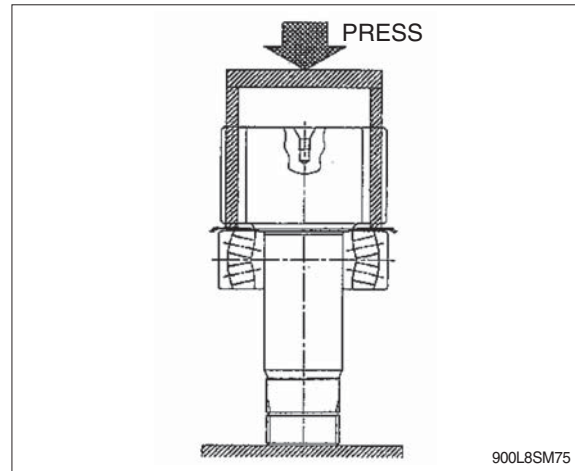
In this state, check parts according to inspection shown in section 6.

As mentioned above, it is recommended to replace drive shaft assembly as set as far as possible.

However, if partial replacement is inevitable, follow procedures mentioned below.

(13) Remove bearing seal (915) and spherical roller bearing (401) from driving shaft using press and jig as in right figure.

※ If bearing seal (915) and oil seal (801) is removed, do not use in reassembly of reduction gear.



(14) Remove oil seal (801) from casing (102)

4) REASSEMBLING

Reassemble the reduction gear, following the procedures described below.

(1) Reassembling of drive shaft assembly

① Insert bearing seal (915) to shaft (201).

※ Take care not to damage sliding face of oil seal.



900L8SM76

② Put grease on the inside of bearing (401) and press to insert bearing.

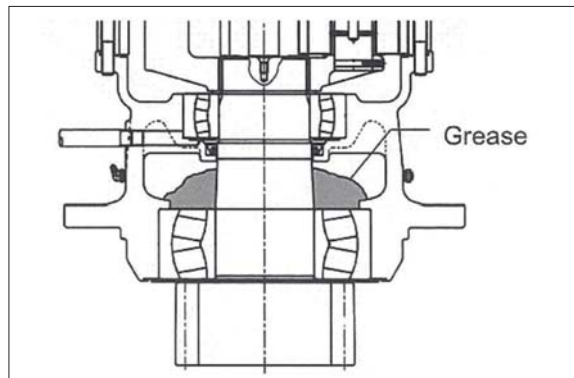


900L8SM77

※ Put grease on the bearing.

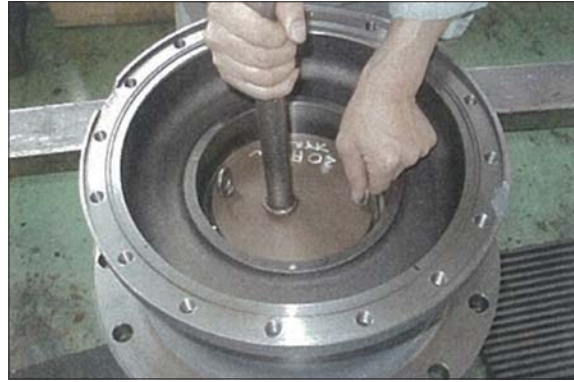


900L8SM78



900L8SM79

- (2) Put down casing (102) on a level surface.
- (3) Insert oil seal (801) into front casing (102) using jig.



900L8SM80

- (4) Lift up drive shaft assembly using lift-up screw holes on the drive shaft, and insert it to casing.
- (5) Place the reduction gear in a vertical position with end of drive shaft, face down.



900L8SM81

- (6) Insert bearing (402) using jig.



900L8SM82

- (7) Insert snap ring (913).
- (8) Put grease into casing from inlet port of grease.



900L8SM83

(9) Reassembling of carrier No.2 assembly

- ① Set thrust washer (286)
- ② Insert planetary gear (203).



900L8SM84

- ③ Insert pin No.2 (282) while tapping lightly with plastic hammer.



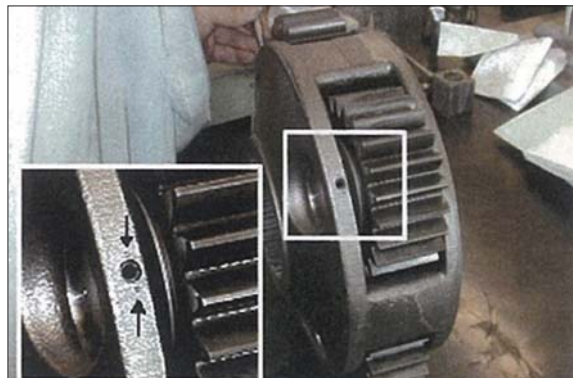
900L8SM85

- ④ Insert spring pin (910) and caulk carrier No.2 (230) both sides of spring pin with punch.



900L8SM86

※ Refer to "installation dimension".



900L8SM87

(10) Apply liquid packing to casing (102).



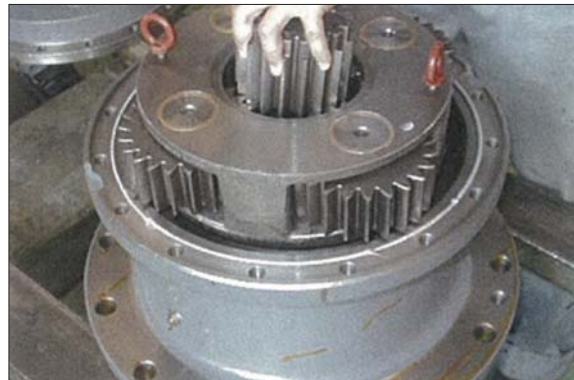
900L8SM88

(11) Install carrier No.2 assembly into casing (102).



900L8SM89

(12) Install sun gear No.2 (204).



900L8SM90

(13) Install ring gear (202) to casing (102).
Install four socket head cap screw into casing temporarily using washer not to damage casing.

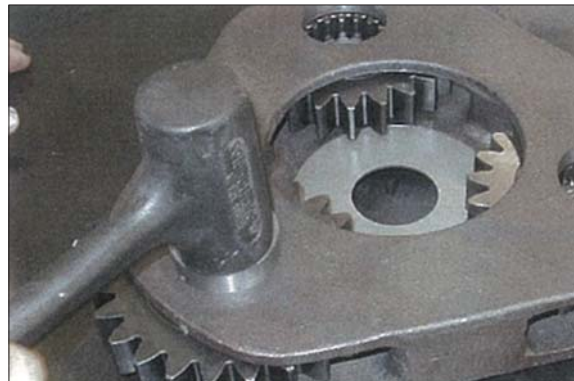


900L8SM91

(14) Reassembling of carrier No.1 assembly

- ① Set thrust washer (231)
- ② Insert planetary gear (287).
- ③ Install needle cage (403), planetary gear No.1 (210), side plate (285) into carrier No.1 (231).

- ④ Install pin No.1 (283) to carrier No.1 (231).

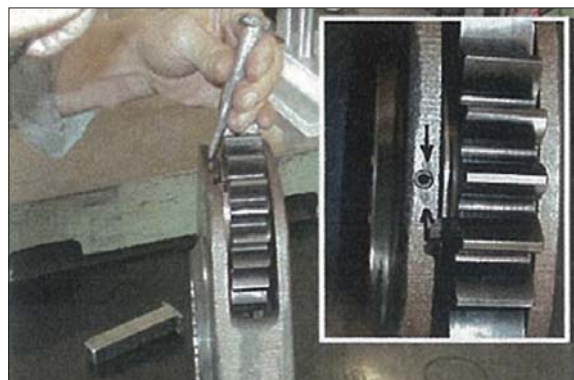


900L8SM92

- ⑤ Insert spring pin (909) and caulk carrier No.1 (231) both sides of spring pin with punch.



900L8SM93



900L8SM94

(15) Install carrier No.1 assembly.



900L8SM95

(16) Install sun gear No.1 (211).



900L8SM96

(17) Remove temporary bolts and apply liquid packing to casing (102).



900L8SM97

(18) Install rear casing (104) to ring gear (202) and tighten hexagon socket head screws (602).



900L8SM98

- (19) Install snap ring (912) and O-ring (802) to hydraulic motor, and then install hydraulic motor to reduction gear and tighten hexagon head screws (601).
- (20) Fit plug (922) that is winded by seal tape to casing (102).
- (21) Supply gear oil to inlet port of gear oil of reduction gear.

GROUP 6 TRAVEL DEVICE

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Swing the work equipment 90 ° and lower it completely to the ground.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Remove the track shoe assembly.
For details, see removal of track shoe assembly.

- (5) Remove the cover.

- (6) Remove the hoses.

※ Fit blind plugs to the disconnected hoses.

- (7) Remove the bolts and the sprocket.
 - Tightening torque : 199 ± 20 kgf · m
(1439 ± 145 lbf · ft)

- (8) Sling travel device assembly (1).

- (9) Remove the mounting bolts (2), then remove the travel device assembly.

· Weight : 440 kg (970 lb)

· Tightening torque : 199 ± 30 kgf · m
(1439 ± 217 lbf · ft)

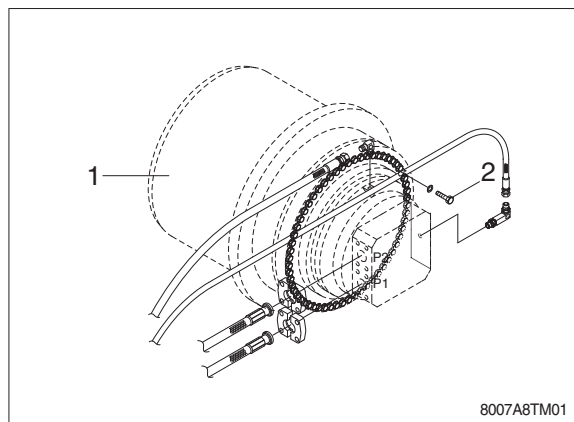
2) INSTALL

- (1) Carry out installation in the reverse order to removal.

- (2) Bleed the air from the travel motor.

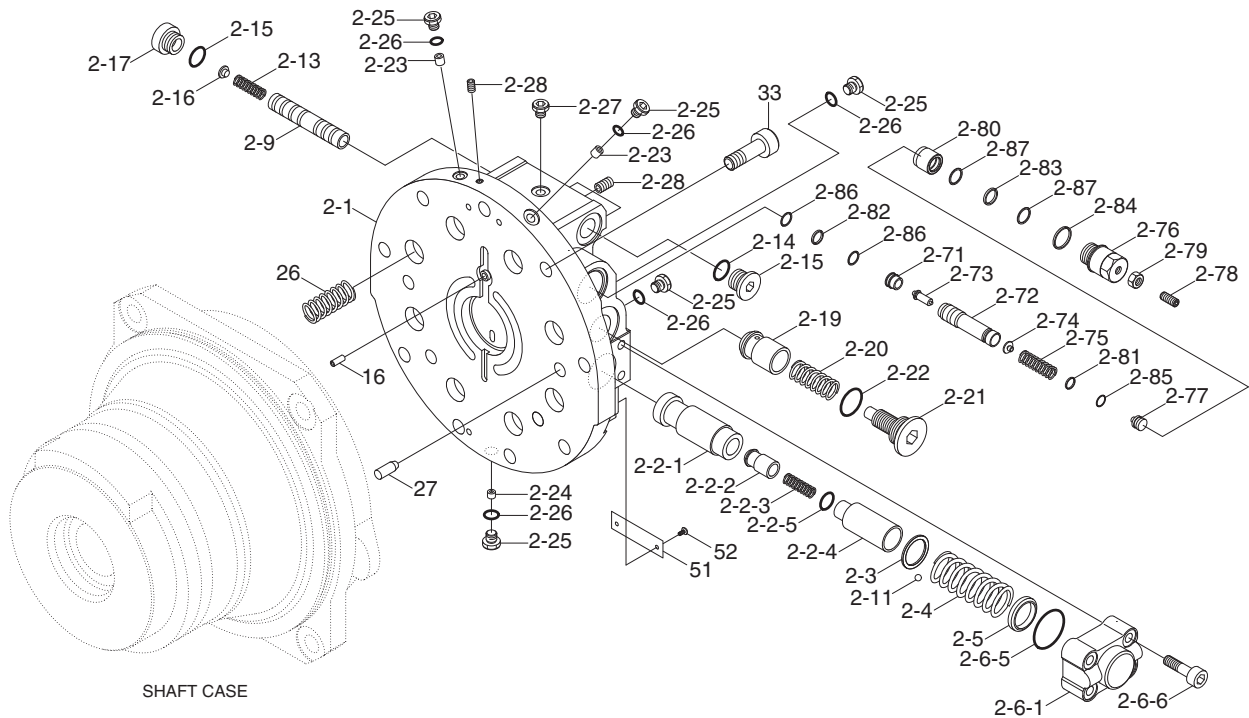
- ① Remove the air vent plug.
- ② Pour in hydraulic oil until it overflows from the port.
- ③ Tighten plug lightly.
- ④ Start the engine, run at low idling, and check oil come out from plug.
- ⑤ Tighten plug fully.

- (3) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. TRAVEL MOTOR (1/2)

1) STRUCTURE

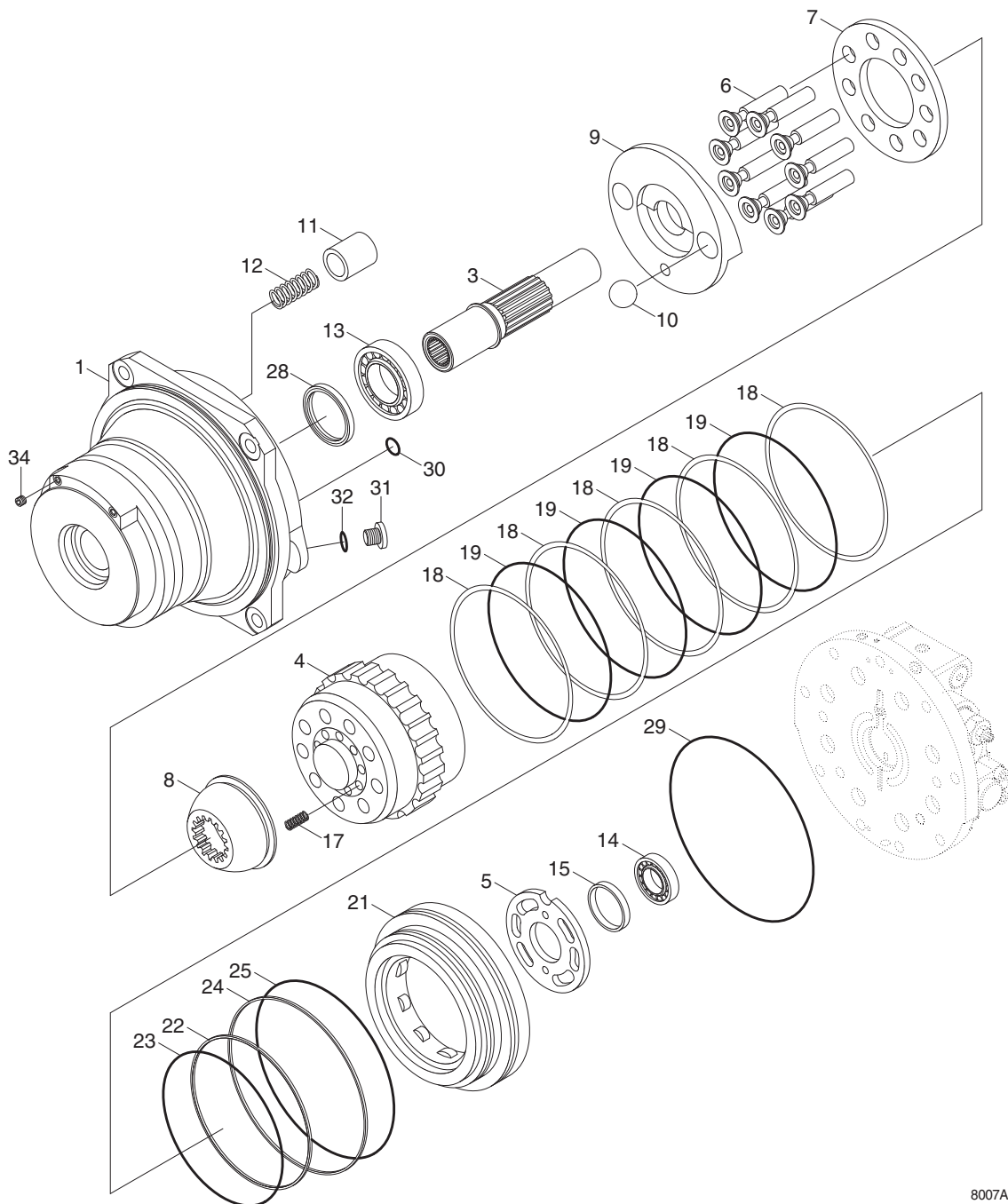


8007A2TM02

2-1	Base plate	2-7-5	Spring	2-15	O-ring
2-2	Spool assy	2-7-6	Plug	2-16	Spring guide
2-2-1	Spool	2-7-7	Spring guide	2-17	Plug
2-2-2	Check valve	2-7-8	Set screw	2-19	Check valve
2-2-3	Spring	2-7-9	Nut	2-20	Spring
2-2-4	Plug	2-80	Free piston	2-21	Plug
2-2-5	O-ring	2-81	O-ring	2-22	O-ring
2-3	Spring seat	2-82	O-ring	2-23	Orifice
2-4	Spring	2-83	O-ring	2-24	Orifice
2-5	Spring seat	2-84	O-ring	2-25	Plug
2-6	Cap assy	2-85	Back up ring	2-26	O-ring
2-6-1	Cap	2-86	Back up ring	2-27	Shipping plug
2-6-5	O-ring	2-87	Back up ring	2-28	Plug
2-6-6	Bolt	2-9	Valve assy	16	Pin
2-7	Relief valve assy	2-9-1	Spool	26	Spring
2-7-1	Poppet seat	2-9-2	Spool-C	27	Pin
2-7-2	Relief housing	2-11	Orifice	33	Socket bolt
2-7-3	Poppet	2-13	Spring	51	Name plate
2-7-4	Spring seat	2-14	Plug	52	Drive screw

TRAVEL MOTOR (2/2)

· Control part



8007A2TM03

1	Case	12	Spring	24	O-ring
3	Shaft	13	Roller bearing	25	Back up ring
4	Cylinder block	14	Roller bearing	28	Oil seal
5	Valve plate	15	Collar	29	O-ring
6	Piston assy	17	Spring	30	O-ring
7	Retainer plate	18	Friction plate	31	Plug
8	Plate holder	19	Disc plate	32	O-ring
9	Swash plate	21	Brake piston	34	Plug
10	Steel ball	22	O-ring		
11	Piston assy	23	Back up ring		

2) MAINTENANCE INSTRUCTION

(1) Tools for disassembly and reassembly

No.	Tool name	Specification	Applicable Components or Parts
1	Torque wrench	60 kgf · m (434 lbf · ft)	Orifice (2-11)
2		900 kgf · m (6510 lbf · ft)	Plug (2-2-4, 2-25), Nut (2-7-9), Orifice (2-23)
3		1800 kgf · m (13019 lbf · ft)	Bolt (2-6-6), Plug (2-14, 2-17)
4		5600 kgf · m (40505 lbf · ft)	Valve assy (2-7), Plug (2-21), Socket bolt (33)
5	Ratchet steering wheel for socket wrench	-	-
6	Hexagonal bit for torque wrench	Hex. 2.5	Orifice (2-11)
7		Hex. 4	Orifice (2-23, 2-24)
8		Hex. 5	-
9		Hex. 6	Set screw (2-7-8), Plug (2-25)
10		Hex. 10	Bolt (2-6-6), Plug (2-14, 2-17)
11		Hex. 12	Plug (31)
12		Hex. 14	Plug (2-2-4, 2-21), Socket bolt (33)
13	Socket	Hex. 21	-
14		Hex. 36	Relief valve assy (2-7)
15	Hexagon socket screw key	Hex. 2.5	Orifice (2-11)
16		Hex. 4	Orifice (2-23, 2-24)
17		Hex. 5	-
18		Hex. 6	Set screw (2-7-8), Plug (2-25)
19		Hex. 10	Bolt (2-6-6), Plug (2-14, 2-17)
20		Hex. 12	Plug (31)
21		Hex. 14	Plug (2-2-4, 2-21), Socket bolt (33)
22	Spanner	Hex. 19	Nut (2-7-9)
23		Hex. 21	-
24		Hex. 36	Relief valve assy (2-7)
25	Minus driver	6×100	Base plate assy (2), Valve plate (5)
26	Plastic hammer	#3	-
27	Punch	About 10 mm	-
28	Hand Press	200 kgf or more	-
29	Crane	For 400 kg	-
30	Eyebolt	M12	Case (1), Base plate assy (2), Base plate (2-1)
31	Chain string (wire)	-	-

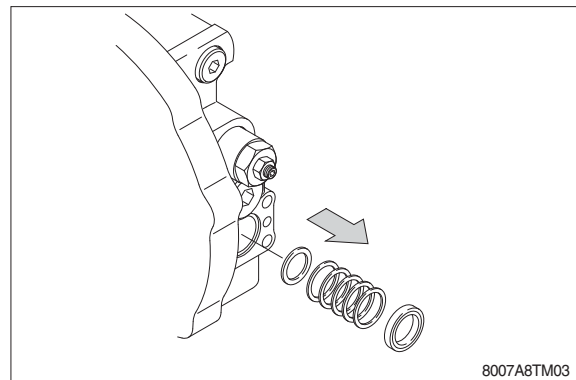
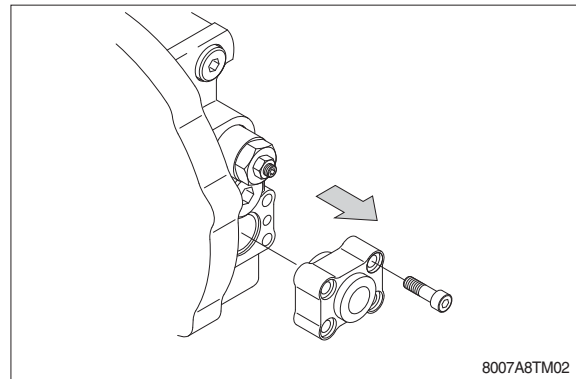
3) DISASSEMBLY

(1) General precautions

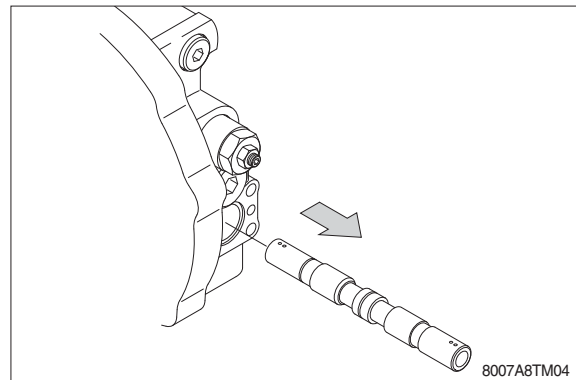
- ① Before disassembling the motor, check the items to be inspected and, for remedy against trouble, closely examine the nature of the trouble, so that the motor can be disassembled effectively.
- ② To disassemble the motor, use the disassembling procedures described in section 2) and select a clean place.
- ③ Place a rubber or vinyl sheet or other such protective materials on your working bench to protect the surface of the motor to be serviced.
- ④ During disassembly, give a match mark to the mating surfaces of each part.
- ⑤ Arrange removed parts in order so that they will not become damaged or missing during disassembly.
- ⑥ Once seals have been disassembled, they should be replaced even if damage is not observed. Have replacement seals ready on hand before starting your disassembling job.

(2) DISASSEMBLY TRAVEL MOTOR

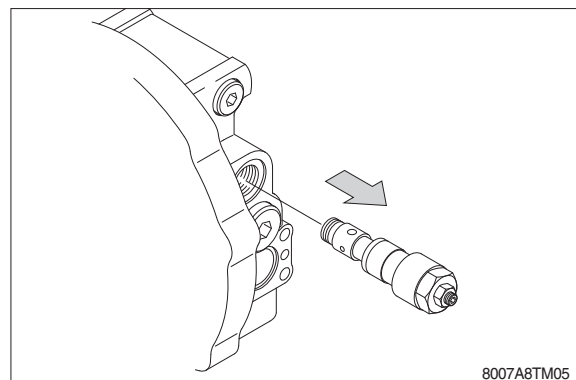
- ① Remove cap (2-6) and take out spring (37), spring seat (36).



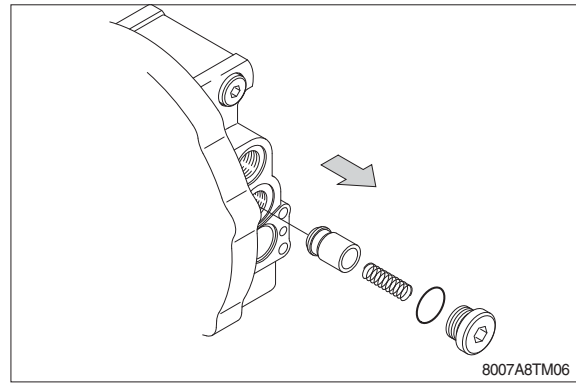
- ② Remove spool assy (2-2) turning slowly. Be careful not to damage around the spool assy.



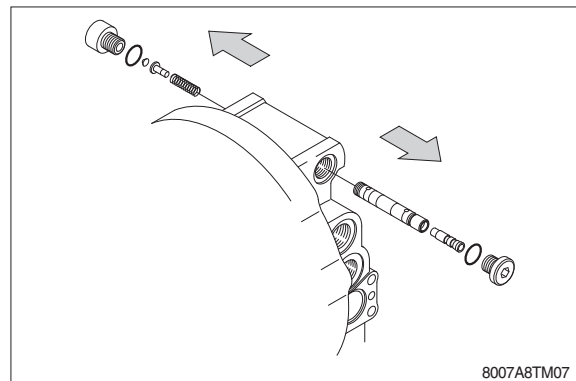
- ③ Loosen the plug (2-7-6) to remove the relief valve assembly (2-7).
 - ※ Do not move the setscrew, nut. Otherwise, the set pressure will change.
 - ※ Do not disassemble the relief valve assembly because it is a functional component.



- ④ Remove plug (2-21), spring (2-20) and check valve (2-19).



- ⑤ Remove Plugs (2-14, 2-17) remove spring (2-13) and spool assy (2-9).



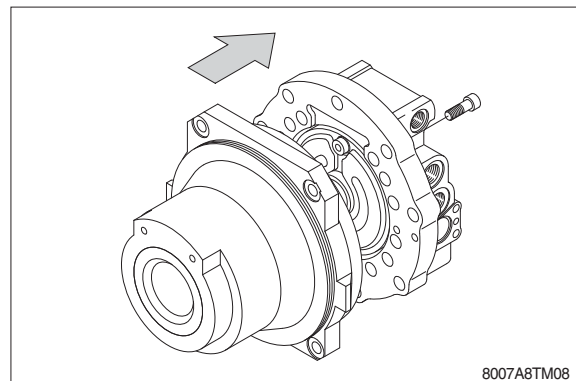
- ⑥ Remove socket head bolt (33).

– Points

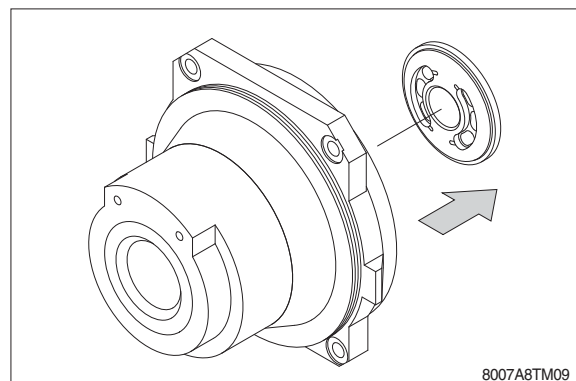
To disassemble the motor easily, socket head bolt (33) should be loosened evenly because base plate (1-2-1) lift up by the reactive force of springs (26).

Remove base plate (1-2-1).

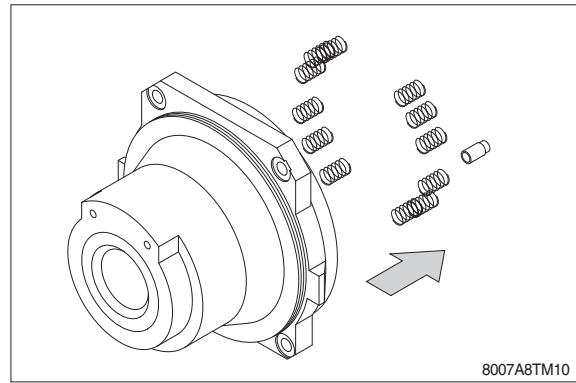
- Then, pay attention so that cylinder block does not come out. When it is difficult to remove, strike it by use of plastic hammer. If it is more difficult to remove, remove it by lightly prying with screwdriver.



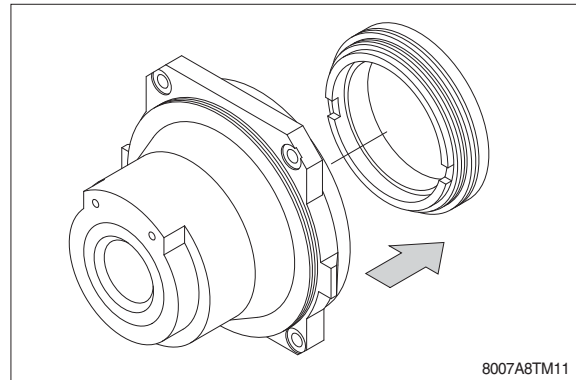
- ⑦ Remove valve plate (5) from base plate (1-2-1).



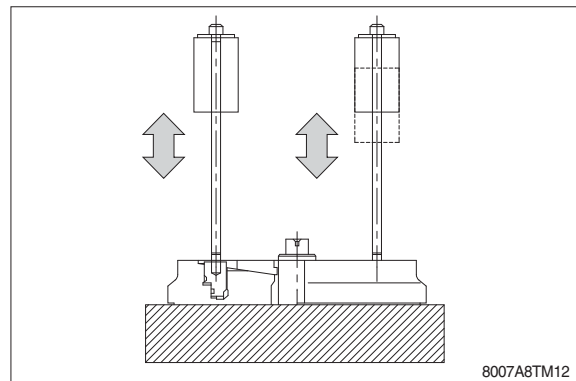
- ⑧ Remove O-rings (29)(30), pins (27) and springs (26).



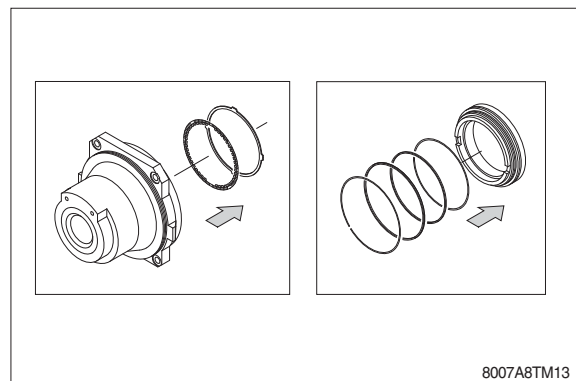
- ⑨ Remove brake piston (21).
Blow compressed air into parking brake-releasing port on case (1).



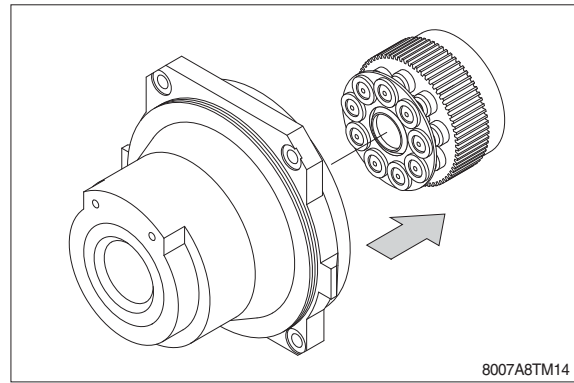
- ※ Before work, put rag on all surface of brake piston because brake piston fly out and oil flies off while at work.



- ※ After removing brake piston, remove disk (19), friction plate (18)(20). And then, removing O-rings (22)(24) and back up rings (23)(25).

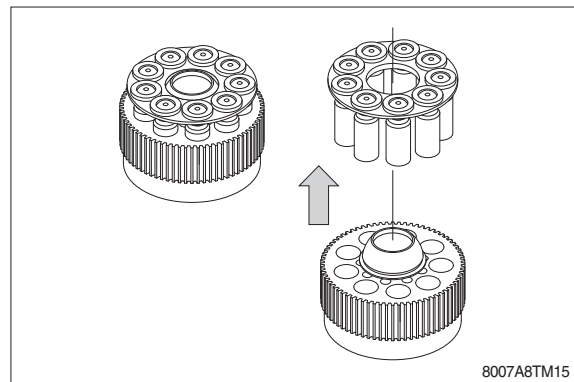


⑩ Remove cylinder block assy.

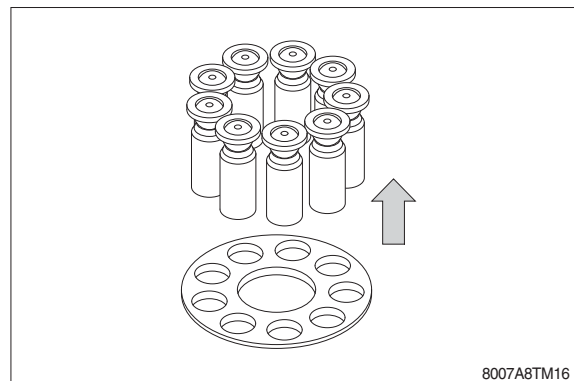


⑪ Disassemble cylinder block assy.

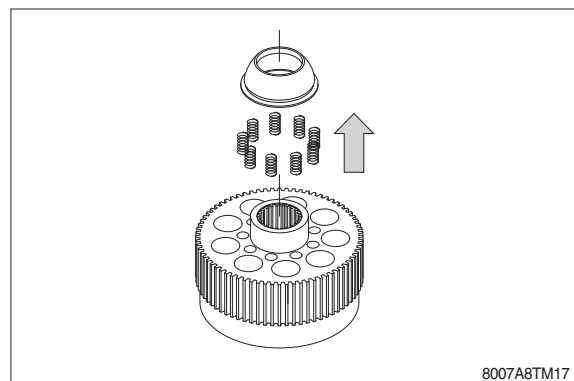
a. Remove piston assy (6) and retainer plate (7) from cylinder block (4).



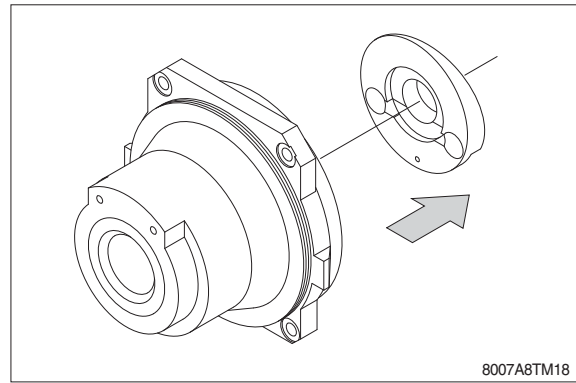
b. Remove piston assy (6) from retainer plate (7).



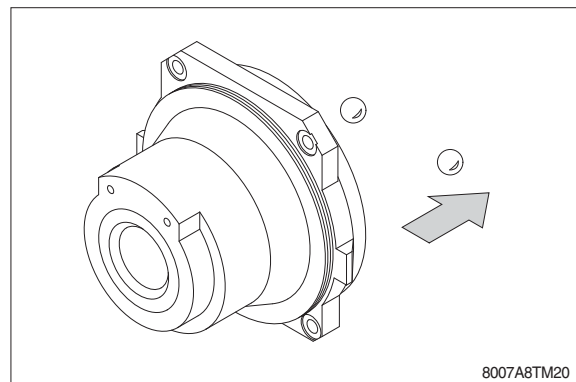
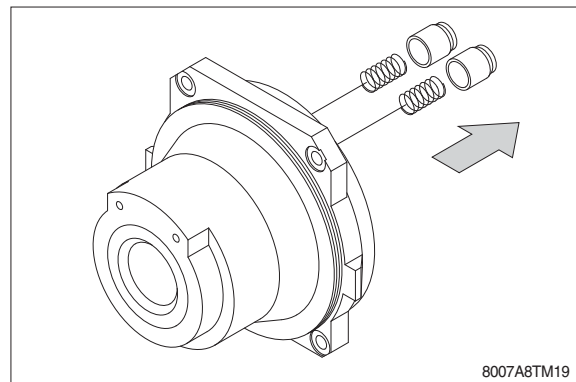
c. Remove retainer holder (8) from cylinder block (4).
And then, remove springs (17) from cylinder block (4).



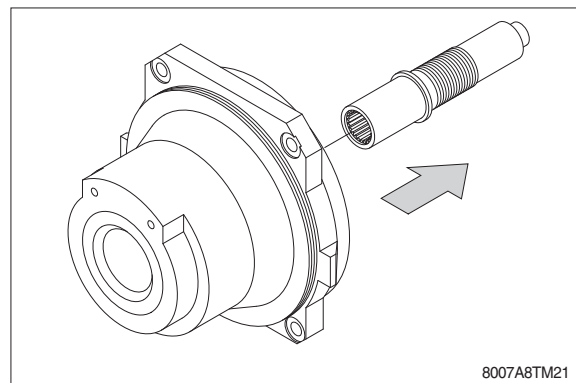
⑫ Remove swash plate (9).



⑬ Remove piston assy (11) and spring (12).
And then remove steel ball (10).



⑭ Remove shaft (3).

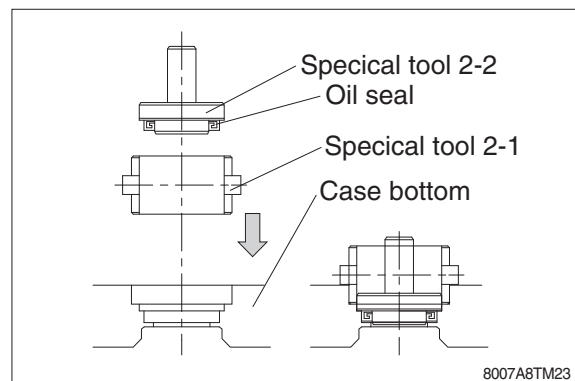
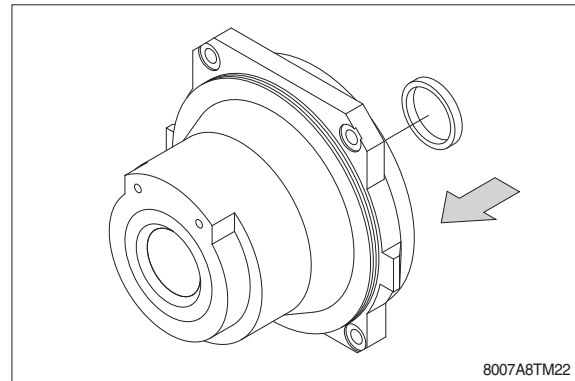


4) REASSEMBLY

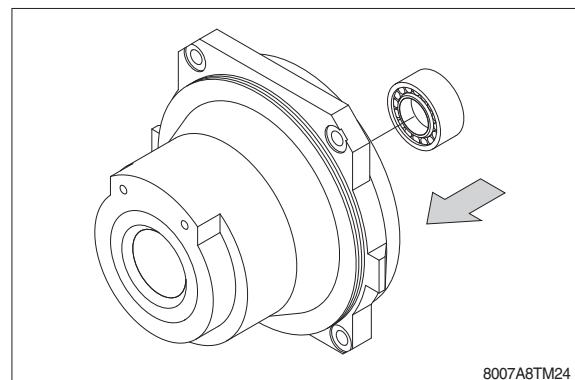
(1) General precautions

- ① Reassemble in a work area that is clean and free from dust and grit.
- ② Handle parts with bare hands to keep them free of liny contaminates.
- ③ Repair or replace the damaged parts.
Each parts must be free of burrs its corners.
- ④ Do not reuse O-rings, oil seal and floating seal that were removed in disassembly.
Provide the new parts.
- ⑤ Wash all parts thoroughly in a suitable solvent.
Dry thoroughly with compressed air.
Do not use the cloths.
- ⑥ When reassembling oil motor components of motor, be sure to coat the sliding parts of the motor and valve with fresh hydraulic oil. (NAS class 9 or above)
- ⑦ Use a torque wrench to tighten bolts and plugs, to the torque specified as follows.

- ① Apply grease to oil seal (28) and press fit it in case (1).

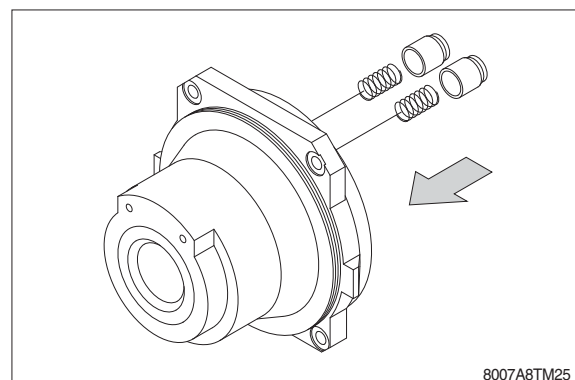


- ② Press fit the outer race of roller bearing (13) in case (1).

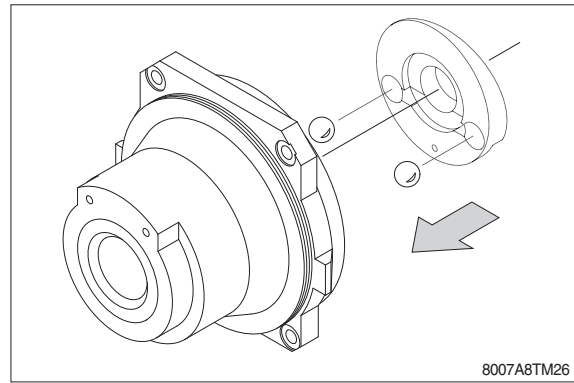


- ③ Install springs (12) and piston assy (11) on case (1).

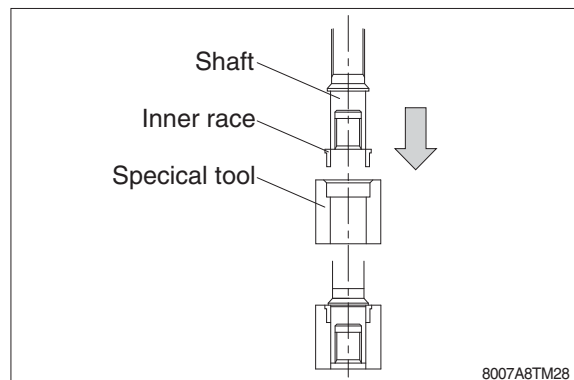
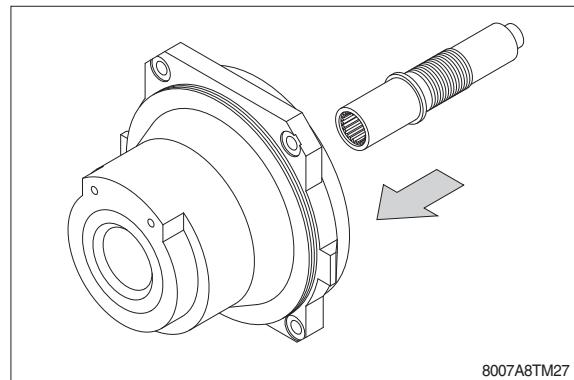
- ※ Apply hydraulic oil to the sliding surface of the piston assy.



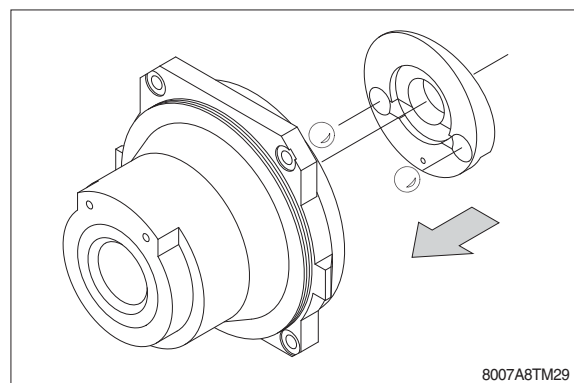
- ④ Install steel ball (10).
 ※ Apply hydraulic oil to the surface of the steel ball.



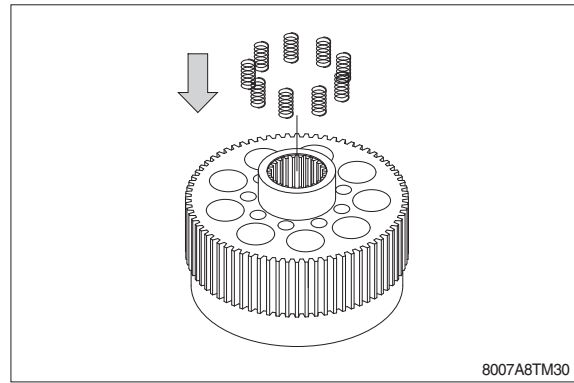
- ⑤ Press fit Inner race of roller bearing (13) on shaft (3).
 And then, install shaft sub assy on case (1).



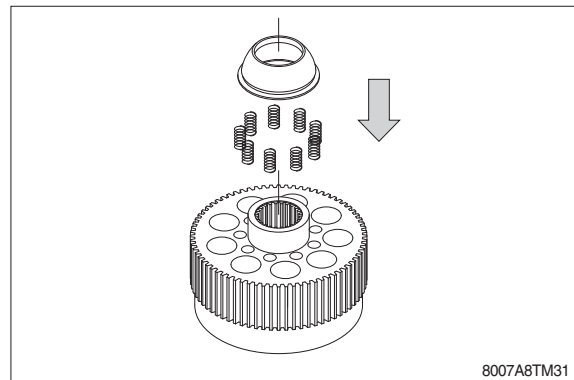
- ⑥ Install Swash plate (9).
 ※ Apply hydraulic oil to the surface of the steel ball.



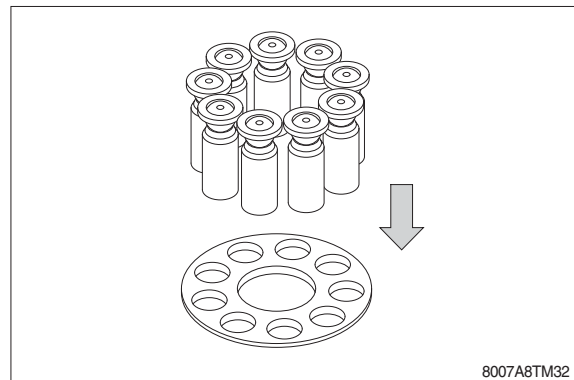
- ⑦ Install 9 springs (17) on cylinder block (4).



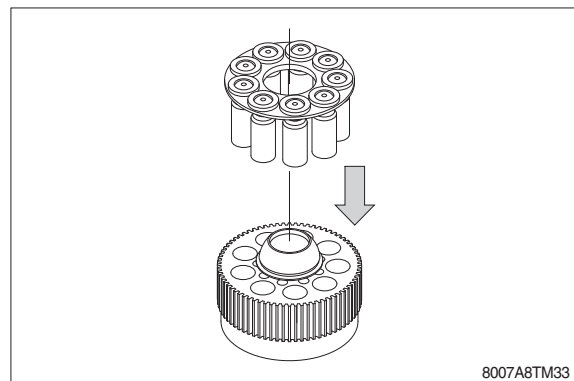
- ⑧ Install retainer holder (8) on cylinder block (4).



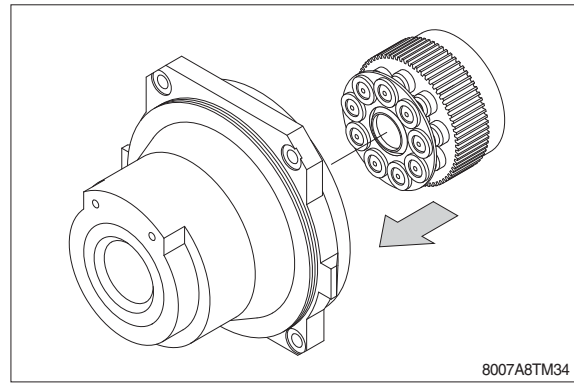
- ⑨ Install 9 piston assy (6) in each holes of retainer plate (7).
※ Be care for the direction of the retainer plate.



- ⑩ Install piston assy (6) and retainer plate (7) in cylinder block (4).
※ Apply hydraulic oil in 9 holes of cylinder block.
Apply hydraulic oil on the surface of retainer holder (8) and retainer plate (7).



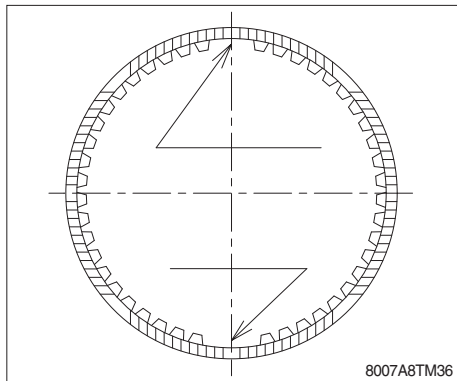
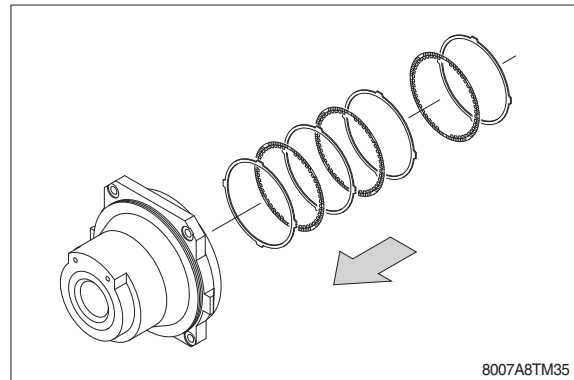
- ⑪ Install cylinder block assy.
- ※ Apply hydraulic oil on the surface of piston assemblies (6) and swash plate (9).



- ⑫ Install friction plates (18) and disk plates (19).
 - a. Apply enough hydraulic oil to disk plate.
 - b. The circular arc part of the friction plate is set to the cutting lack part of
 - c. the case.

There is a part where teeth are lacked in the spline of disk plate.

When assembling the disk plates, match the position of these each parts.



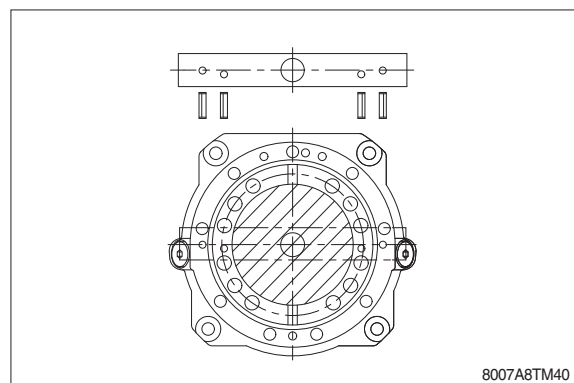
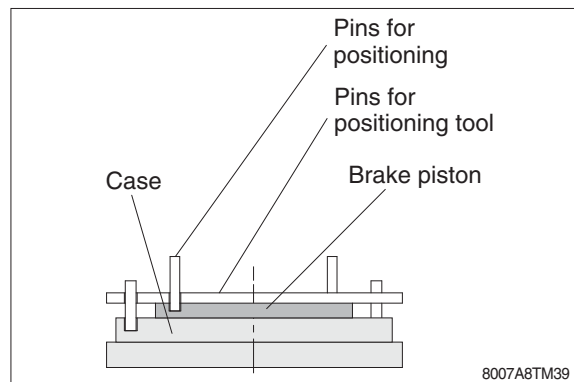
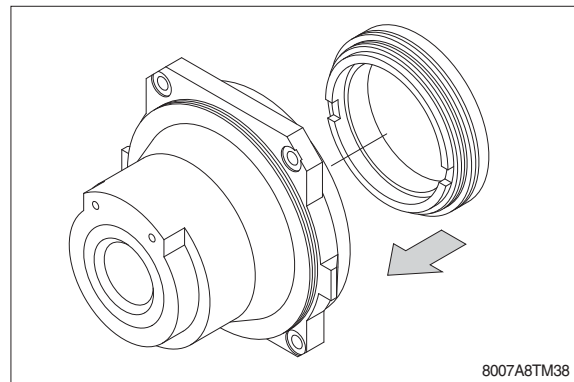
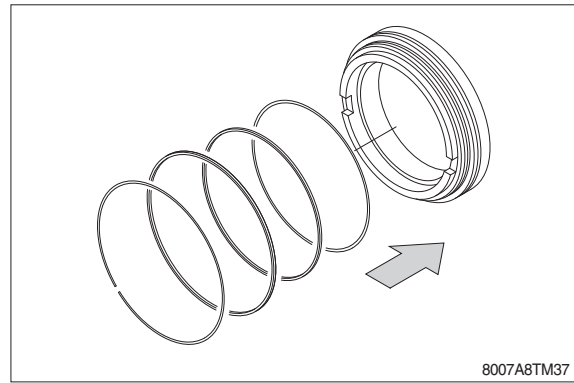
- d. Refer to the sectional drawing for the combination of assembling friction plate and disk plate.

⑬ Apply grease to O-rings (22)(24), backup ring (23)(25), and install them to brake piston (21).

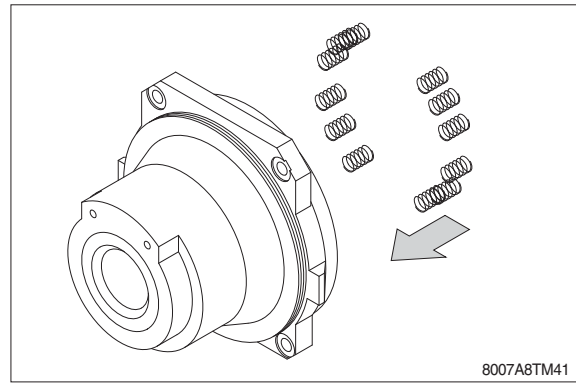
And install brake piston (21) to case (1) to align pins (27) installed on base plate in No.** with holes on brake piston (21).

When install it, beat on evenly outside of brake piston by using of plastic hammer.

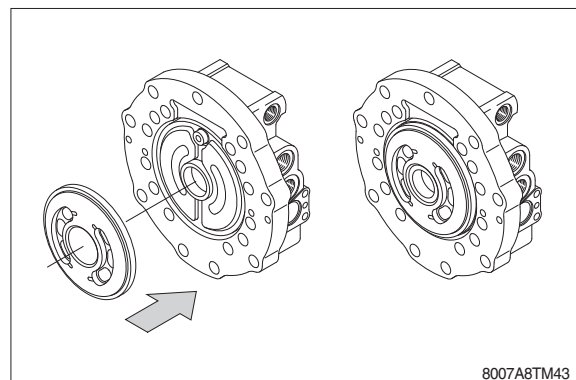
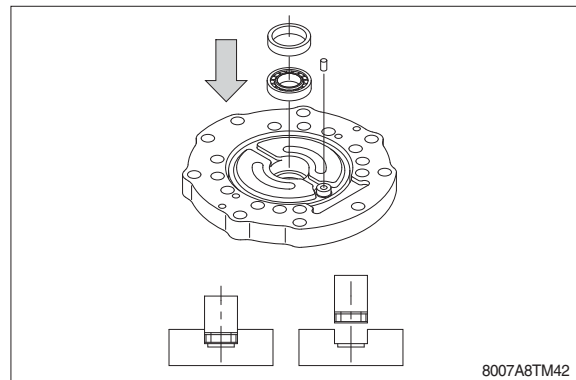
- a. Each backup rings should be set out side position.
- b. Be careful of installing direction of brake piston.
- c. Apply grease to outside of brake piston and inside of case (1).



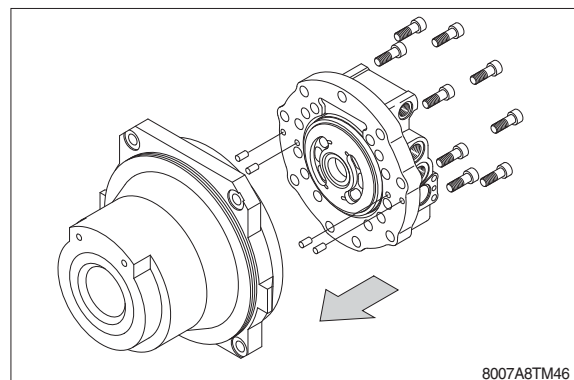
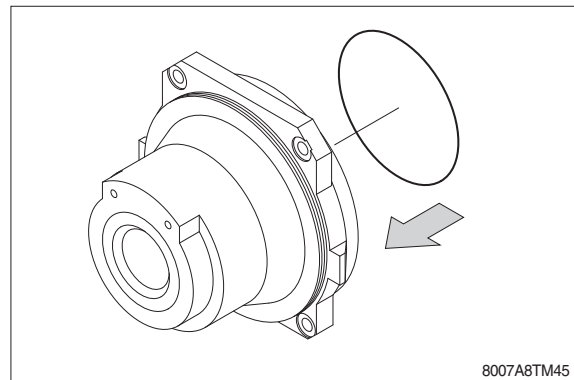
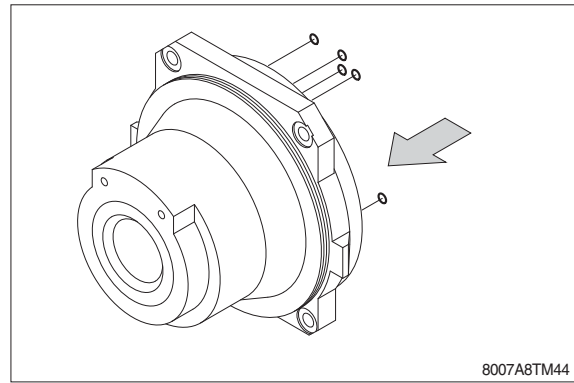
- ⑭ Install springs (26) in the holes of brake piston (21).



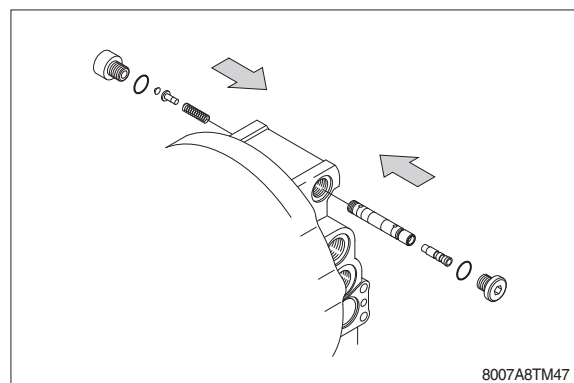
- ⑮ Press fit roller bearing (14) on base plate (2-1).
Install pins (16) and color (15) on base plate (2-1).
※ Apply grease to the surface of valve plate (25) and base plate (2-1).



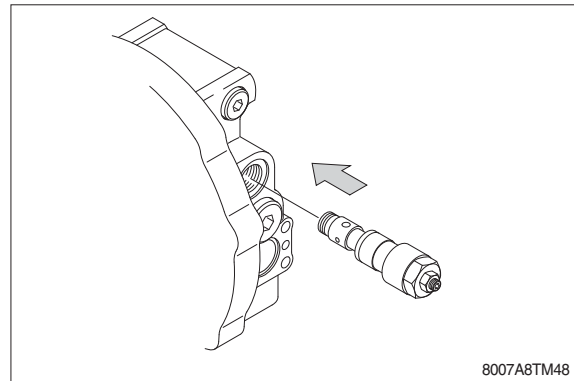
- ⑩ Install O-rings (29)(30) on case (1).
 Install pins (27) on base plate (2-1).
 Install base plate (2-1) and socket head bolt (9).
- Apply grease to O-ring (25).
 - Do not apply grease to O-ring (30).
 - Be care for direction of pin (27).
 - Apply hydraulic oil to the surface between cylinder block (4) and valve Plate (5).
 - Be care for pilot line of base plate and case (1).
 - Tighten the bolts evenly, as base plate is pushed by spring.



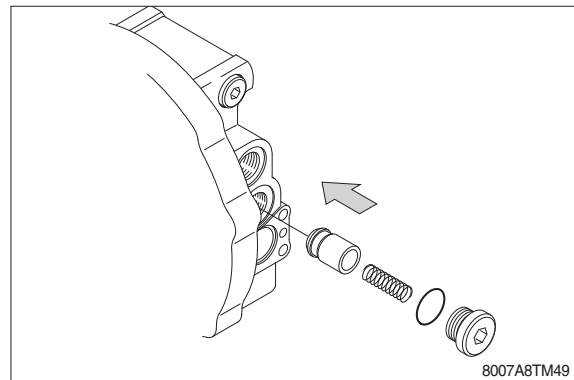
- ⑪ Place spring (2-13) on valve assy (2-9), and then install valve assy on base plate (2-1).
 Tighten plug (2-14) with O-ring (2-15).
 Place spring guide (2-16) and washer (2-18), and then tighten plug (2-17) with O-ring (2-15).
- ※ Apply hydraulic oil to valve assy before installation.
 Apply slight grease to O-rings (2-15).



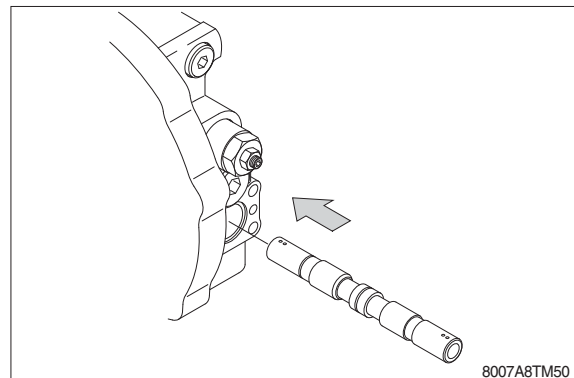
- ⑱ Tighten relief valve assemblies (2-7).
※ Apply slight grease to O-rings (2-7-12)
and backup rings (2-7-16).



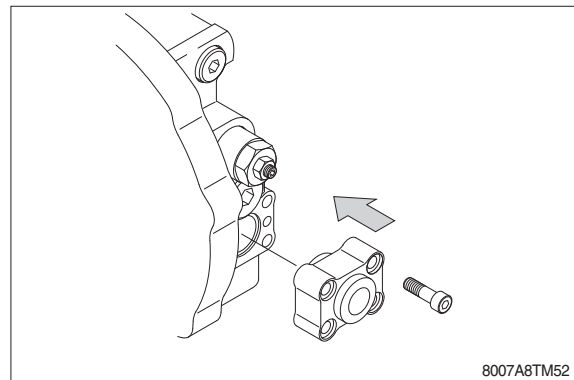
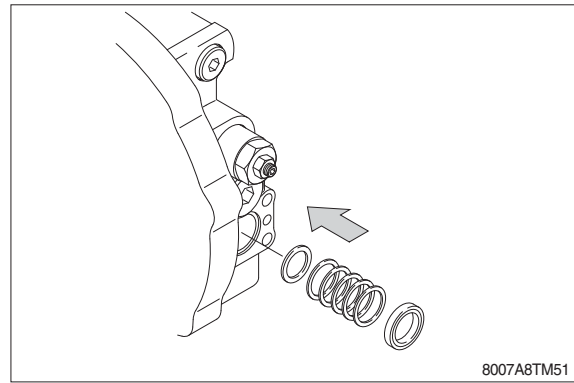
- ⑲ Place check valve (2-19) and springs (2-20).
Tighten plug (2-21) with O-ring (2-22).
※ Apply slight grease to the O-rings.



- ⑳ Install spool assy (2-2) on base plate (2-1).
Install it while turning to prevent it from sticking.
※ Apply hydraulic oil to spool assy before installation.

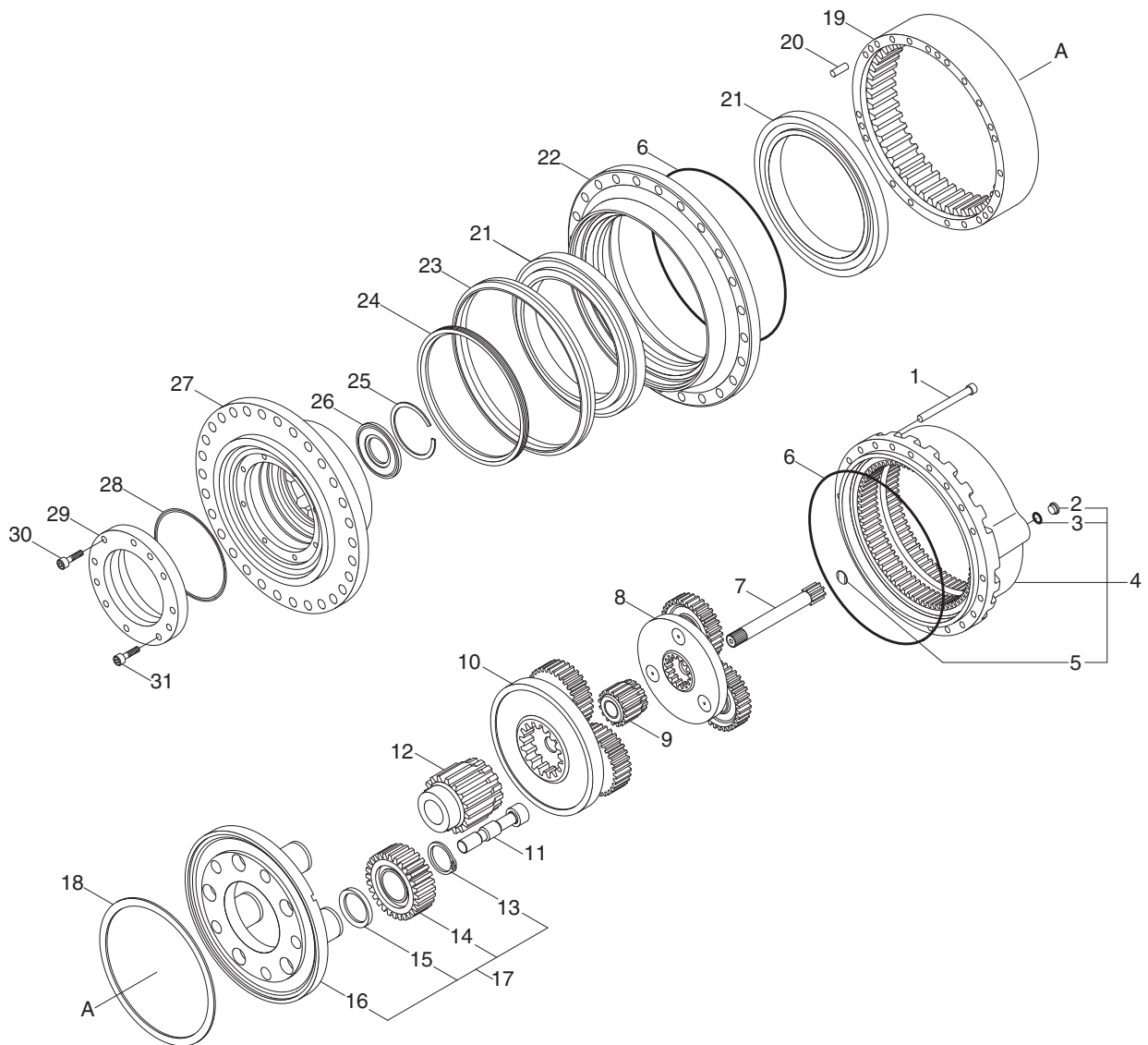


- ② Place spring seats (2-3) and springs (2-4).
Install O-rings (2-10) on base plate (2-1).
Install O-rings (2-6-5) on cap assy (2-6).
Place spring seats (2-5) on cap assy (2-6), and then install them on base plate (2-1).
※ Tighten socket head bolts (2-6-6).
Apply grease to O-rings (2-6-5).



3. REDUCTION GEAR

1) STRUCTURE



80092TM04

- | | | | | | |
|----|-------------------|----|-------------------|----|----------------|
| 1 | Screw | 12 | Sun gear | 23 | Lifetime seal |
| 2 | Oil breather plug | 13 | Circlip | 24 | Spacer |
| 3 | Washer | 14 | Planetary assy | 25 | Circlip |
| 4 | Cover assy | 15 | Spacer | 26 | Discs retainer |
| 5 | Pad | 16 | Planetary carrier | 27 | Hub |
| 6 | O-ring | 17 | Gear assy(3rd) | 28 | O-ring |
| 7 | Sun gear | 18 | Spacer | 29 | Motor adaptor |
| 8 | Gear assy(1st) | 19 | Toothed ring | 30 | Screw |
| 9 | Sun gear | 20 | Pin | 31 | Screw |
| 10 | Gear assy(2nd) | 21 | Bearing | | |
| 11 | Screw | 22 | Gearbox housing | | |

2) DISASSEMBLING

Initial inspection of the gears and the travel motor, can be made without disassembling the track and the gearmotor from the machine.

Prior to disassembling make sure that the oil is discharged, unscrew and remove the 4 screws (31), and remove the travel motor and the O-ring seal.

- (1) Unscrew the 12 socket head screws (30) and remove the motor flange from the motor adapter (29).



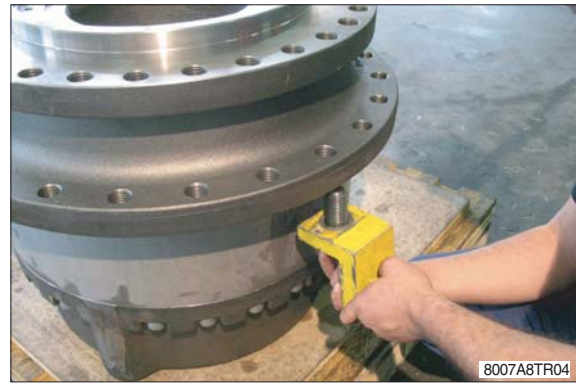
- (2) By using a tackle remove the motor adapter (29).



- (3) Remove the O-ring (28) from its seat in the motor adapter (29).



(4) Assemble the equipment on the gearbox housing (22).



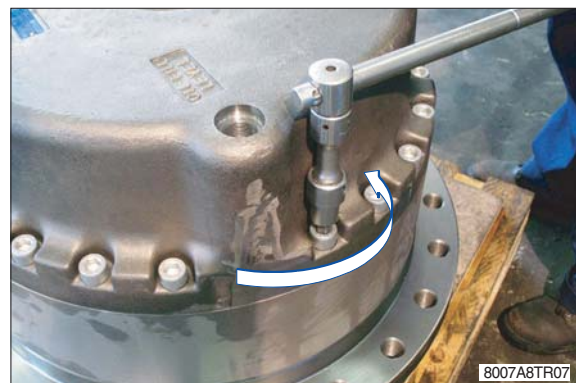
(5) By using a tackle and the equipment turn the gearbox upside down.



(6) Unscrew the 2 plugs (2) and the 2 washers (3) from the end cover (4).



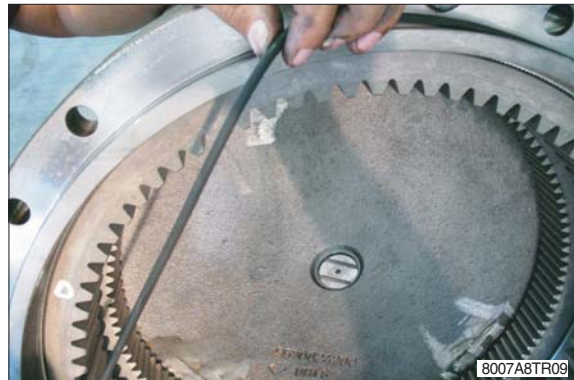
(7) Unscrew the 21 socket head screws (1) from the end cover (4).



(8) By using a tackle and the equipment remove the end cover (4).



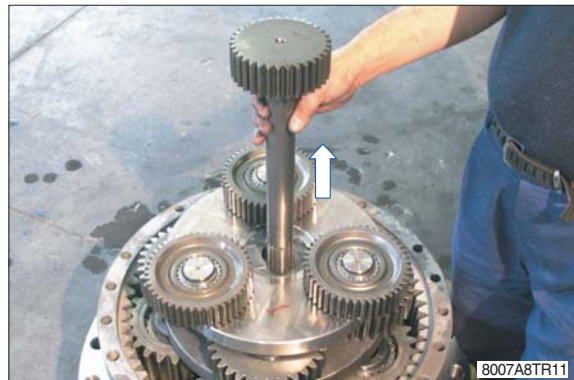
(9) Remove the O-ring (6) from its seat in the end cover (4).



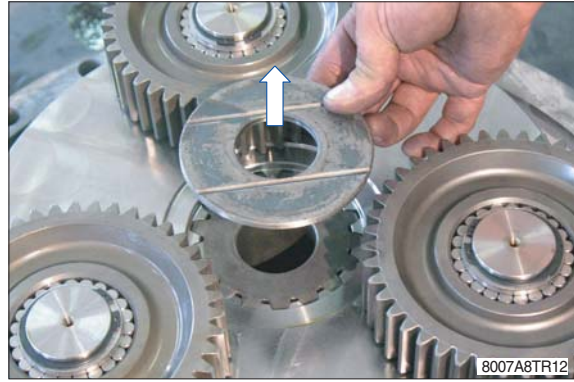
(10) Screw a socket head screw in the threaded hole of the pad (5) in order to remove it from the end cover (4).



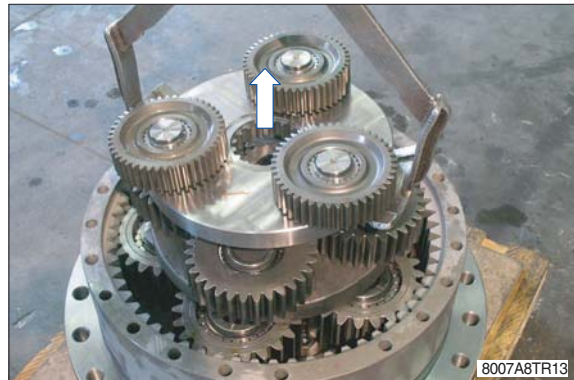
(11) Remove the 1st stage sun gear (7).



(12) Remove the centering ring.



(13) By using a tackle and the equipment remove the 1st reduction assembly (8).



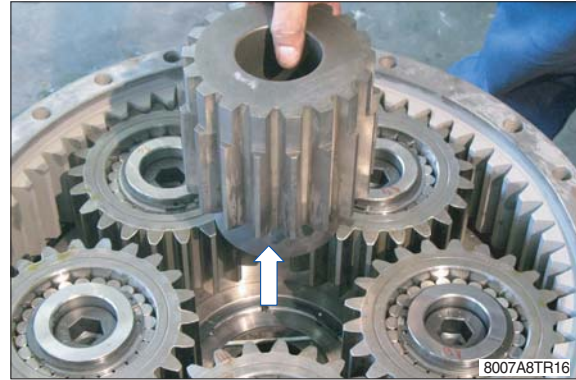
(14) Remove the 2nd stage sun gear (9).



(15) By using a tackle and the equipment remove the 2nd reduction assembly (10).



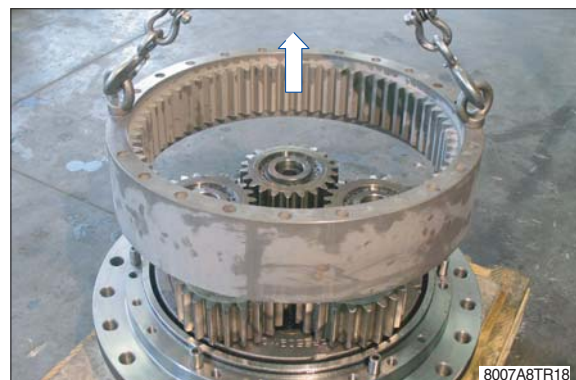
(16) Remove the 3rd stage sun gear (12).



(17) By using a crowbar lift the toothed ring (19) from the gearbox housing (22).



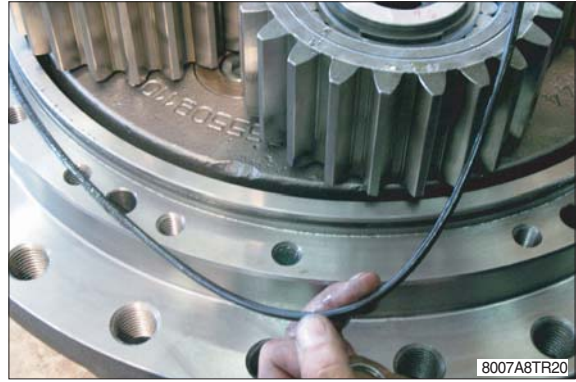
(18) Tighten 2 eye bolts on the toothed ring (19) and by using a tackle remove it from the gearbox housing (22).



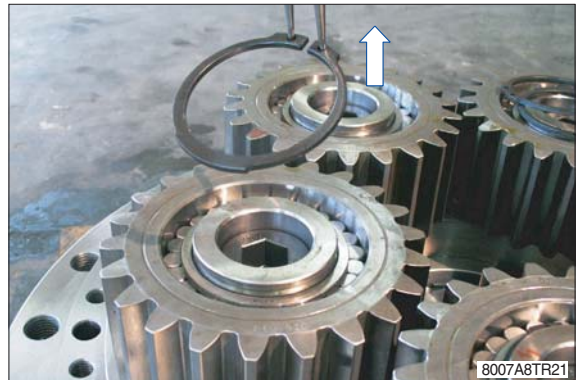
(19) By using the puller remove the 6 pins (20) from the gearbox housing (22).



(20) Remove the O-ring (6) from its seat in the gearbox housing (22).



(21) By using pliers remove the circlips (13) from their seats placed in the planetary carrier's pins (16).



(22) By using a puller remove the planet assemblies of the 3rd reduction (14).

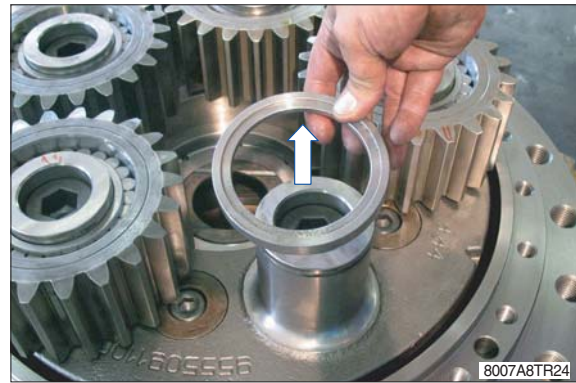


(23) Remove the planet assemblies of the 3rd reduction (14).



(24) Remove the spacer (15) from their seats placed in the planetary carrier's pins (16).

※ In order to proceed with the gearbox disassembly, it is now necessary to remove it from the machine and bring it to a properly equipped workshop.



(25) By using a tackle palce the screwer on the planetary carrier's pins (16).



(26) By using the screwer tighten the 5 socket head screws (11) from the planetary carrier (16).



(27) Take out the nos. 5 socket head screws (11).



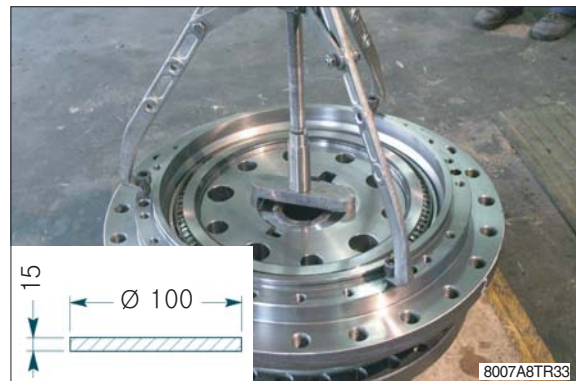
(28) By using a tackle remove the planetary carrier (16) from the gearbox housing (22).



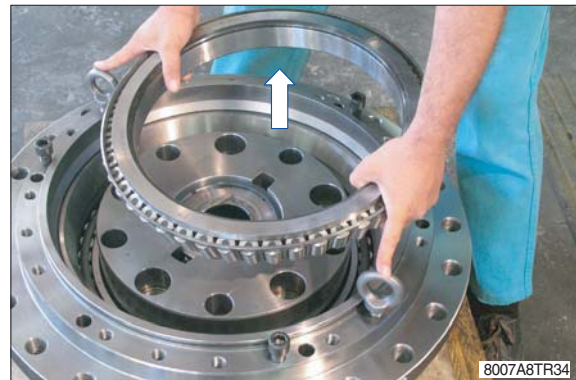
(29) By using a screwdriver, remove the spacer (18) from the planetary carrier (16).



(30) By using a puller and a metal stopper remove the flanged hub (27) from the gearbox housing (22).

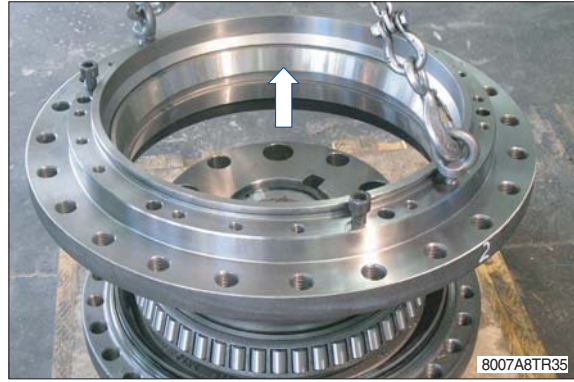


(31) Remove the bearing inner ring (21) from its seat in the gearbox housing (22).



(32) Tighten 2 eye bolts on the gearbox housing (22) and by using a tackle remove it from the flanged hub (27).

※ In case of oil leakages, it might be necessary to check and eventually replace the lifetime seal (23), which means both the steel rings and the O-ring seals.



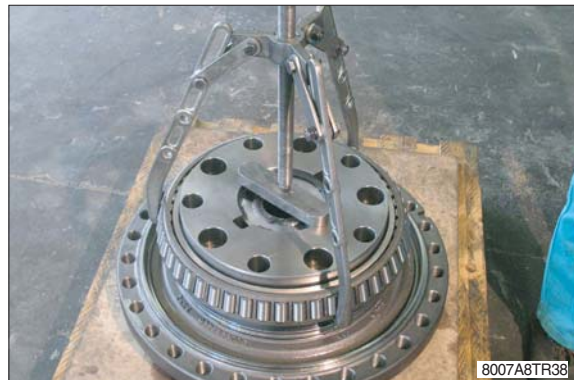
(33) Remove the half-seal (23) from the flanged hub (27).



(34) Remove the half-seal (23) from the gearbox housing (22).



(35) By using a puller remove the bearing inner ring (21) from the flanged hub (27).



(36) Remove the spacer (24) from its seat in the flanged hub (27).



(37) By using pliers remove the circlip (25) from its seat in the flanged hub (27).



(38) By using a punch remove the discs retainer (26) from the flanged hub (27).



(39) By using a rubber hammer and a punch remove the bearing outer rings (21) from the gearbox housing (22).

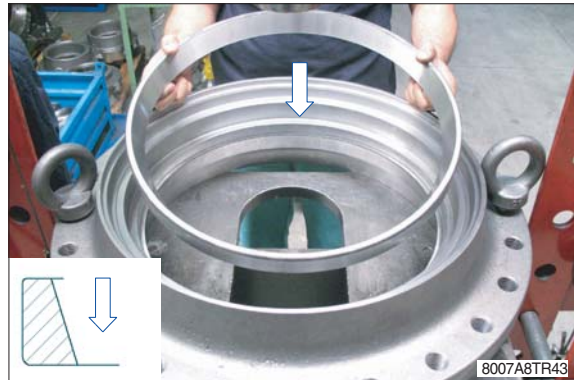
※ The gearbox disassembly ends with the above operation. All the parts are now available for the necessary inspections.



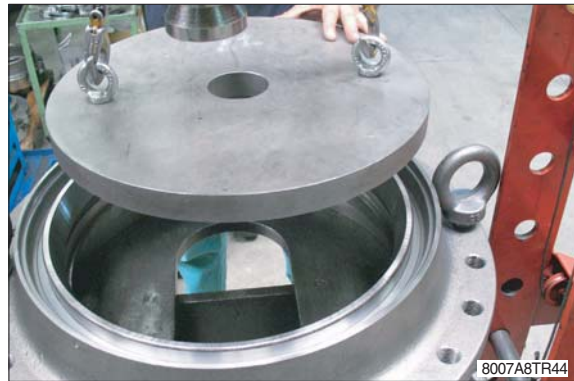
3) REASSEMBLY

- ※ The pieces that are subject to general wear and tear are the following:
 - Gears
 - Bearings
 - All the seals
- ※ Replace the used or irregular parts respecting the following steps:
 - Accurately remove dirt, and in particular properly clean the seals, bearings and locking rings seating.
 - Lubricate the parts before connecting them.
 - In the case of damaged gears, for example a planetary, do not proceed to replace the individual gear but the entire reduction assembly.
 - When reconnecting a part always replace all the seals involved. Add some grease on the seats and on the new seals to make easier the reassembly.

- (1) Assemble the bearing inner ring (21) in the gearbox housing (22).



- (2) Place the equipment on the bearing outer ring (21).



- (3) By using a press and the stopper push the bearing outer ring (21) against the gearbox housing shoulder (22).

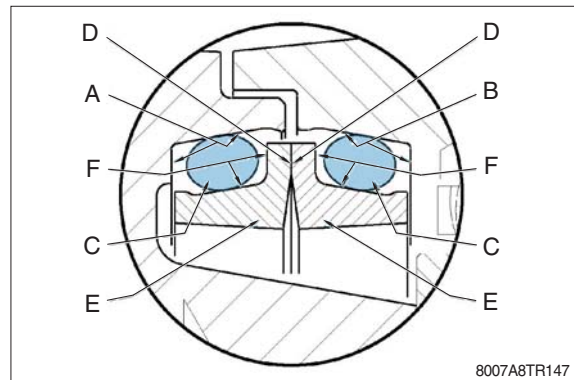


- (4) Insert the spacer (24) on the flanged hub (27).



※ Make ready of the lifetime seal:

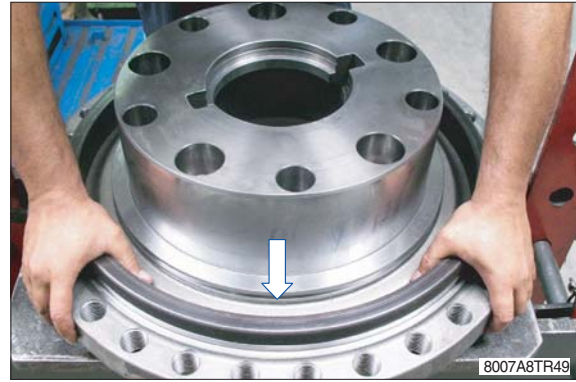
- ① Carefully clean the seats (A and B) using, if necessary, metallic brushes or solvent (surfaces in contact with or (c) must be perfectly clean and dry).
- ② Make sure that sealing surfaces (D) of metal rings (E) are free from scratches, dinges or foreign substances; metallic ring surfaces must be perfectly clean and dry. We suggest to dip the metallic rings in volatile solvent or industrial degreasing alcohol.
- ③ Carefully clean the lapped surface (D) of metal rings (E) and remove dust or fingerprints. Then lubricate them with a thin oil film, taking care not to oil the other components.



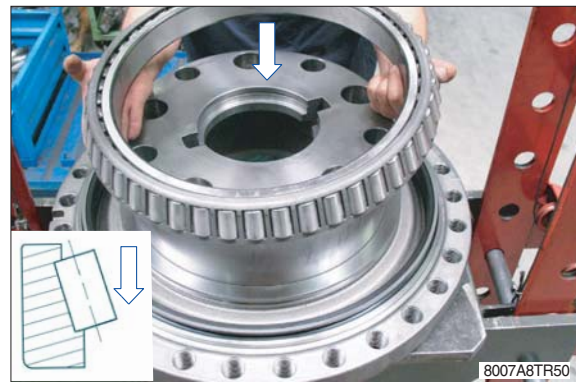
- (5) Assemble the half seal (23) on the tool.



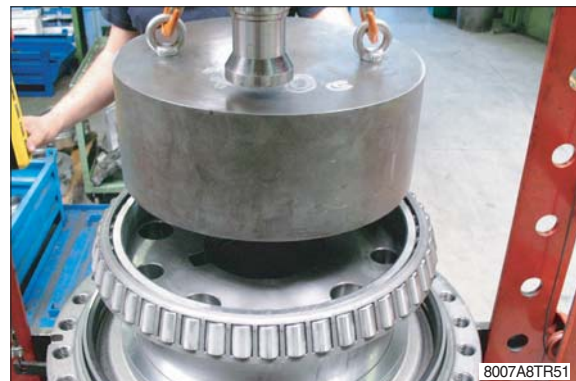
(6) Assemble the 1st half seal (23) in the flanged hub (27).



(7) Assemble the bearing inner ring (21) in the flanged hub (27).



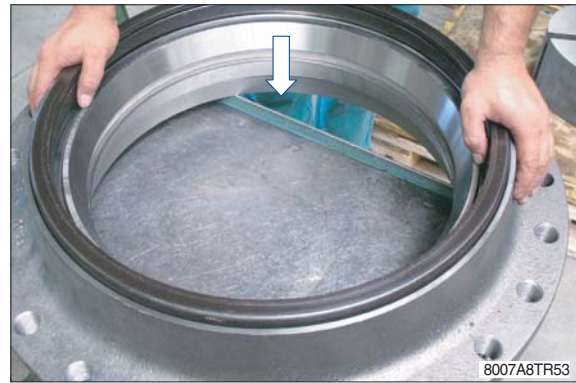
(8) Place the equipment on the bearing inner ring (21).



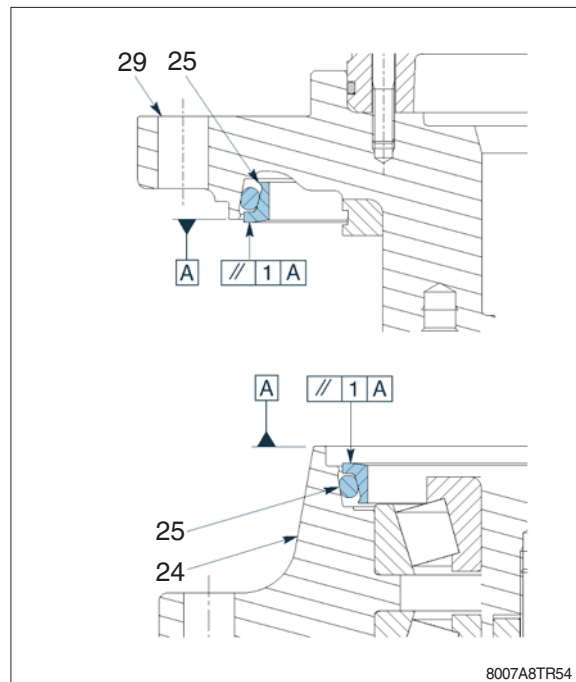
(9) By using a press and the stopper push the bearing inner ring (21) against the flanged hub shoulder (27).



(10) Insert the 1st reduction assembly (8).



※ Correct lifetime seal (23) assembly check.

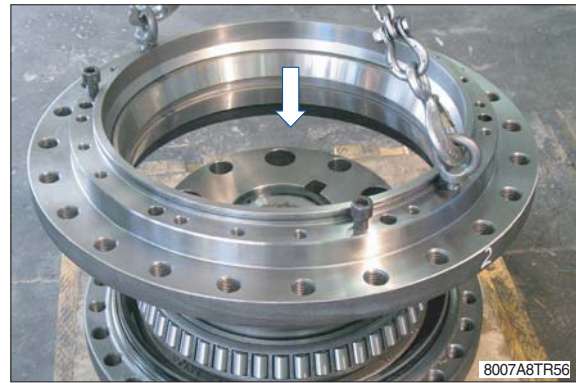


(11) Clean carefully the seal faces (23).

※ Apply a thin oil film on the entire metallic face of one or both seals. Oil must not contact surfaces other than the sealing faces.



(12) By using a tackle place the gearbox housing (22) on the flanged hub (27).



(13) Assemble the bearing inner ring (21) on the flanged hub (27).



(14) Place the equipment on the bearing inner ring (21).



(15) By using a press and the stopper push the bearing inner ring (21) against the shoulder of the flanged hub (27) until assembling of the unit is complete.



(16) By using a tackle remove the gearbox by the press.



(17) Place the discs retainer (26).



(18) By using a rubber hammer push the discs retainer (26) against the shoulder until assembly is complete.



(19) By using pliers assemble the circlip (13) into its seat on the flanged hub (27).

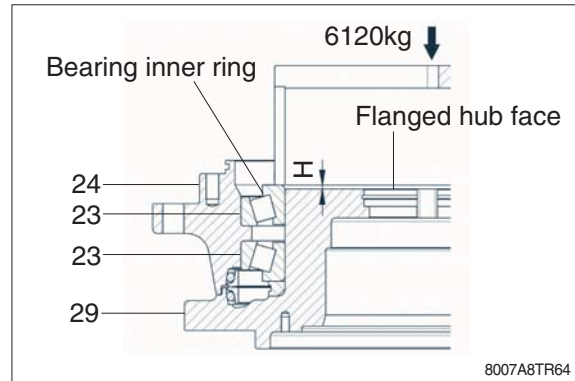


※ In case of bearings (21), gearbox housing (22) or flanged hub (27) replacing, follow the steps here below before proceeding with reassembling.

- ① Position the stopper on bearing (21).
- ② By using a press apply a load of 6120 kg (13500 lb) on the stopper.
- ③ Measure the control value "H"
- ④ Reduce the thickness "S" of the spacer (18) flattening the bearing areas at the following value;

$$S = 10 - H - 0.1$$
- ⑤ Assemble the planet carrier (16) to the flanged hub (27) and by a dynamometric wrench find the necessary torque for the gearbox housing rotation (22).

$$8.2 \sim 12.2 \text{ kgf} \cdot \text{m} (59.3 \sim 88.2 \text{ lbf} \cdot \text{ft})$$



- (20) Assemble the spacer (18) on the planetary carrier (16).



- (21) By using a rubber hammer push the spacer (18) against the shoulder until assembly is completed.



(22) By using a tackle place the planetary carrier (16) on the flanged hub (27).



(23) Apply LOCTITE type 243 on the 5 socket head screws (11).



(24) By using a tackle place the screwdriver on the planetary carrier's pins (16).



(25) By using the screwdriver tighten the socket head screws (11), by a torque wrench with an input multiplier torque of $6.7 \text{ kgf} \cdot \text{m}$ ($48.5 \text{ lbf} \cdot \text{ft}$) corresponding to an output multiplier torque of $342 \text{ kgf} \cdot \text{m}$ ($2474 \text{ lbf} \cdot \text{ft}$).



(26) Assemble the O-ring (6) into its seat in the gearbox housing (22).



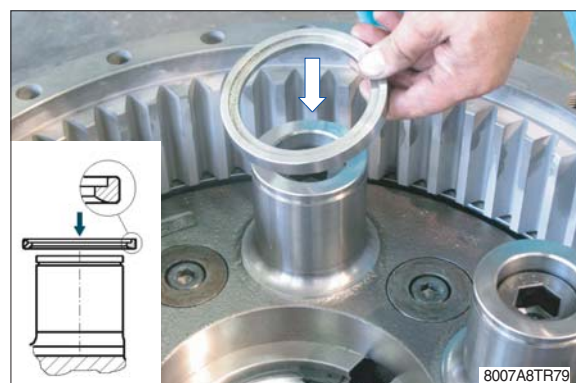
(27) By using a rubber hammer push the 6 pins (20) against the shoulder until assembly is completed.



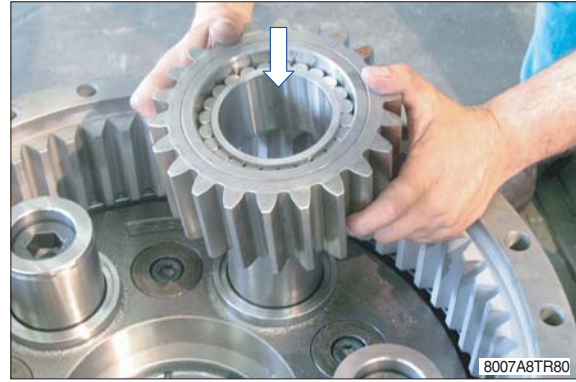
(28) By using a tackle assemble the toothed ring and, by using a rubber hammer, push it against the shoulder until assembly is completed.



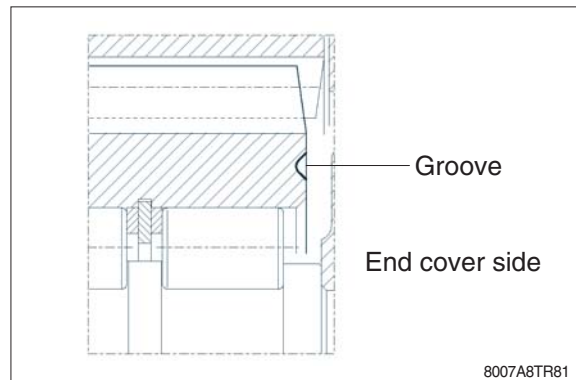
(29) Assemble correctly the spacers (15) on the pins of the planetary carrier (16).



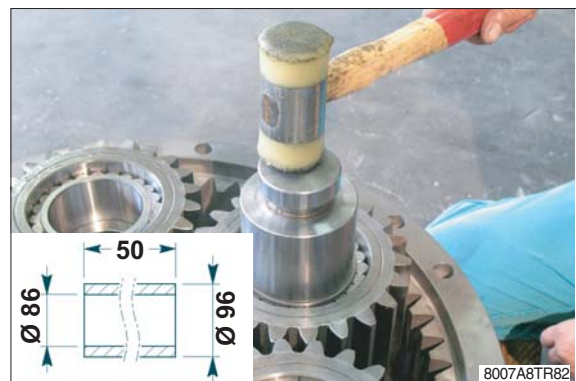
(30) Place the reduction planet assemblies of the 3rd reduction (14) on the pins of the planetary carrier (16).



※ Place correctly the reduction planet assemblies checking that the groove is towards the end cover.



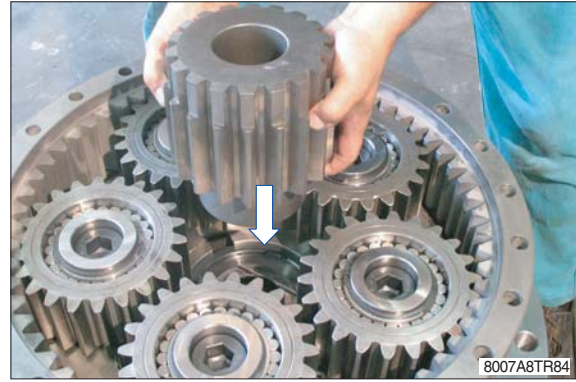
(31) By using a stopper and a rubber hammer push the planet assemblies of the 3rd reduction (16) against the shoulder until assembly is completed.



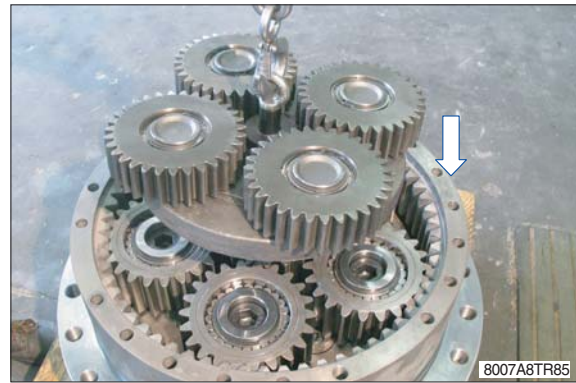
(32) By using pliers, assemble the circlips (13) in the planetary carrier pin seats (16).



(33) Insert the 3rd stage sun gear (12).



(34) By using a tackle and the equipment assemble the 2nd reduction assembly (10).



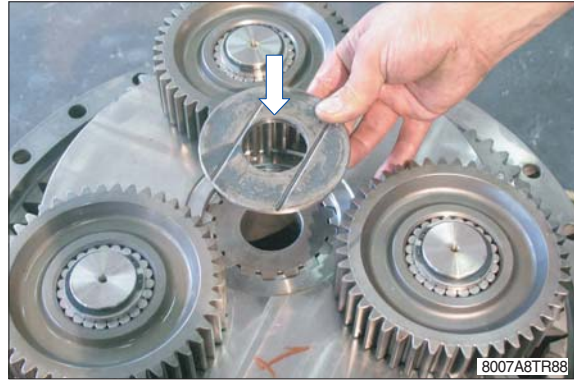
(35) Insert the 2nd stage sun gear (9).



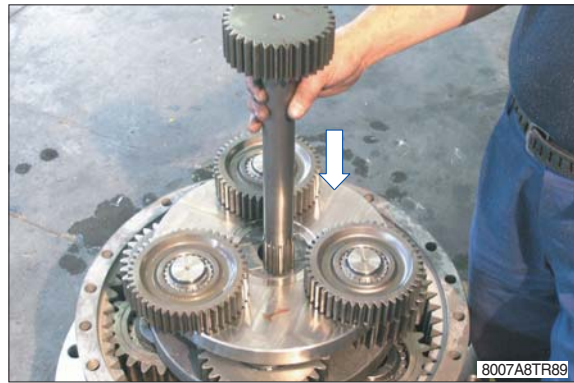
(36) By using a tackle and the equipment assemble the 1st reduction assembly (8).



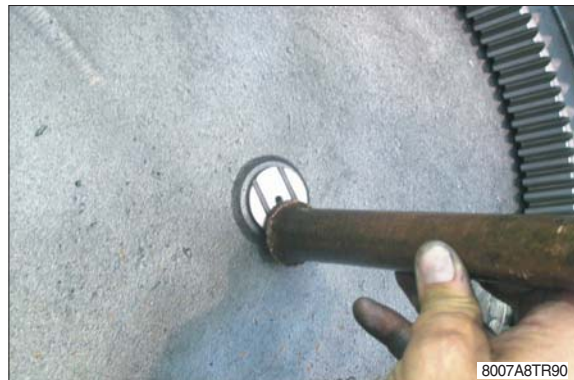
(37) Assemble the centering ring.



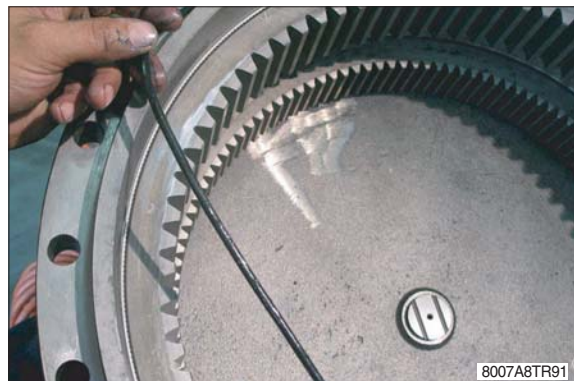
(38) Insert the 1st stage sun gear (7).



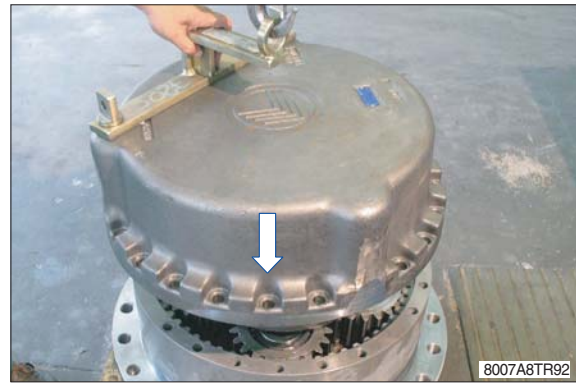
(39) By using a punch and a rubber hammer press the pad (5) against the shoulder of the end cover (4).



(40) Assemble the O-ring (6) into its seat in the end cover (4).



(41) By using a tackle and the equipment place the end cover (4) on the toothed ring (19).



(42) Tighten the 21 socket head screws (1) by a torque wrench at $48.9 \text{ kgf} \cdot \text{m}$ ($354 \text{ lbf} \cdot \text{ft}$) torque.



(43) Insert the washers (3) and the plugs (2) into the oil draining-filling holes of the end cover (4). Tighten the plugs by a torque wrench at $7.1 \pm 1.0 \text{ kgf} \cdot \text{m}$ ($51.4 \pm 7.2 \text{ lbf} \cdot \text{ft}$) torque.



(44) By using a tackle and the equipment turn the gearbox upside down.



(45) Assemble the O-ring (28) into its seat in the motor adapter flange (29).



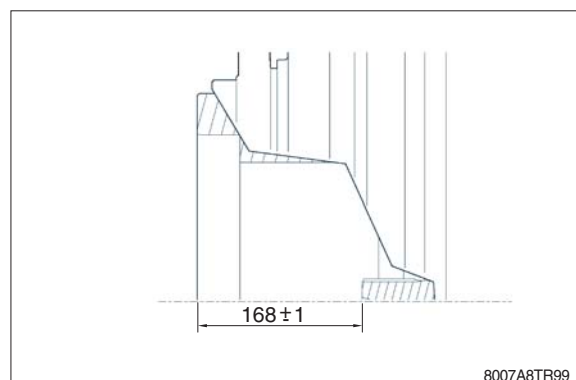
(46) Position the motor adapter flange (29) on the gearbox.



(47) Tighten the 12 socket head screws (30) by a torque wrench torque.



※ Before assembling the hydraulic motor, verify by a depth slide gauge the correct assembly of the unit checking the axial distance as shown in the figure.



GROUP 7 RCV LEVER

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

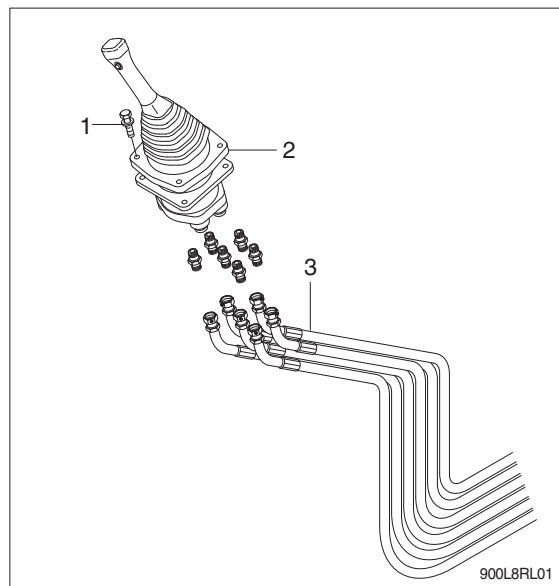
- (4) Loosen the socket bolt (1).
 - (5) Remove the cover of the console box.
 - (6) Disconnect pilot line hoses (3).
 - (7) Remove the pilot valve assembly (2).
- ※ When removing the pilot valve assembly, check that all the hoses have been disconnected.

2) INSTALL

- (1) Carry out installation in the reverse order to removal.
- (2) Confirm the hydraulic oil level and check the hydraulic oil leak or not.



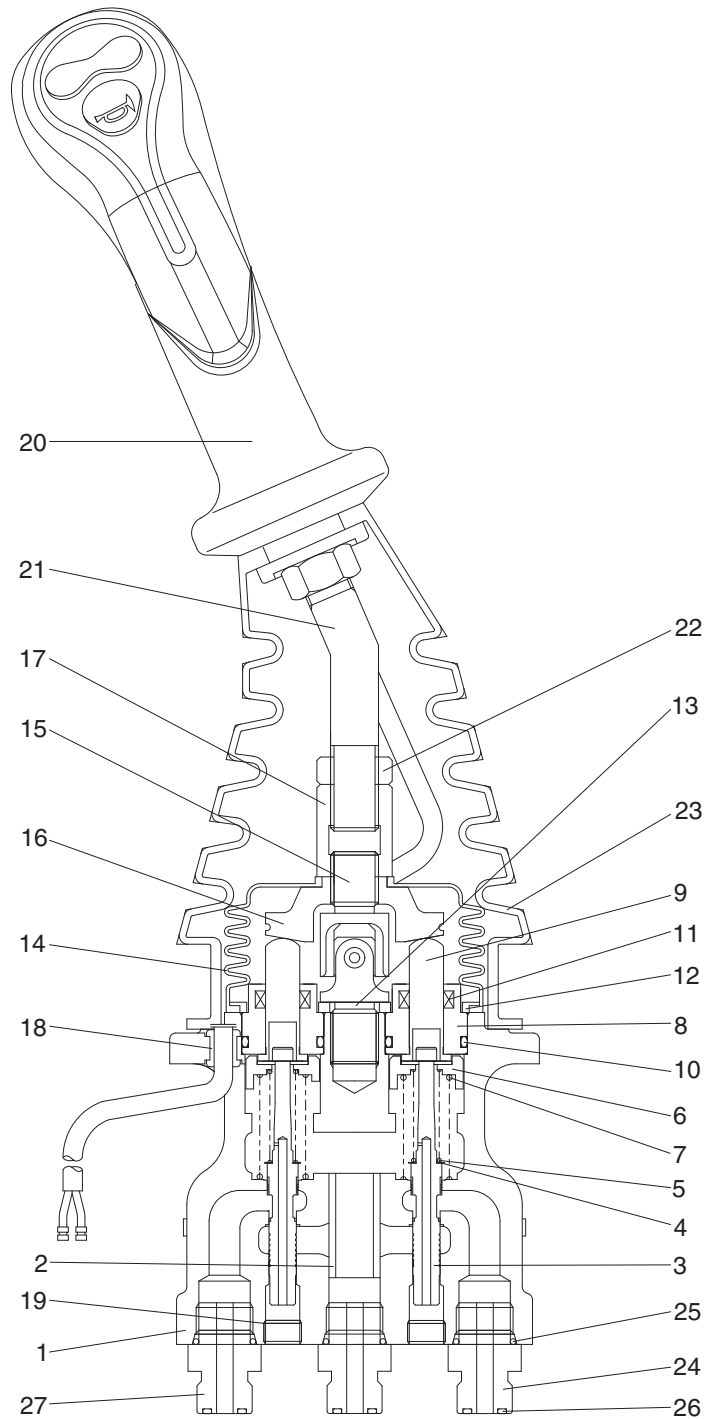
13031GE18



900L8RL01

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

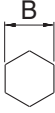


300L2RL06

1	Case	8	Plug	15	Joint assembly	22	Nut
2	Bushing	9	Push rod	16	Swash plate	23	Boot
3	Spool	10	O-ring	17	Adjusting nut	24	Last guard filter
4	Shim	11	Rod seal	18	Bushing	25	O-ring
5	Spring	12	Plate	19	Plug	26	O-ring
6	Spring seat	13	Spacer	20	Handle assembly	27	Connector
7	Spring	14	Boot	21	Handle bar		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	6	
Spanne	22	
	27	
(+) Driver	Length 150	
(-) Driver	Width 4~5	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Joint	15	M14	3.5	25.3
Swash plate	16	M14	5.0 ± 0.35	36.2 ± 2.5
Adjusting nut	17	M14	5.0 ± 0.35	36.2 ± 2.5
Lock nut	22	M14	5.0 ± 0.35	36.2 ± 2.5

3) DISASSEMBLY

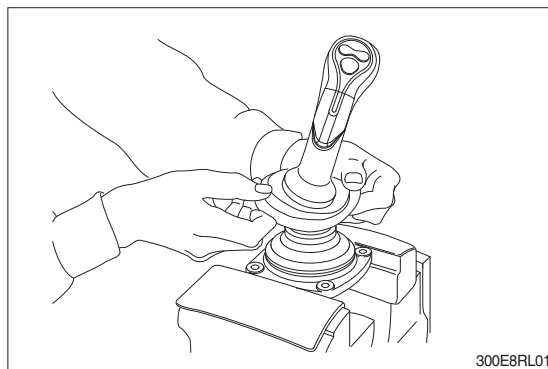
※ Procedures are based on the type L1.

(1) Clean pilot valve with kerosene.

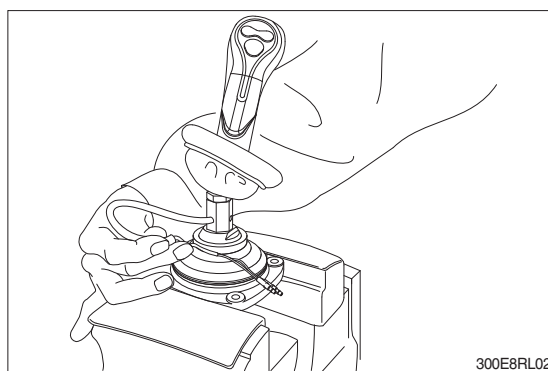
※ Put blind plugs into all ports

(2) Fix pilot valve in a vise with copper (or lead) sheets.

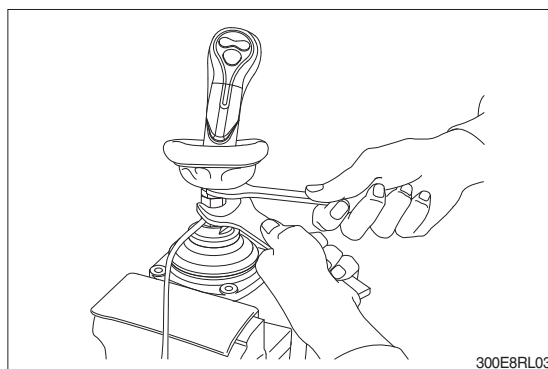
(3) Remove end of boot (23) from case (1) and take it out upwards.



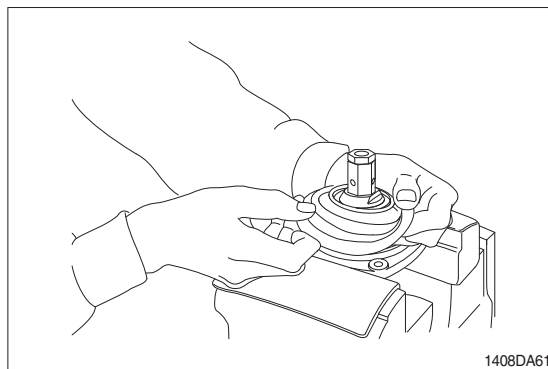
※ For valve with switch, remove cord also through hole of casing.



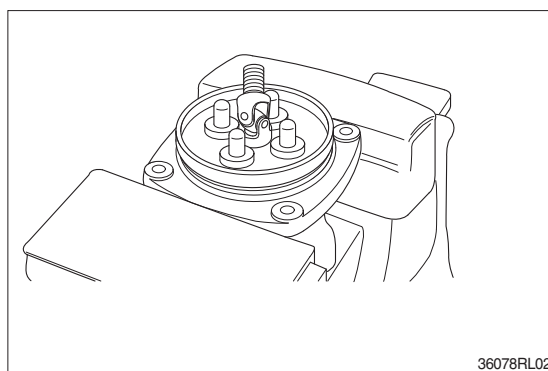
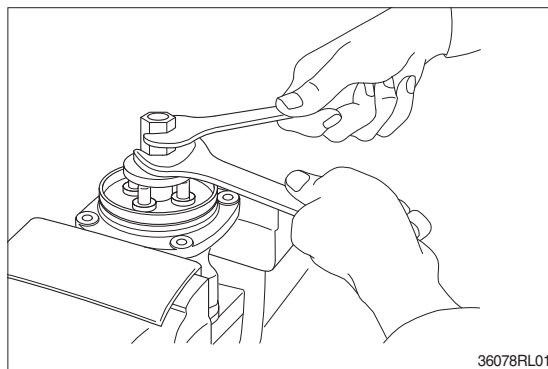
(4) Loosen lock nut (22) and adjusting nut (17) with spanners on them respectively, and take out handle section as one body.



(5) Remove the boot (14).

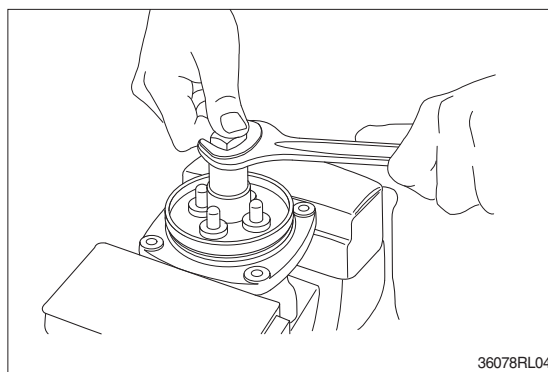
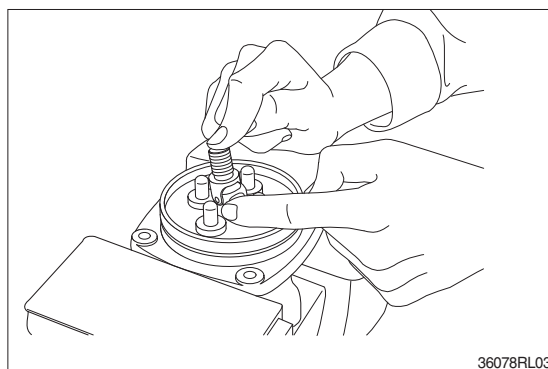


- (6) Loosen adjusting nut (17) and swash plate (16) with spanners on them respectively, and remove them.

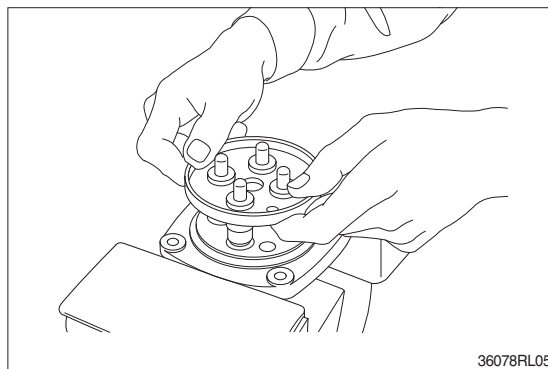


- (7) Turn joint anticlockwise to loosen it, utilizing jig (Special tool).

- ※ When return spring (7) is strong in force, plate (12), plug (8) and push rod (9) will come up on loosening joint. Pay attention to this.

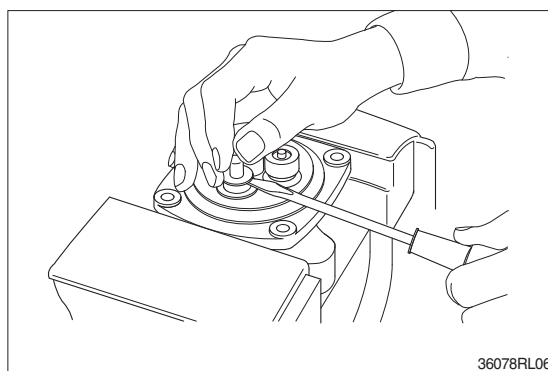


(8) Remove plate (12).



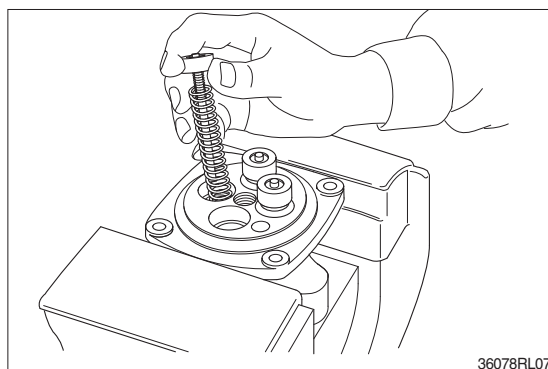
(9) When return spring (7) is weak in force, plug (8) stays in casing because of sliding resistance of O-ring.

- ※ Take it out with minus screwdriver. Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.
- ※ During taking out, plug may jump up due to return spring (7) force. Pay attention to this.



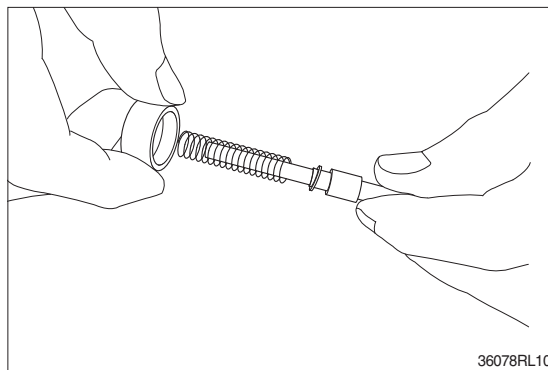
(10) Remove reducing valve subassembly and return spring (7) out of casing.

- ※ Record relative position of reducing valve subassembly and return springs.

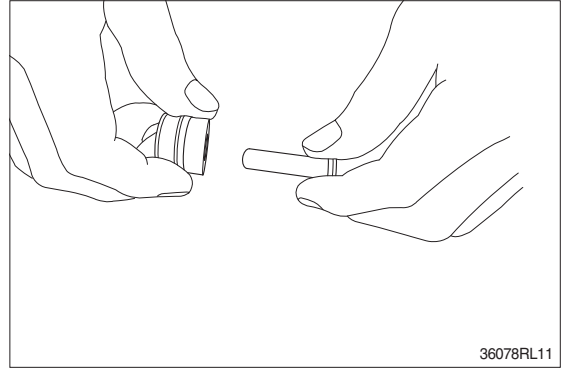


(11) Separate spool (3), spring seat (6), spring (5) and shim (4) individually.

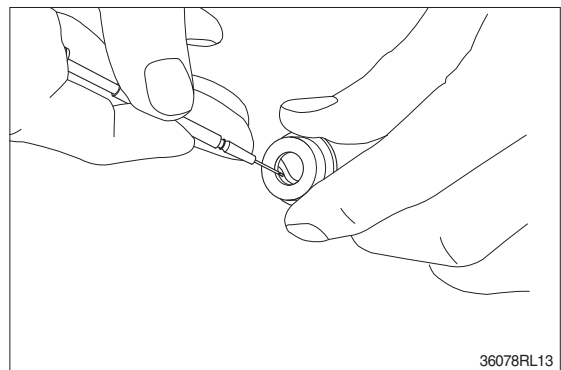
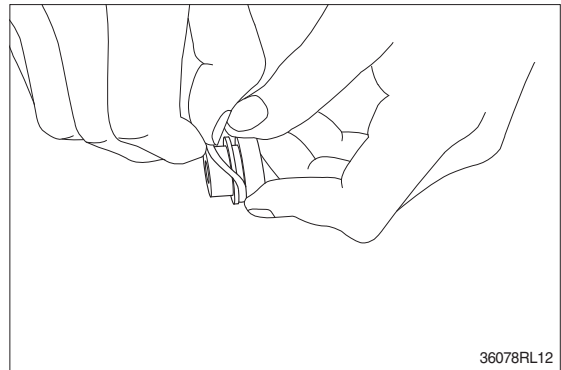
- ※ Pay attention not to damage spool surface.
- ※ Record original position of spring seat (6).
- ※ Until being assembled, they should be handled as one subassembly group.



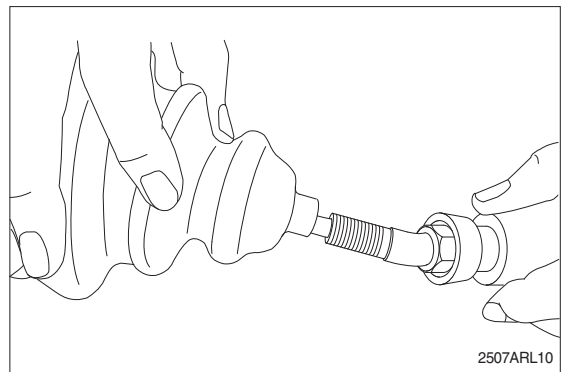
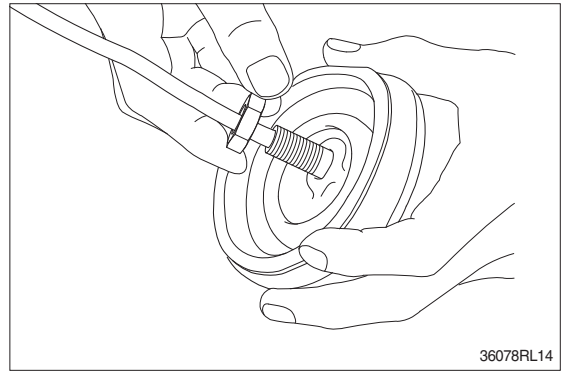
(12) Take push rod (9) out of plug (8).



(13) Remove O-ring (10) and seal (11) from plug (8).
Use small minus screwdriver or so on to remove this seal.



(14) Remove lock nut (22) and then boot (23).



(15) Cleaning of parts

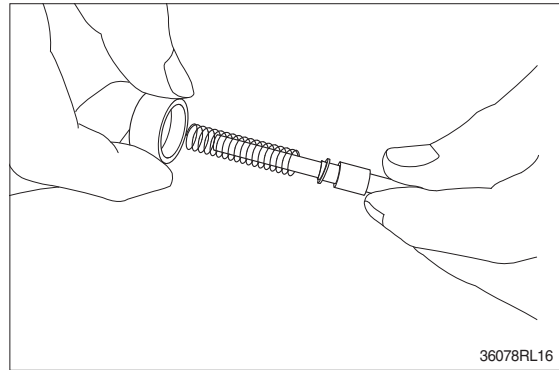
- ① Put all parts in rough cleaning vessel filled with kerosene and clean them (rough cleaning).
 - ※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.
 - ※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.
Therefore, control cleanliness of kerosene fully.
- ② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides (finish cleaning).
 - ※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

(16) Rust prevention of parts

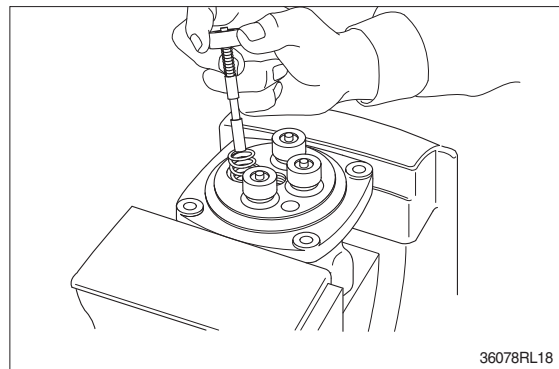
- Apply rust-preventives to all parts.
- ※ If left as they are after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

4) ASSEMBLY

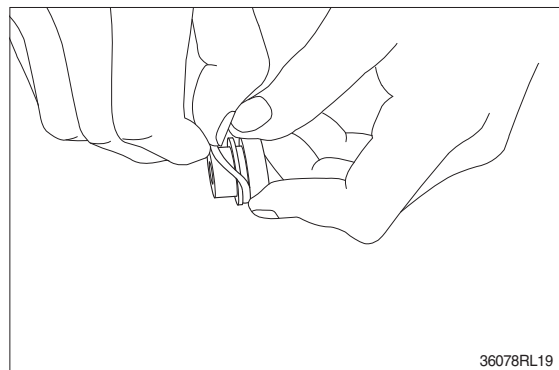
- (1) Put shim (4), springs (5) and spring seat (6) onto spool (3) in this order.



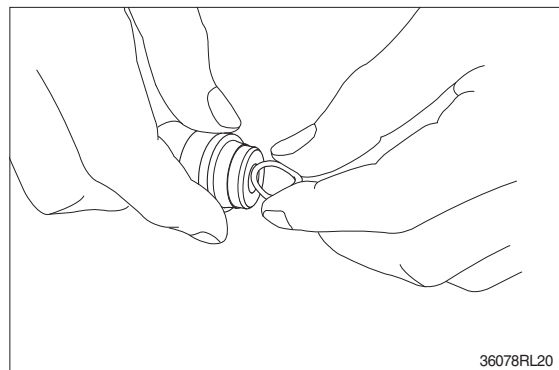
- (2) Assemble spring (7) into casing (1).
Assemble reducing valve subassembly into casing.
※ Assemble them to their original positions.



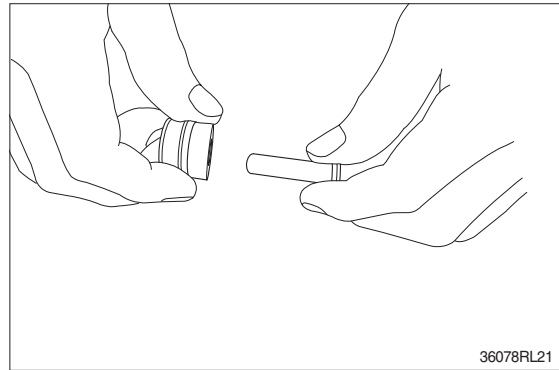
- (3) Assemble O-ring (10) onto plug (8).



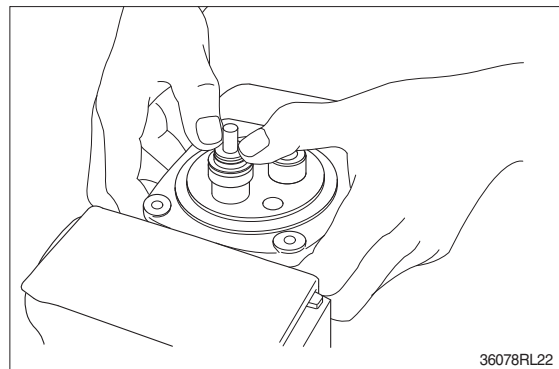
- (4) Assemble seal (11) to plug (8).
※ Assemble seal in such lip direction as shown below.



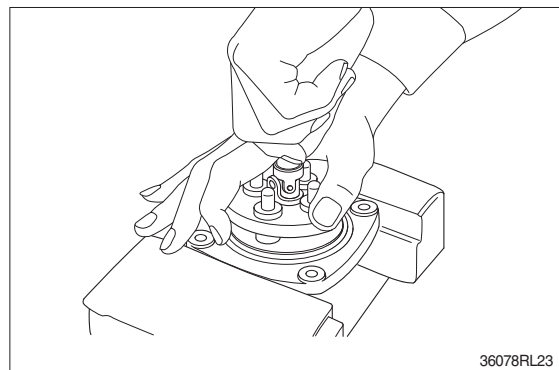
- (5) Assemble push rod (9) to plug (8).
※ Apply working oil on push-rod surface.



- (6) Assemble plug subassembly to casing.
※ When return spring is weak in force, subassembly stops due to resistance of O-ring.

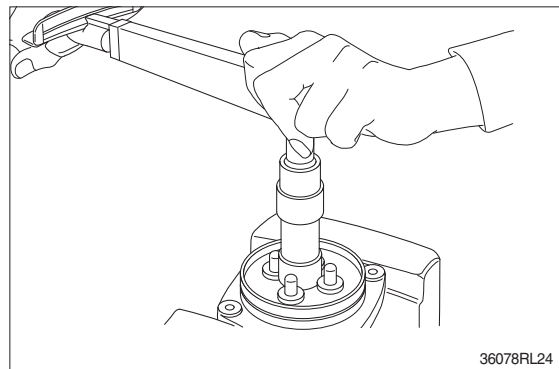


- (7) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (12), and tighten joint (15) temporarily.

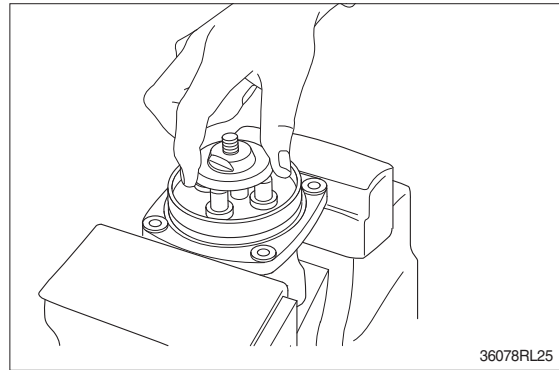


- (8) Fit plate (12).

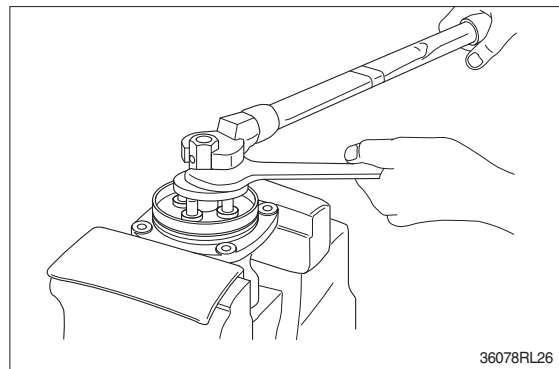
- (9) Tighten joint (15) with the specified torque to casing, utilizing jig.



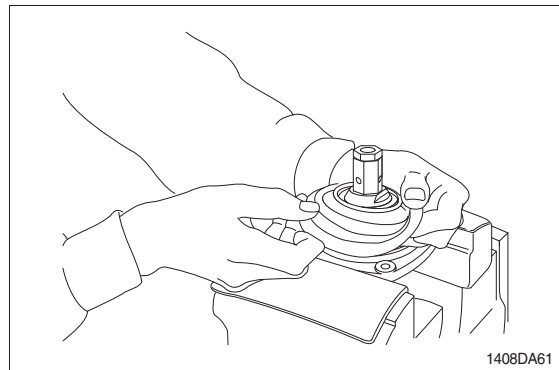
- (10) Assemble swash plate (16) to joint (15).
- ※ Screw it to position that it contacts with 4 push rods evenly.
 - ※ Do not screw it over.



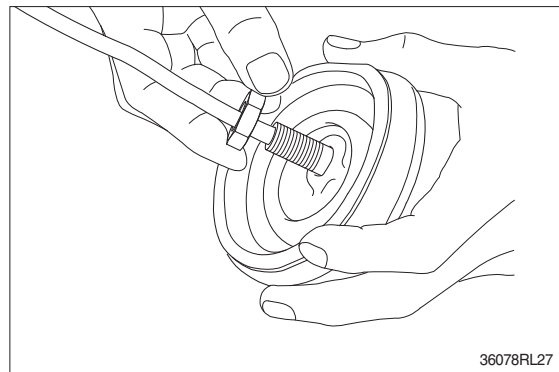
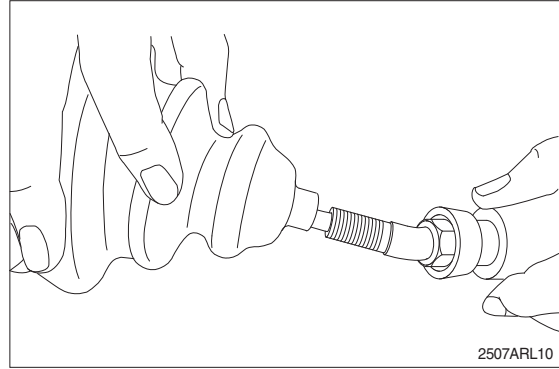
- (11) Assemble adjusting nut (17), apply spanner to width across flat of plate (16) to fix it, and tighten adjusting nut to the specified torque.
- ※ During tightening, do not change position of disk.



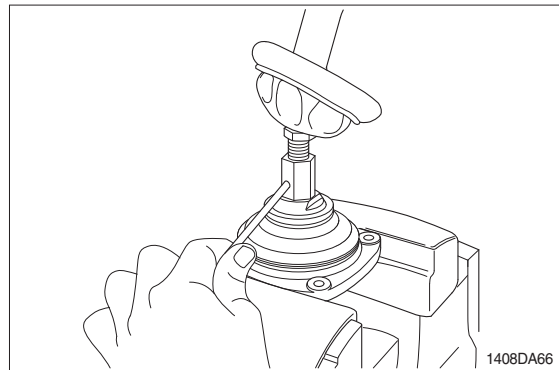
- (12) Fit boot (14) to plate.



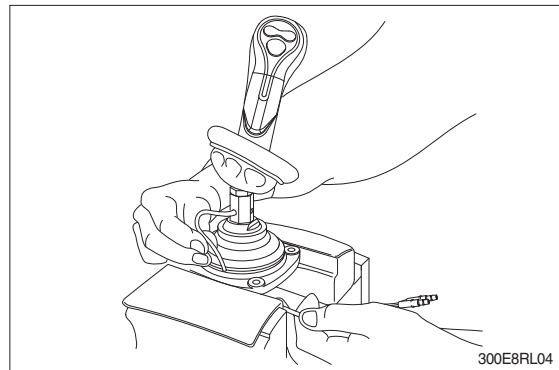
(13) Fit boot (23) and lock nut (22), and handle subassembly is assembled completely.



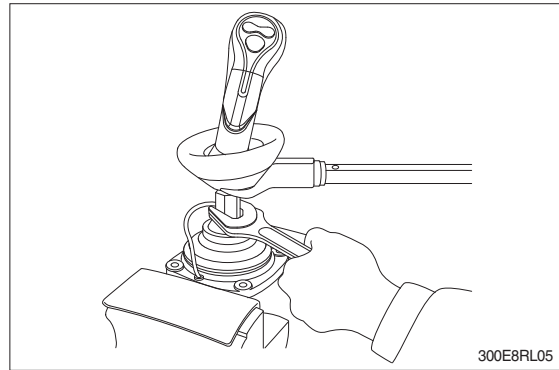
(14) Pull out cord and tube through adjusting nut hole provided in direction 60 ° to 120 ° from casing hole.



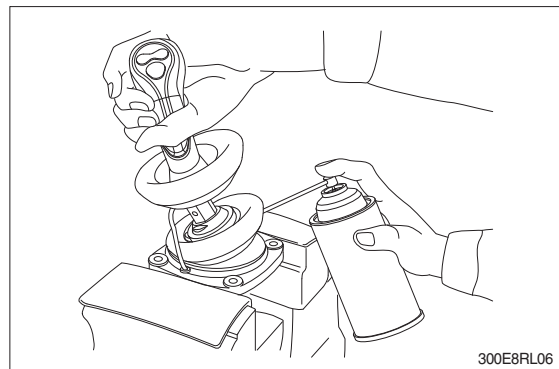
(15) Assemble bushing (18) to plate and pass cord and tube through it.
※ Provide margin necessary to operation.



(16) Determine handle direction, tighten lock nut (22) to specified torque to fix handle.

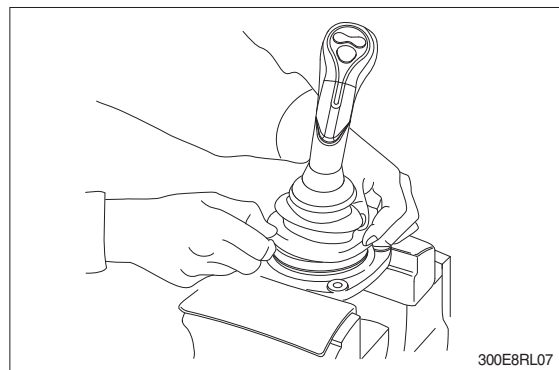


(17) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(18) Assemble lower end of bellows to casing.

(19) Inject volatile rust-preventives through all ports and then put blind plugs in ports.



GROUP 8 TURNING JOINT

1. REMOVAL AND INSTALL

1) REMOVAL

- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

- (4) Disconnect all hoses.
- (5) Unlock the split pin (4) and remove the pin (3).
- (6) Sling the turning joint assembly (1) and remove the mounting bolt (2).

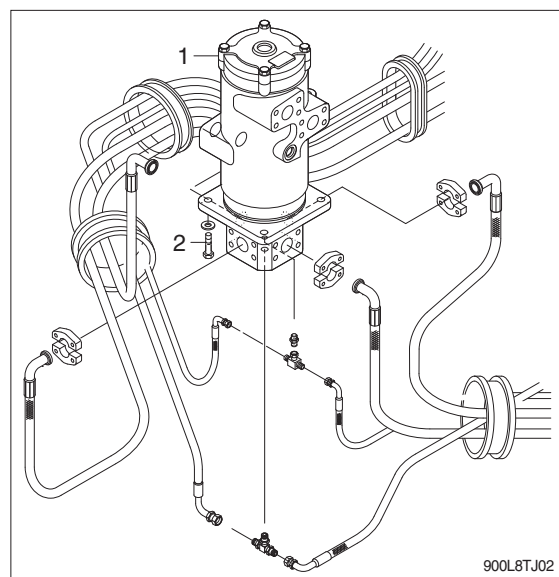
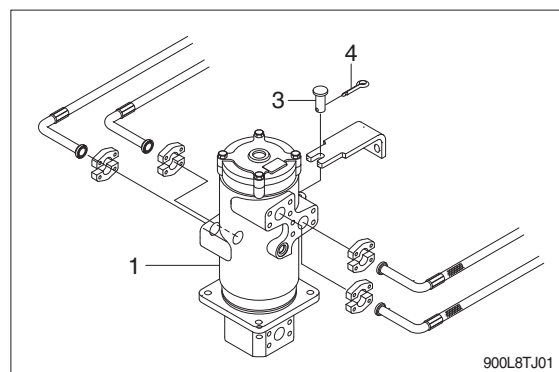
Weight : 75 kg (165 lb)

Tightening torque : $29.7 \pm 4.5 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)

- (7) Remove the turning joint assembly.
※ When removing the turning joint, check that all the hoses have been disconnected.

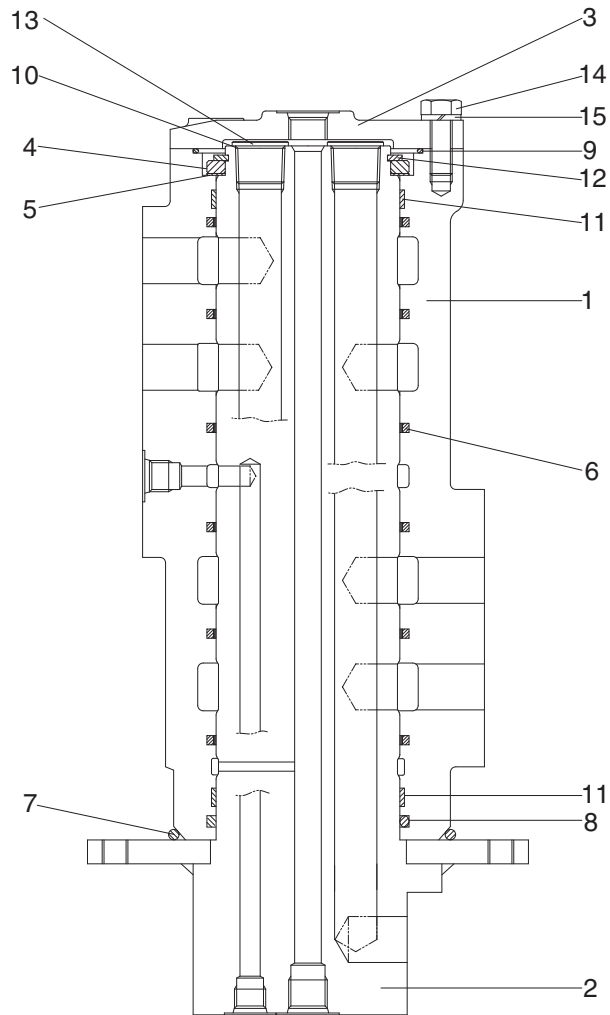
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
※ Take care of turning joint direction.
※ Assemble hoses to their original positions.
※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



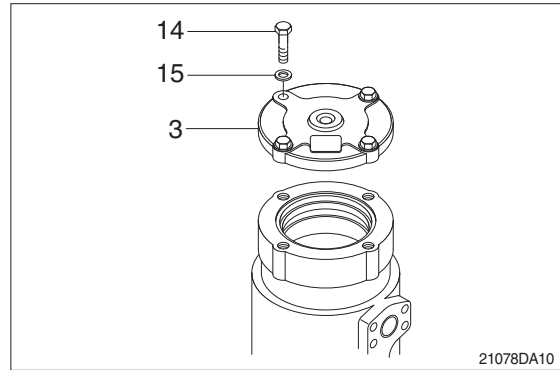
- | | | | | | |
|---|----------------|----|--------------|----|----------------|
| 1 | Hub | 6 | Slipper seal | 11 | Wear ring |
| 2 | Shaft assembly | 7 | O-ring | 12 | Retaining ring |
| 3 | Cover | 8 | O-ring | 13 | Socket plug |
| 4 | Spacer | 9 | O-ring | 14 | Hexagon bolt |
| 5 | Shim | 10 | O-ring | 15 | Spring washer |

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2) DISASSEMBLY

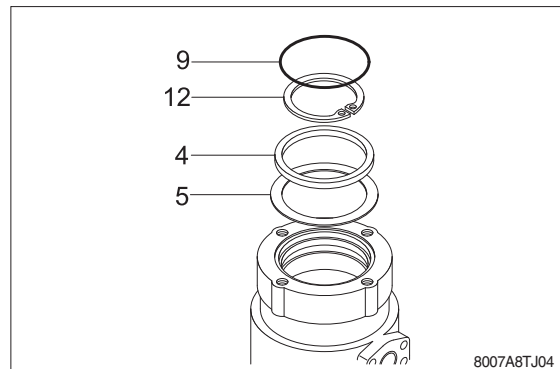
※ Before the disassembly, clean the turning joint.

- (1) Remove bolts (14), washer (15) and cover (3).



- (2) Remove O-ring (9).

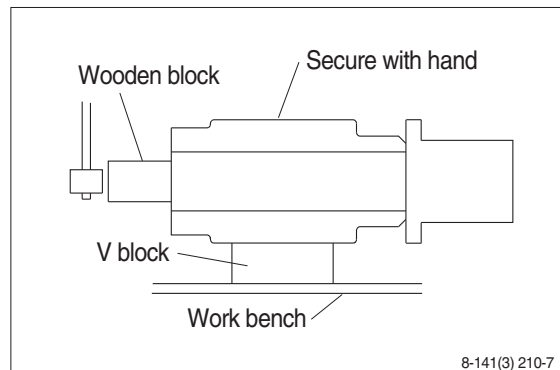
- (3) Remove retainer ring (12), spacer (4) and shim (5).



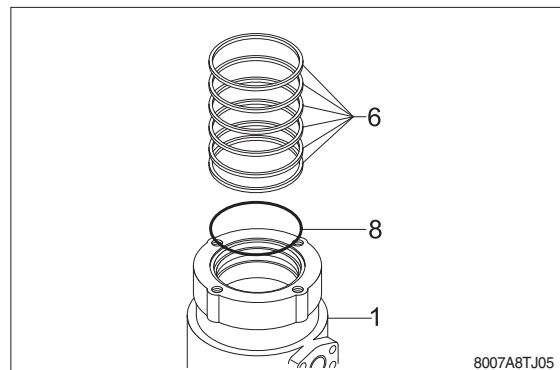
- (4) Place body (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ Take care not to damage the shaft (2) when remove body (1) or rest it sideways.

- ※ Put a fitting mark on body (1) and shaft (2).



- (5) Remove six slipper seals (6) and O-ring (8), from body (1).

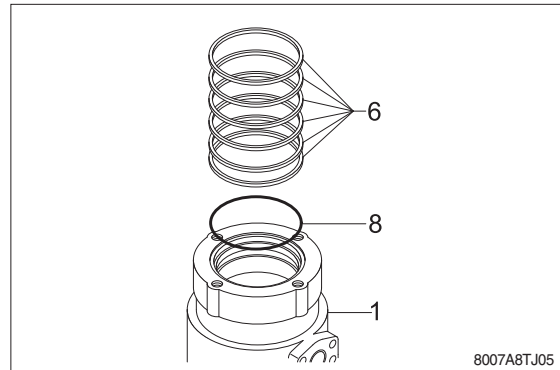


3) ASSEMBLY

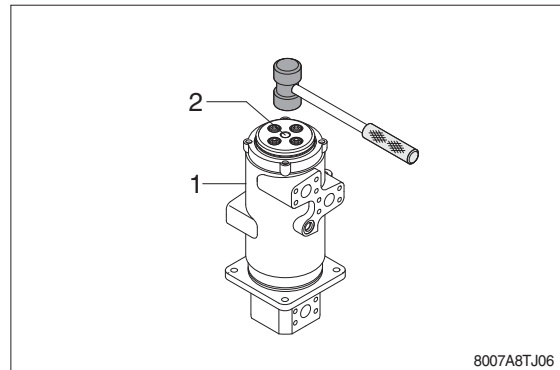
- ※ Clean all parts.
- ※ As a general rule, replace oil seals and O-ring.
- ※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix six slipper seal (6) and O-ring (8), to body (1).

(2) Fit O-ring (7) to shaft (2).

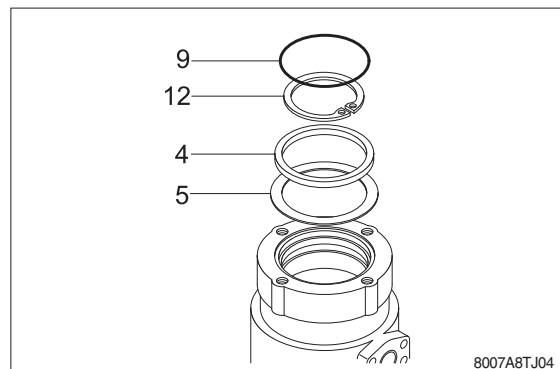


(3) Set shaft (2) on block, tap body (1) with a plastic hammer to install.



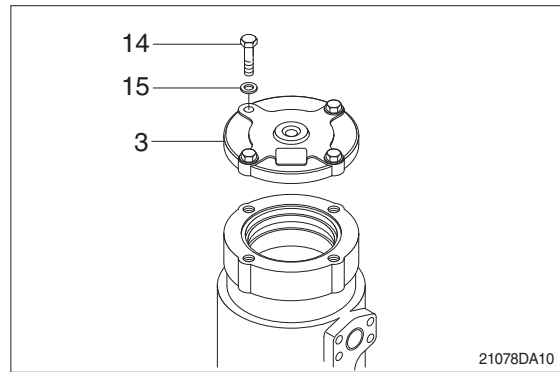
(4) Fit shim (5), spacer (4) and retainer ring (12) to shaft (2).

(5) Fit O-ring (9) to body (1).



(7) Install cover (3) to body (1) and tighten bolts (14).

Torque : 10~12.5 kgf · m
(72.3~90.4 lbf · ft)



GROUP 9 BOOM, ARM AND BUCKET CYLINDER

1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

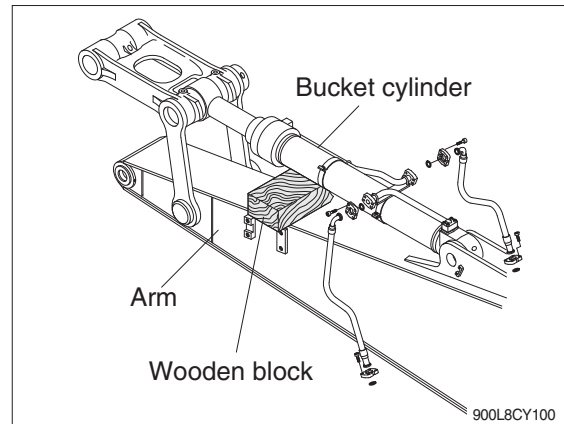
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

⚠ Loosen the breather slowly to release the pressure inside the hydraulic tank.

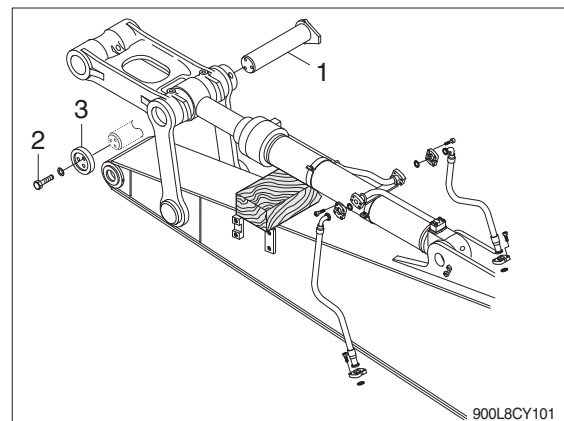
- ※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

- ① Set block between bucket cylinder and arm.

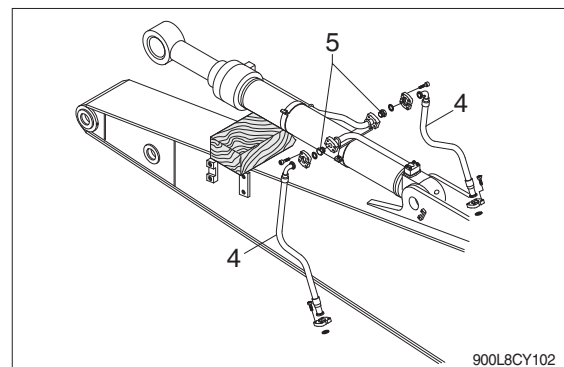


- ② Remove bolt (2), stopper (3) and pull out pin (1).

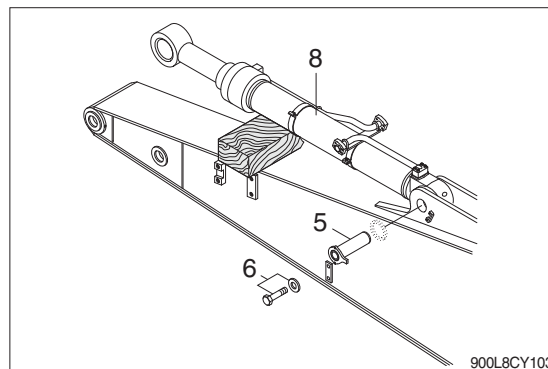
- ※ Tie the rod with wire to prevent it from coming out.



- ③ Disconnect bucket cylinder hoses (4) and put plugs (5) on cylinder pipe.



- ④ Sling bucket cylinder assembly (8) and remove bolt (6) then pull out pin (5).
- ⑤ Remove bucket cylinder assembly (8).
 - Weight : 754 kg (1662 lb)



(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the bucket cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2) ARM CYLINDER

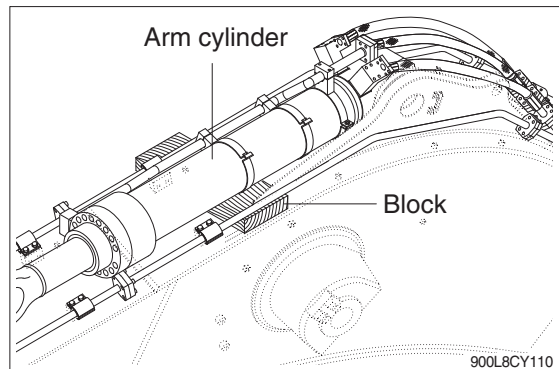
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.

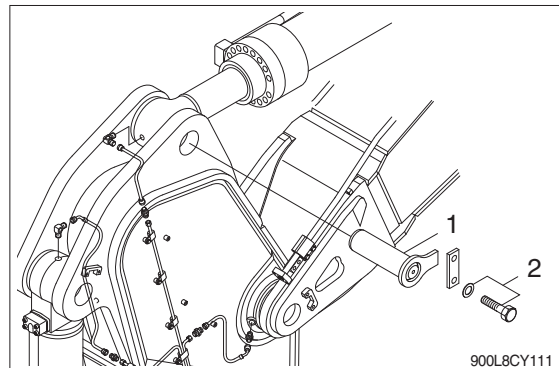
- ※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

- ① Set block between arm cylinder and boom.



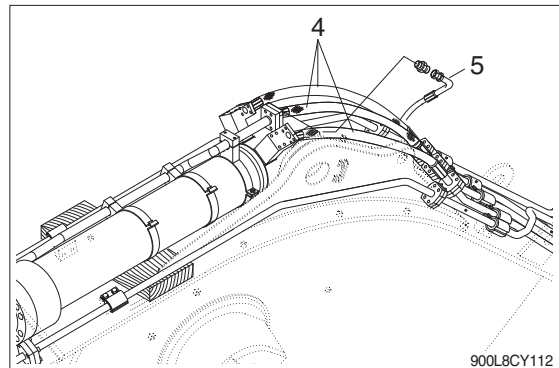
- ② Remove bolt (2) and pull out pin (1).

- ※ Tie the rod with wire to prevent it from coming out.

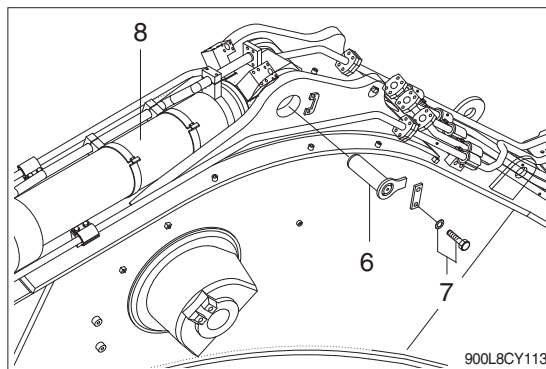


- ③ Disconnect arm cylinder hoses (4) and put plugs on cylinder pipe.

- ④ Disconnect greasing pipings (5).



- ⑤ Sling arm assembly (8) and remove bolt (7) then pull out pin (6).
- ⑥ Remove arm cylinder assembly (8).
 - Weight : 1087 kg (2400 lb)



(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the arm cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

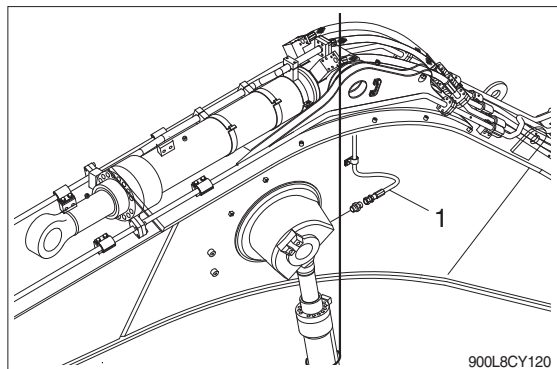
(1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

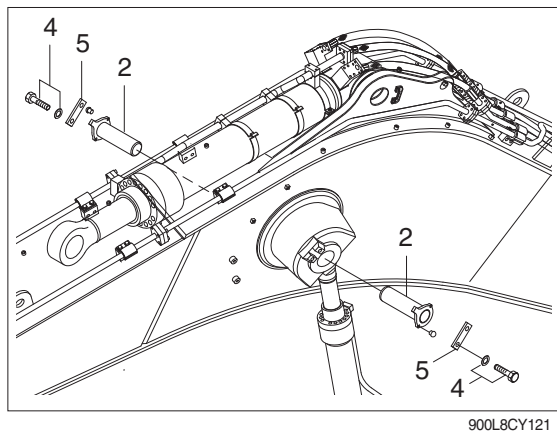
▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.

- ※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

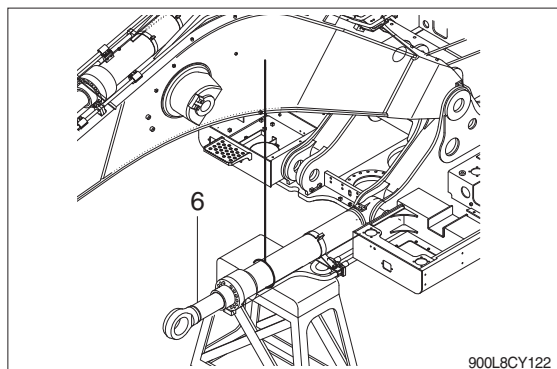
- ① Disconnect greasing hoses(1).
- ② Sling boom cylinder assembly.



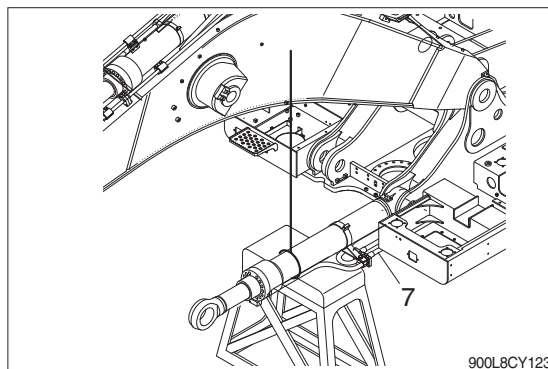
- ③ Remove bolt (4), pin stopper (5) and pull out pin (2).
- ※ Tie the rod with wire to prevent it from coming out.



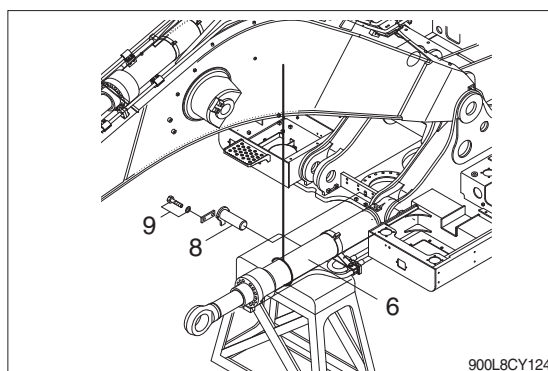
- ④ Lower the boom cylinder assembly (6) on a stand.



- ⑤ Disconnect boom cylinder hoses (7) and put plugs on cylinder pipe.



- ⑥ Remove bolt (9) and pull out pin (8).
⑦ Remove boom cylinder assembly (6).
· Weight : 862 kg (1906 lb)



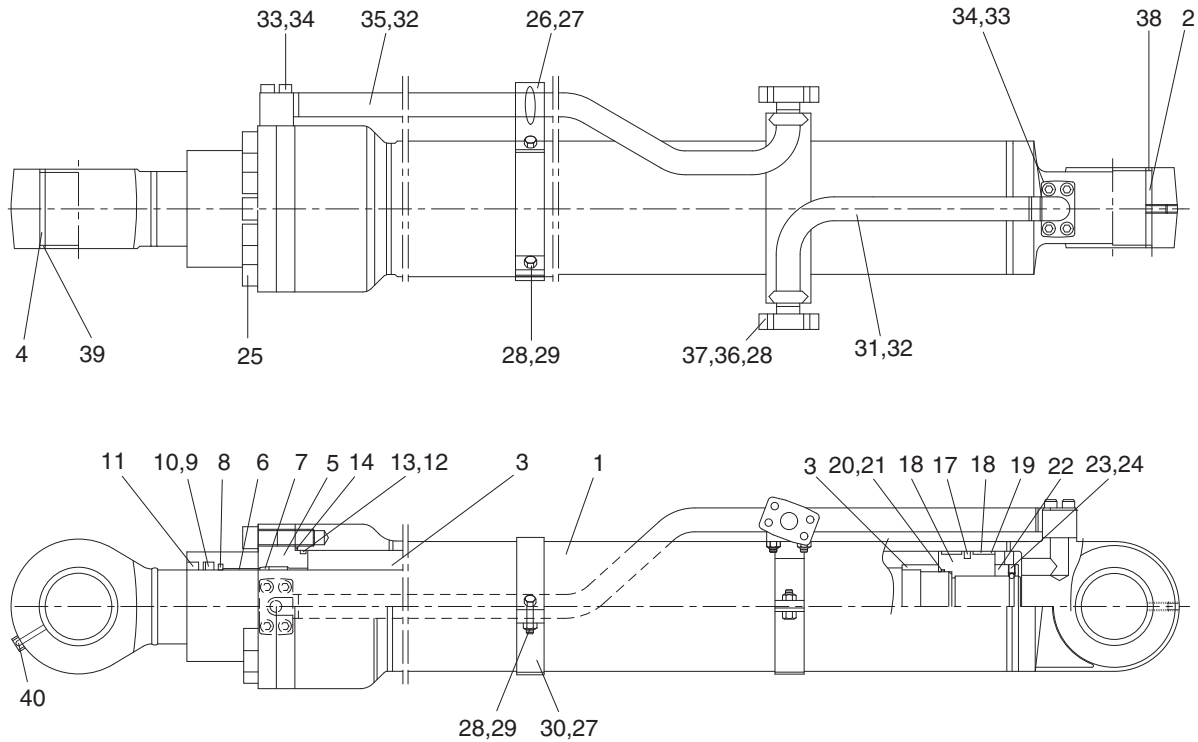
(2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.**
- ※ Bleed the air from the boom cylinder.
 - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

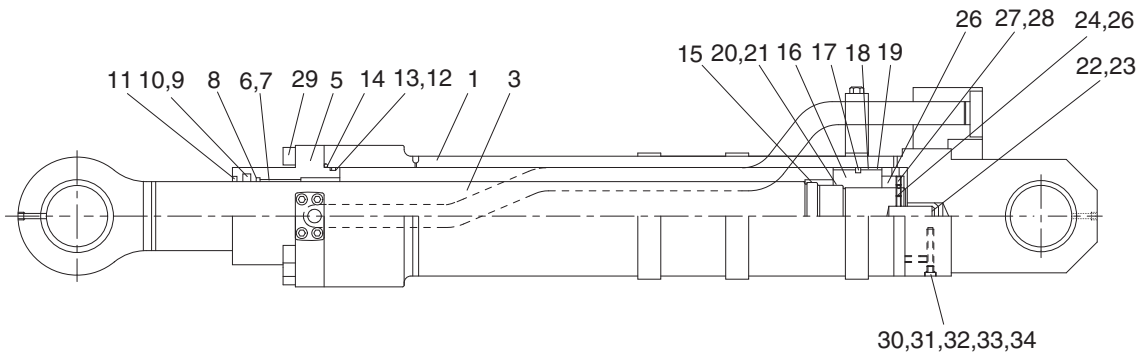
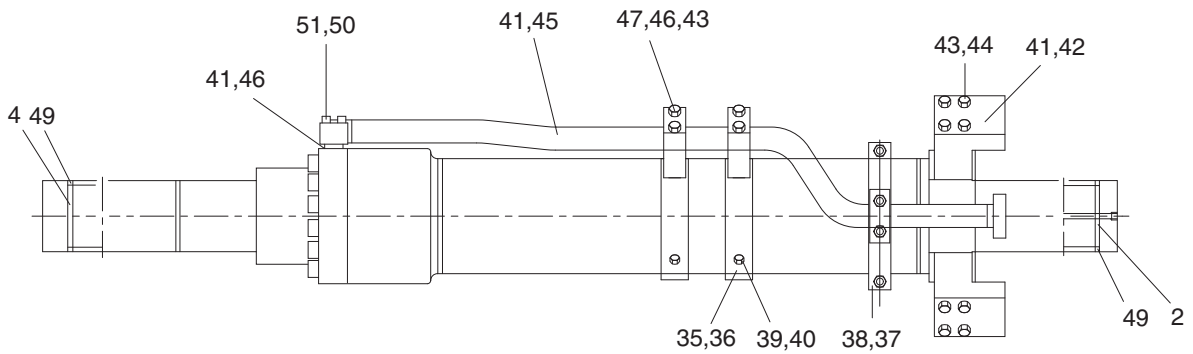
(1) Bucket cylinder



31KD-60010

1	Tube assembly	15	Cushion ring	29	Hex bolt
2	Pin bushing	16	Piston	30	Pipe band assembly
3	Rod assembly	17	Pinton seal	31	Pipe band
4	Pin bushing	18	Wear ring	32	O-ring
5	Rod cover	19	Dust ring	33	Hex socket bolt
6	Rod bushing	20	O-ring	34	Spring washer
7	Retaining ring	21	Back up ring	35	Pipe assembly
8	Buffer seal	22	Piston nut	36	U-bolt
9	U-packing	23	Steel ball	37	Hex nut
10	Back up ring	24	Set screw	38	Pin wiper
11	Dust wiper	25	Hex socket bolt	39	Pin wiper
12	O-ring	26	Pipe band assembly	40	Grease nipple
13	Back up ring	27	Pipe band		
14	O-ring	28	Spring washer		

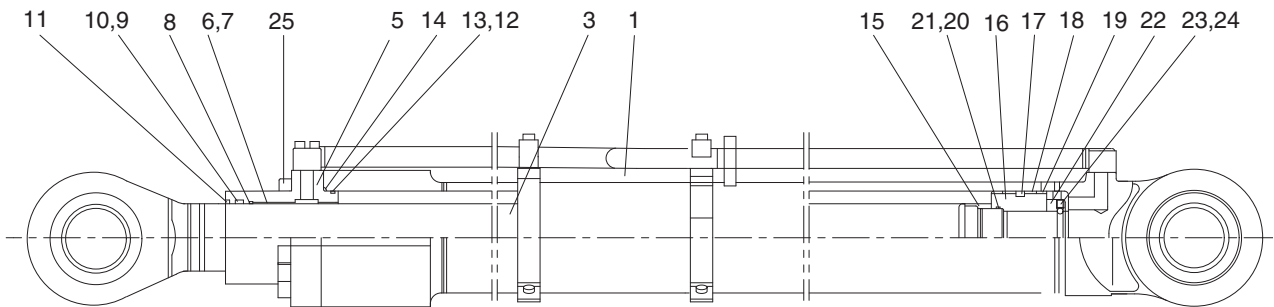
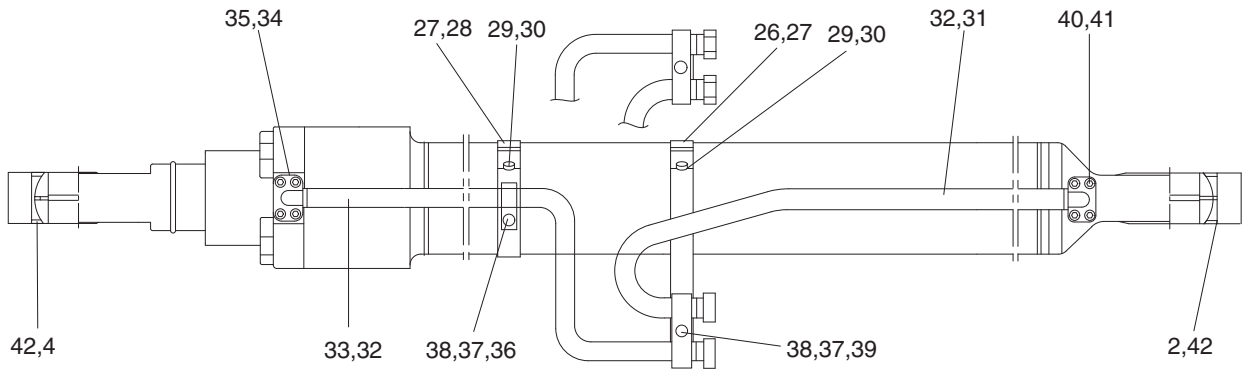
(2) Arm cylinder



31KD-50230

- | | | | | | |
|----|----------------|----|-----------------|----|--------------------|
| 1 | Tube assembly | 18 | Wear ring | 35 | Pipe band assembly |
| 2 | Pin bushing | 19 | Slyd ring | 36 | Pipe band |
| 3 | Rod assembly | 20 | O-ring | 37 | Pipe band assembly |
| 4 | Pin bushing | 21 | Back up ring | 38 | Pipe band |
| 5 | Rod cover | 22 | Guide | 39 | Spring washer |
| 6 | Rod bushing | 23 | Cushion ring | 40 | Hex bolt |
| 7 | Retaining ring | 24 | Set screw | 41 | O-ring |
| 8 | Buffer seal | 25 | Set screw | 42 | Flange port |
| 9 | U-packing | 26 | Piston nut | 43 | Spring washer |
| 10 | Back up ring | 27 | Steel ball | 44 | Hex socket bolt |
| 11 | Dust wiper | 28 | Set screw | 45 | Pipe assembly |
| 12 | O-ring | 29 | Hex socket bolt | 46 | Pipe clamp |
| 13 | Back up ring | 30 | Check valve | 47 | Clamp |
| 14 | O-ring | 31 | Spring | 48 | Spacer |
| 15 | Cushion ring | 32 | Spring support | 49 | Pin wiper |
| 16 | Piston | 33 | O-ring | 50 | Spring washer |
| 17 | Slipper seal | 34 | Plug | 51 | Hex socket bolt |

(3) Boom cylinder

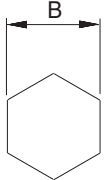


31KD-50210

- | | | | | | |
|----|-------------------|----|--------------------|----|-----------------|
| 1 | Tube assembly | 15 | Cushion ring | 29 | Hex bolt |
| 2 | Spherical bearing | 16 | Piston | 30 | Spring washer |
| 3 | Rod assembly | 17 | Piston seal | 31 | Pipe assembly |
| 4 | Spherical bearing | 18 | Wear ring | 32 | O-ring |
| 5 | Rod cover | 19 | Dust ring | 33 | Pipe assembly |
| 6 | Rod bushing | 20 | O-ring | 34 | Hex socket bolt |
| 7 | Retaining ring | 21 | Back up ring | 35 | Spring washer |
| 8 | Buffer seal | 22 | Piston nut | 36 | Clamp |
| 9 | U-packing | 23 | Steel ball | 37 | Spring washer |
| 10 | Back up ring | 24 | Set screw | 38 | Hex bolt |
| 11 | Dust wiper | 25 | Hex socket bolt | 39 | Clamp |
| 12 | O-ring | 26 | Pipe band assembly | 40 | Spring washer |
| 13 | Back up ring | 27 | Band pipe | 41 | Hex socket bolt |
| 14 | O-ring | 28 | Pipe band assembly | 42 | Retaining ring |

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Allen wrench	6	
	12	
	14	
	19	
	24	
	27	
(-) Driver	Small and large sizes	
Torque wrench	Capable of tightening with the specified torques	

(2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Piston	Bucket cylinder	16	M120	190 ± 19	1374 ± 137
	Boom cylinder	16	M120	190 ± 19	1374 ± 137
	Arm cylinder	16	M120	190 ± 19	1374 ± 137
Piston nut	Bucket cylinder	22	M120	250 ± 25	1808 ± 181
	Boom cylinder	22	M120	250 ± 25	1808 ± 181
	Arm cylinder	26	M120	250 ± 25	1808 ± 181
Socket head bolt	Bucket cylinder	★1 25	M27	120~137	868~991
		33	M14	14~15	101~108
	Boom cylinder	★1 25	M27	120~137	868~991
		34	M14	14~15	101~108
	Arm cylinder	★1 29	M27	120~137	868~991
		51	M16	16~18	116~130
Set screw	Bucket cylinder	★1 24	M14	6.5	47.0
	Boom cylinder	★1 24	M14	6.5	47.0
	Arm cylinder	★1 28	M14	6.5	47.0

★1 Apply the loctite #243 on the thread before tightening.

3) DISASSEMBLY

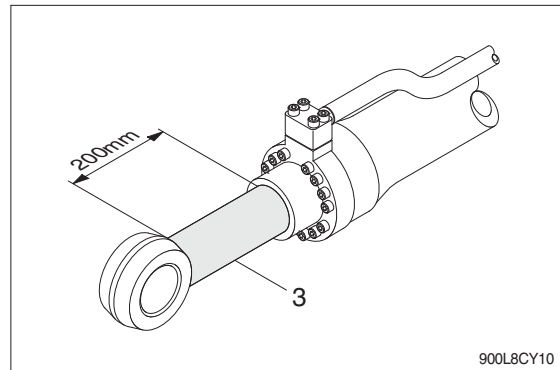
(1) Remove cylinder head and piston rod

※ Procedures are based on the bucket cylinder.

① Hold the clevis section of the tube in a vise.

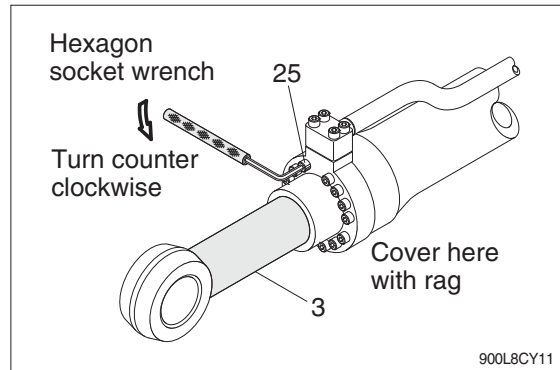
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

② Pull out rod assembly (3) about 200 mm (7.1 in). Because the rod assembly is rather heavy, finish extending it with air pressure after the oil draining operation.



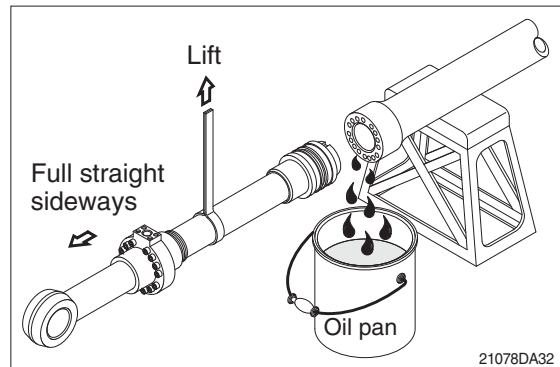
③ Loosen and remove socket bolts (25) of the rod cover in sequence.

※ Cover the extracted rod assembly (3) with rag to prevent it from being accidentally damaged during operation.



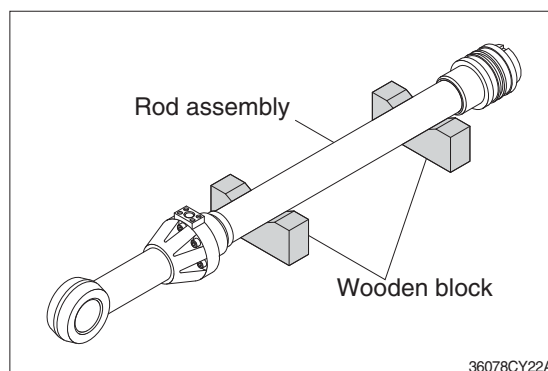
④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (3) with a crane or some means and draw it out. However, when rod assembly (3) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



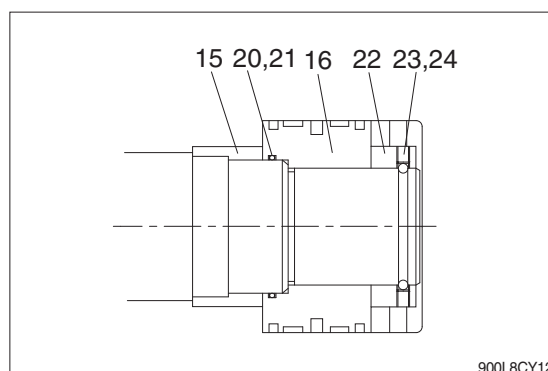
Note that the plated surface of rod assembly (3) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

- ⑤ Place the removed rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

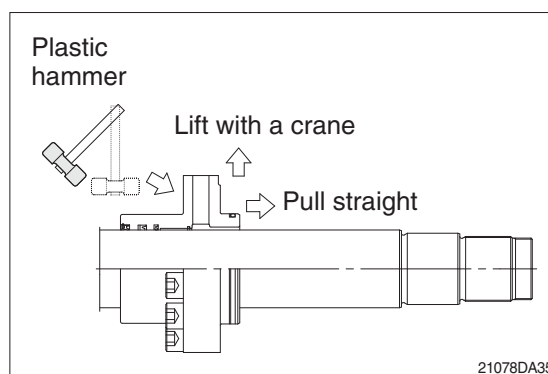


(2) Remove piston and cylinder head

- ① Loosen the set screw (24) and remove steel ball (23).
- ② Remove piston nut (22).
- ※ Since piston nut (22) and piston (16) are tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the piston nut (22) and piston (16).
- ③ Remove piston assembly (16), back up rings (21), and O-ring (20).
- ④ Remove the cushion ring (15)

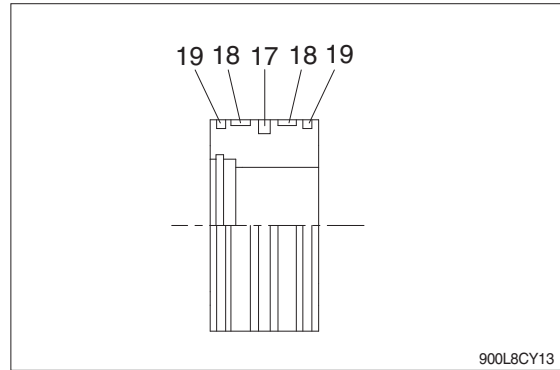


- ⑤ Remove the cylinder head assembly from rod assembly (3).
 - ※ If it is too heavy to move, move it by striking the flanged part of cylinder head with a plastic hammer.
 - ※ Pull it straight with cylinder head assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing (6) and packing (7, 8, 9, 10,11) by the threads of rod assembly (3).



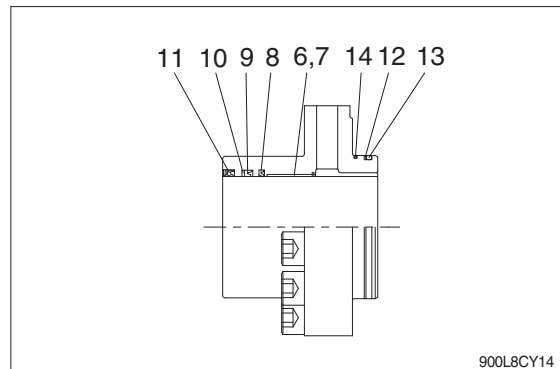
(3) Disassemble the piston assembly

- ① Remove wear ring (18).
 - ② Remove dust ring (19) and piston seal (17).
- ※ Exercise care in this operation not to damage the grooves.



(4) Disassemble cylinder head assembly

- ① Remove back up ring (13) and O-ring (12, 14).
 - ② Remove dust wiper (11).
 - ③ Remove back up ring (10), U-packing (9) and buffer seal (8).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.

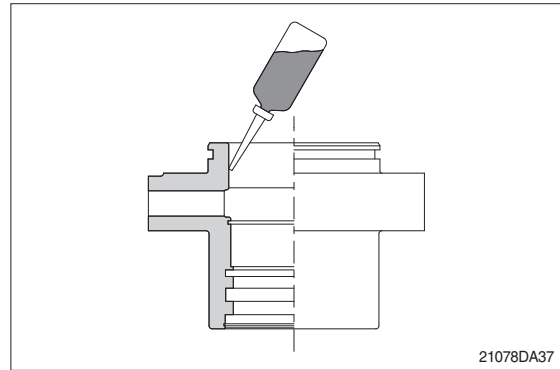


3) ASSEMBLY

(1) Assemble cylinder head assembly

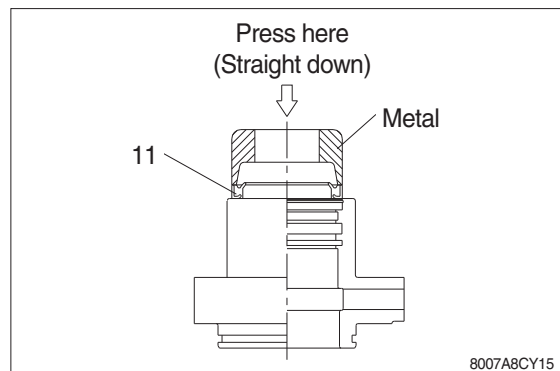
※ Check for scratches or rough surfaces if found smooth with an oil stone.

- ① Coat the inner face of rod cover (5) with hydraulic oil.



- ② Coat dust wiper (11) with grease and fit dust wiper (11) to the bottom of the hole of dust seal.

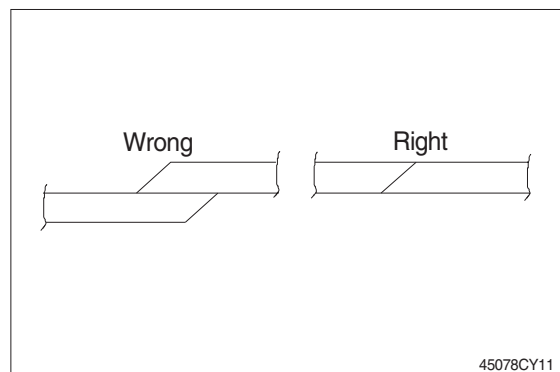
At this time, press a pad metal to the metal ring of dust seal.



- ③ Fit back up ring (10), U-packing (9) and buffer seal (8) to corresponding grooves, in that order.

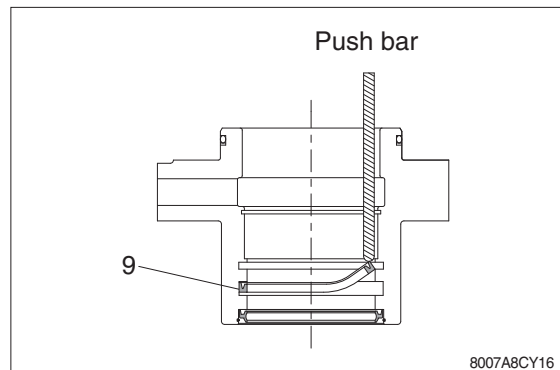
※ Coat each packing with hydraulic oil before fitting it.

※ Insert the backup ring until one side of it is inserted into groove.

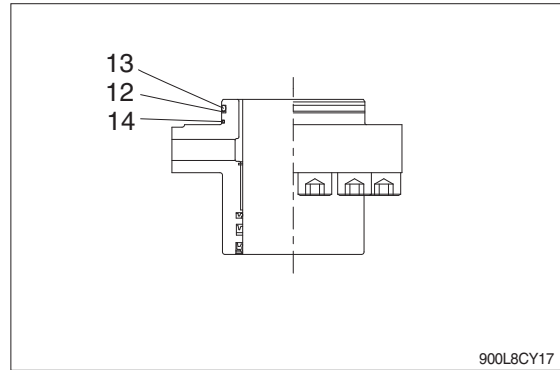


※ U-packing (9) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting U-packing (9) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

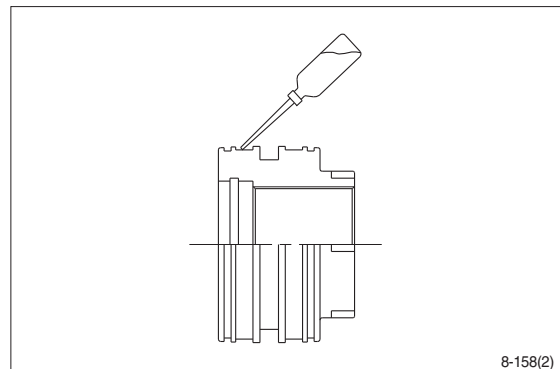


- ④ Fit back up ring (13) to rod cover (5).
- ※ Put the backup ring in the warm water of 30~50°C.
- ⑤ Fit O-ring (12, 14) to rod cover (5).

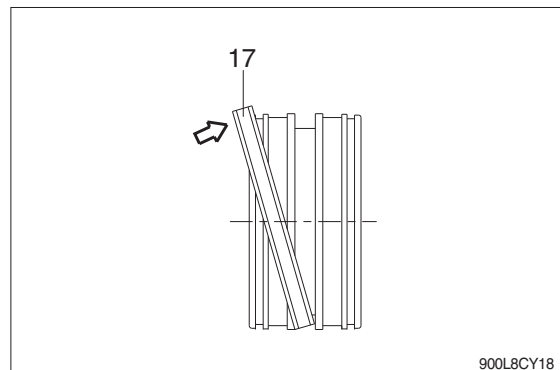


(2) Assemble piston assembly

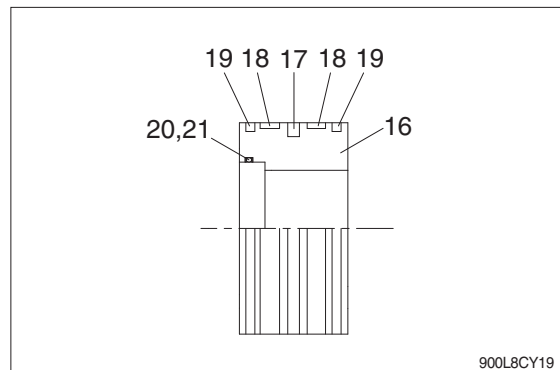
- ※ Check for scratches or rough surfaces.
If found smooth with an oil stone.
- ① Coat the outer face of piston (16) with hydraulic oil.



- ② Fit piston seal (17) to piston.
- ※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
- ※ After assembling the piston seal, press its outer diameter to fit in.

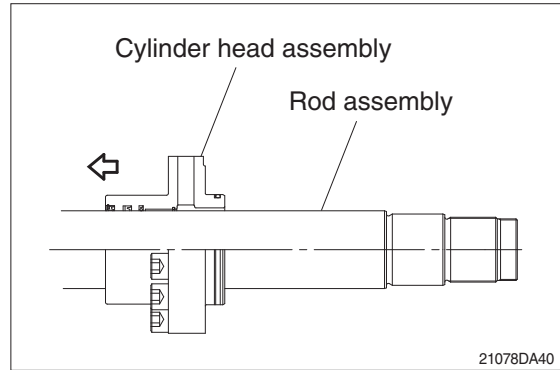


- ③ Fit wear ring (18) and dust ring (19) to piston (16).
- ④ Fit back up rings (21) and O-ring (20) to piston (16).

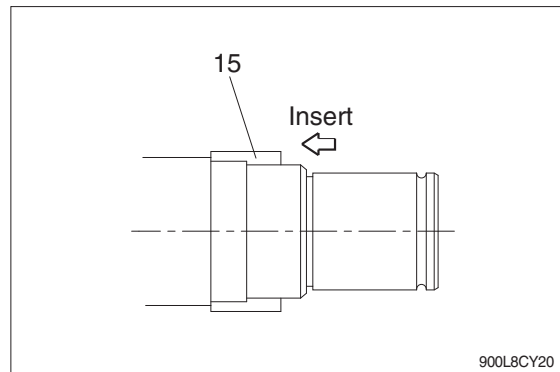


(3) Install piston and cylinder head

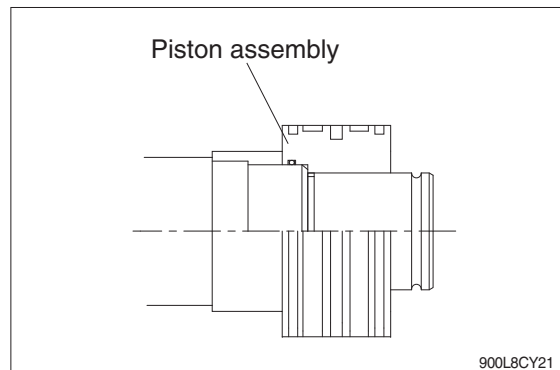
- ① Fix the rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of rod assembly (3), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to rod assembly.



- ④ Insert cushion ring (15) to rod assembly.
- ※ Note that cushion ring (15) has a direction in which it should be fitted.

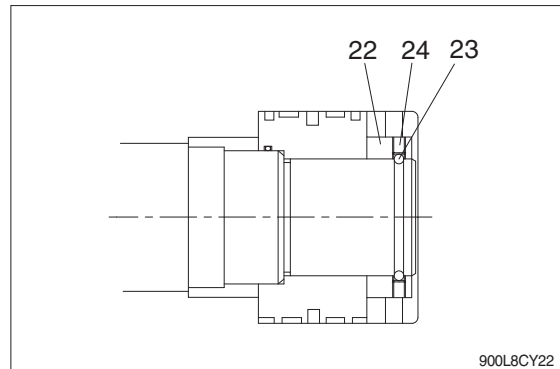


- ⑤ Fit piston assembly to rod assembly.
- Tightening torque : 190 ± 19 kgf · m
(1374 ± 137 lbf · ft)



- ⑥ Fit piston nut (22) as specified torque.
- Tightening torque

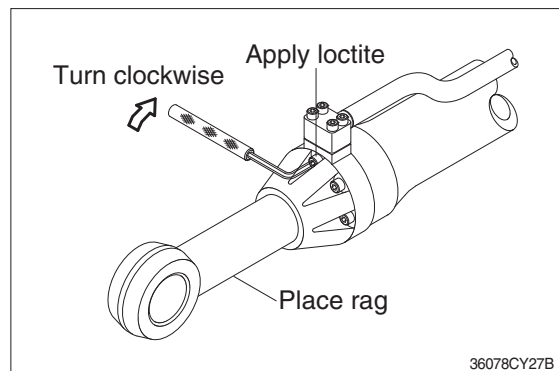
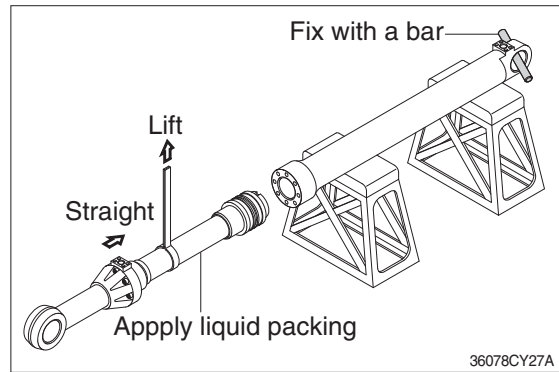
Item		kgf · m	lbf · ft
Bucket	22	250 ± 25	1808 ± 181
Boom	22	250 ± 25	1808 ± 181
Arm	26	250 ± 25	1808 ± 181



- ⑦ Insert the steel ball (23) into hole and tighten the set screw (24).
- Tightening torque : 6.5 kgf · m
(47.0 lbf · ft)

(3) Overall assemble

- ① Place a V-block on a rigid work bench. Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
- ② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.
 - ※ Be careful not to damage piston seal by thread of tube assembly.
- ③ Match the bolt holes in the cylinder head flange to the tapped holes in the tube assembly and tighten socket bolts to a specified torque.
 - ※ Refer to the table of tightening torque.

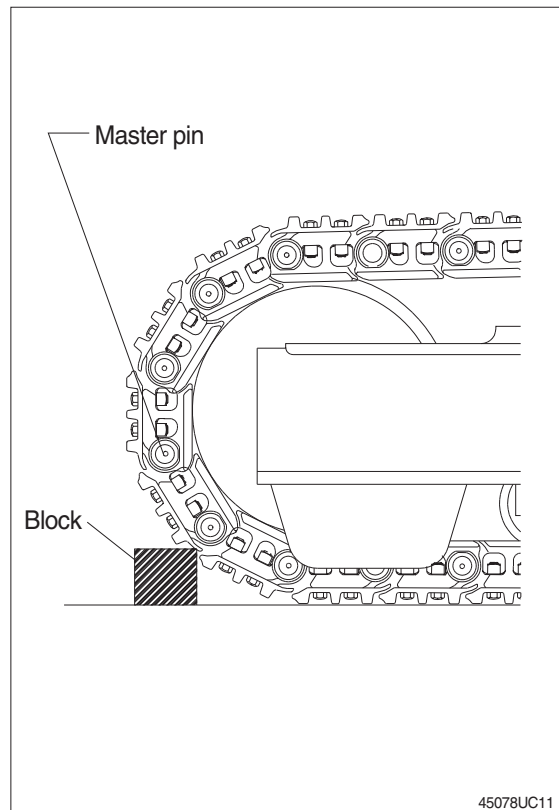


GROUP 10 UNDERCARRIAGE

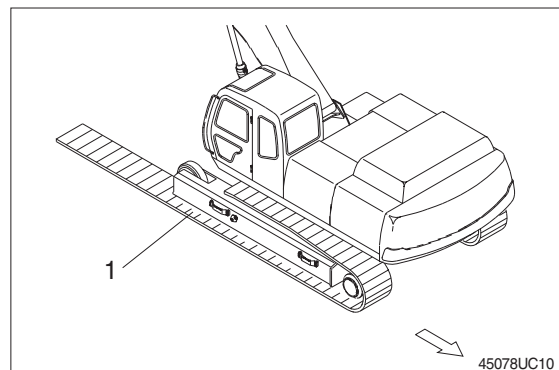
1. TRACK LINK

1) REMOVAL

- (1) Move track link until master pin is over front idler in the position put wooden block as shown.
- (2) Loosen tension of the track link.
※ If track tension is not relieved when the grease valve is loosened, move the machine backwards and forwards.
- (3) Push out master pin by using a suitable tool.

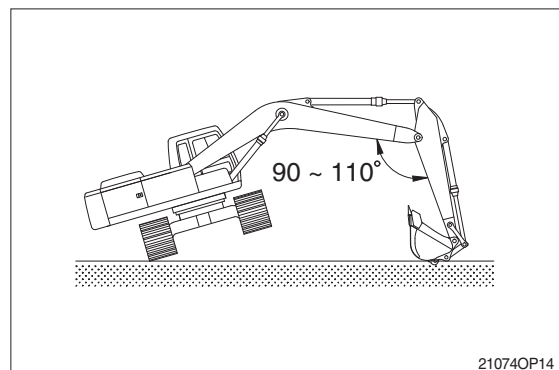


- (4) Move the machine slowly in reverse, and lay out track link assembly (1).
※ Jack up the machine and put wooden block under the machine.
※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.



2) INSTALL

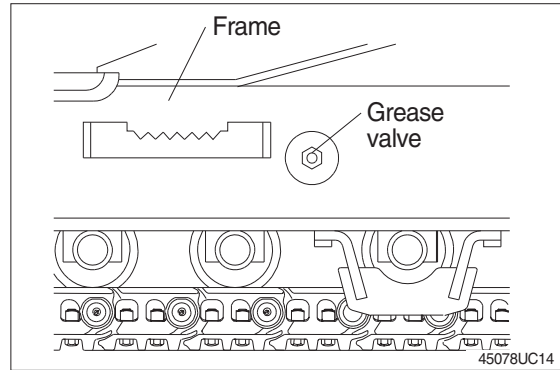
- (1) Carry out installation in the reverse order to removal.
※ Adjust the tension of the track link.



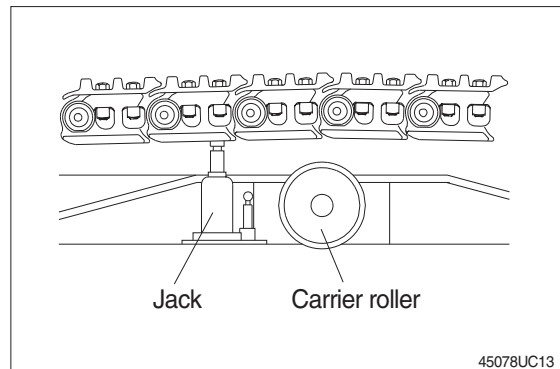
2. CARRIER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.



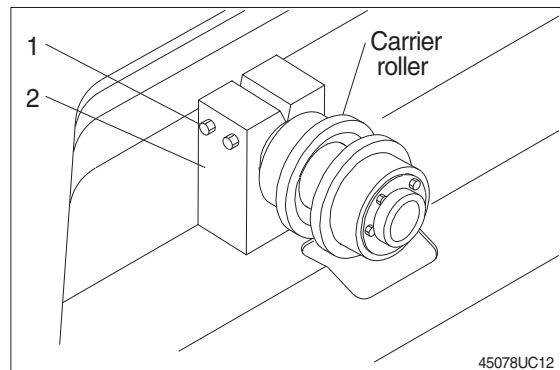
(2) Jack up the track link height enough to permit carrier roller removal.



(3) Loosen the lock nut (1).

(4) Open bracket (2) with a screwdriver, push out from inside, and remove carrier roller assembly.

- Weight : 75 kg (165 lb)
- Tightening torque : 57.9 ± 6.0 kgf · m
(419 ± 43.4 lbf · ft)



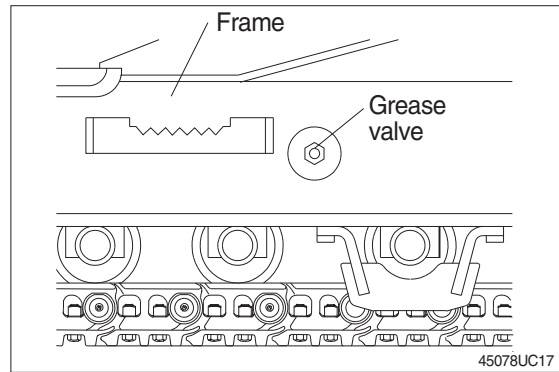
2) INSTALL

(1) Carry out installation in the reverse order to removal.

3. TRACK ROLLER

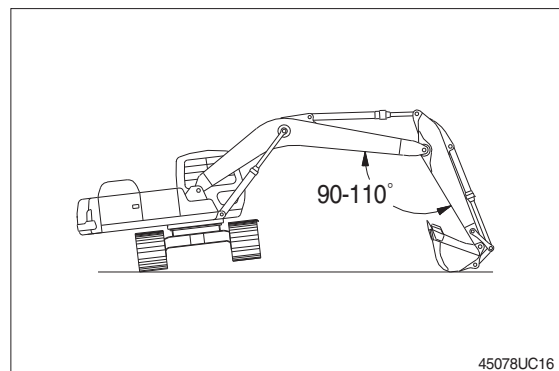
1) REMOVAL

(1) Loosen tension of the track link.



(2) Using the work equipment, push up track frame on side which is to be removed.

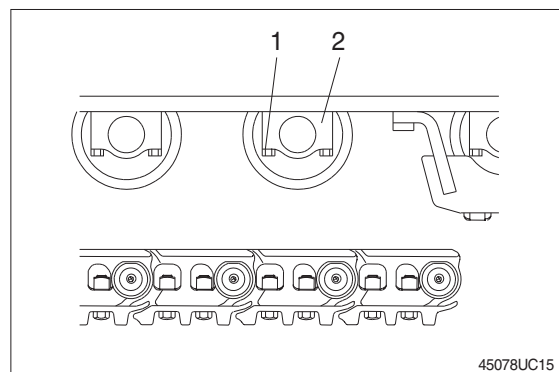
※ After jack up the machine, set a block under the unit.



(3) Remove the mounting bolt (1) and draw out the track roller (2).

· Weight : 185 kg (410 lb)

· Tightening torque : 135 ± 13 kgf · m
(976 ± 94.0 lbf · ft)



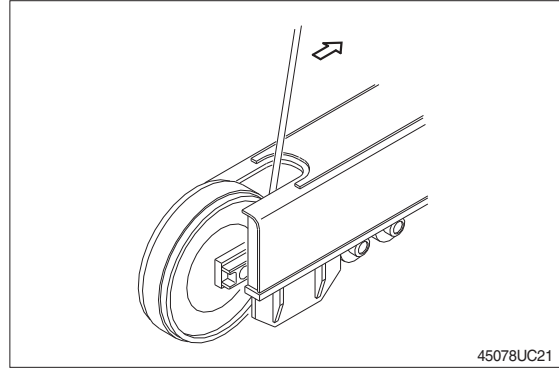
2) INSTALL

(1) Carry out installation in the reverse order to removal.

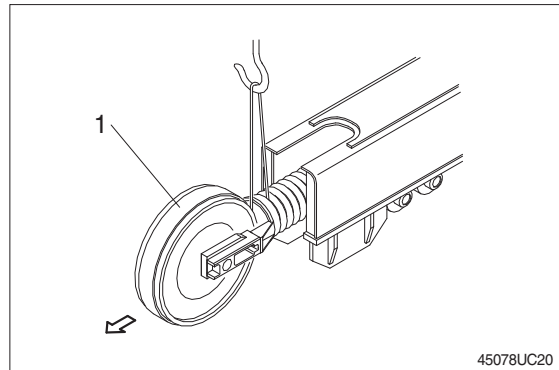
4. IDLER AND RECOIL SPRING

1) REMOVAL

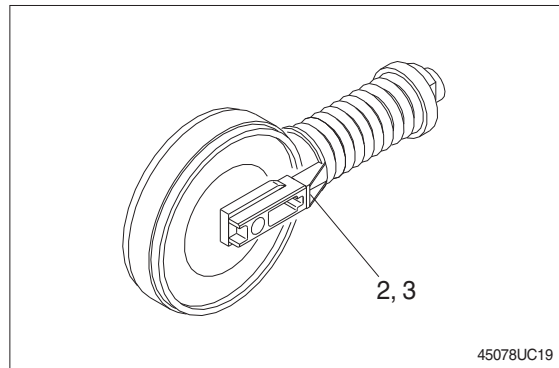
- (1) Remove the track link.
For detail, see **removal of track link**.



- (2) Sling the recoil spring (1) and pull out idler and recoil spring assembly from track frame, using a pry.
· Weight : 550 kg (1210 lb)

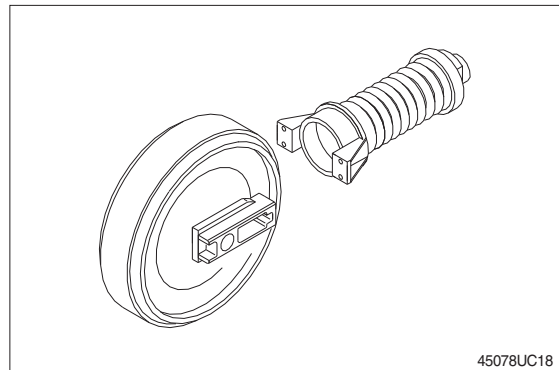


- (3) Remove the bolts (2), washers (3) and separate idler from recoil spring.
· Tightening torque : 57.9 ± 6.0 kgf · m
(419 ± 43.4 lbf · ft)



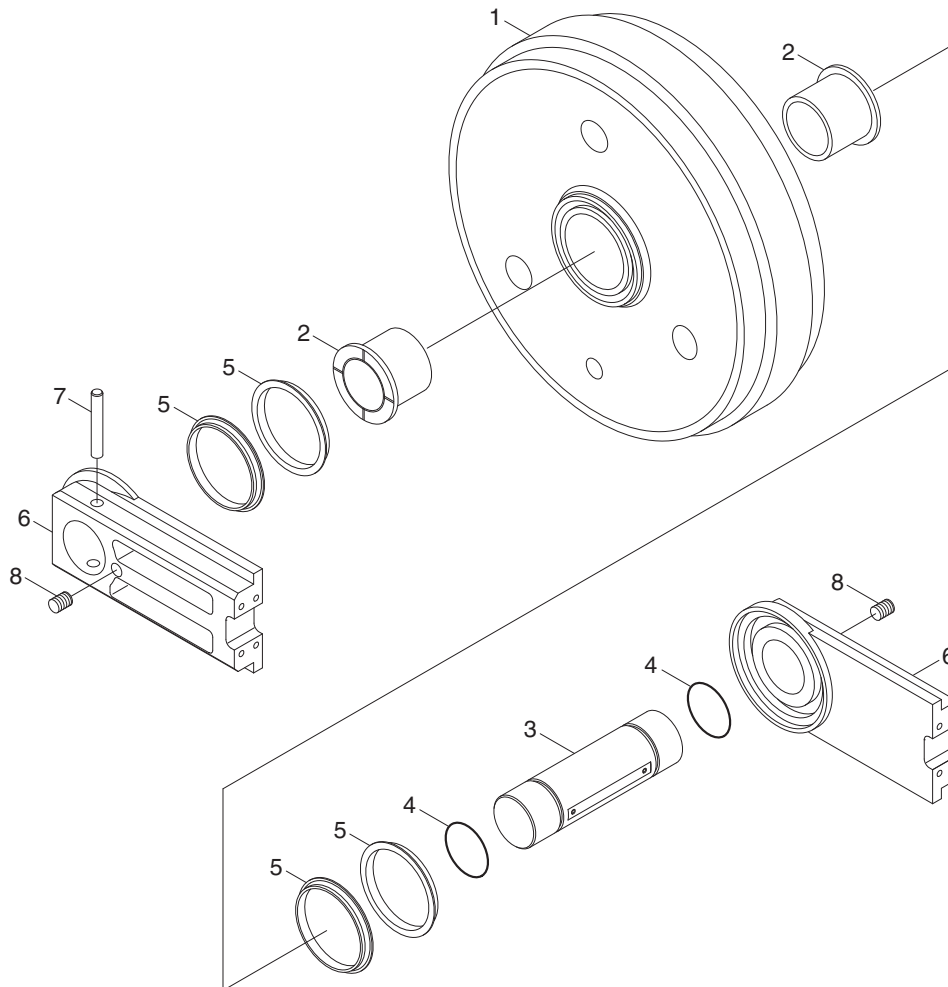
2) INSTALL

- (1) Carry out installation in the reverse order to removal.
※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure



81ND-13050

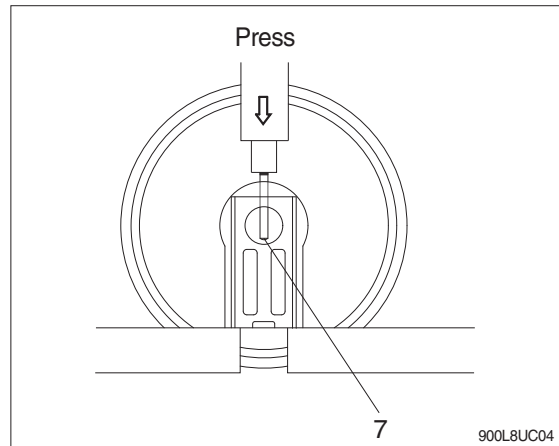
- 1 Shell
- 2 Bushing
- 3 Shaft

- 4 O-ring
- 5 Seal assy
- 6 Bracket

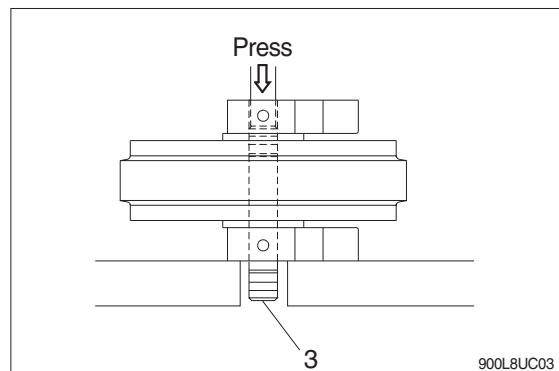
- 7 Pin
- 8 Plug

(2) Disassembly

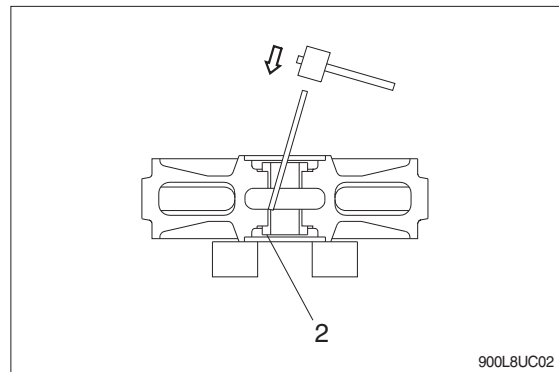
- ① Remove plug and drain oil.
- ② Draw out the pin (7), using a press.



- ③ Pull out the shaft (3) with a press.
- ④ Remove seal (5) from shell (1) and bracket (6).
- ⑤ Remove O-ring (4) from shaft.



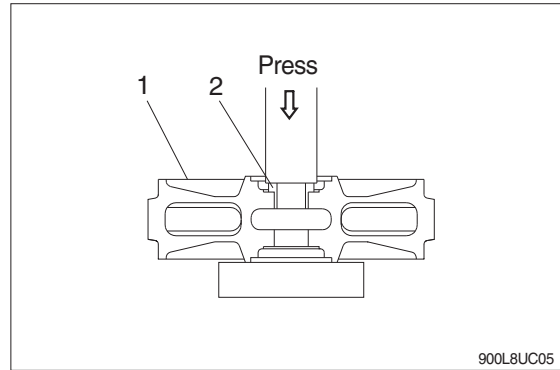
- ⑥ Remove the bushing (2) from idler, using a special tool.
- ※ Only remove bushing if replacement is necessary.



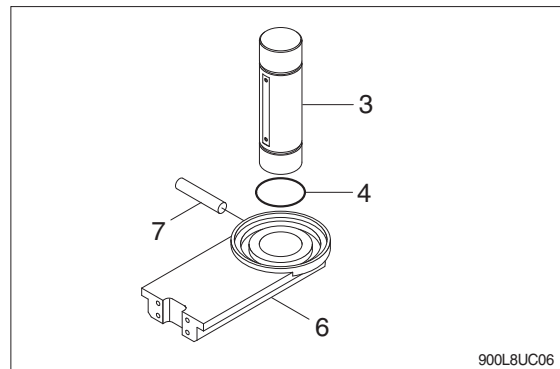
(3) Assembly

- ※ Before assembly, clean the parts.
- ※ Coat the sliding surfaces of all parts with oil.

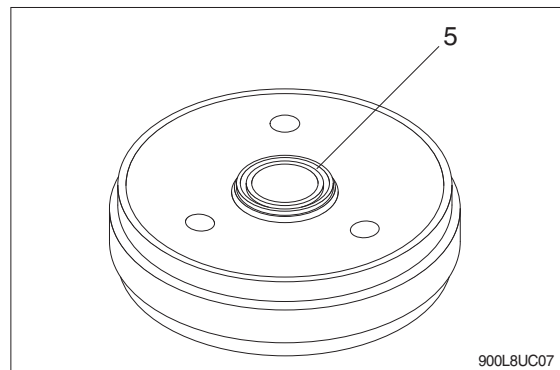
- ① Cool up bushing (2) fully by some dry ice and press it into shell (1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.



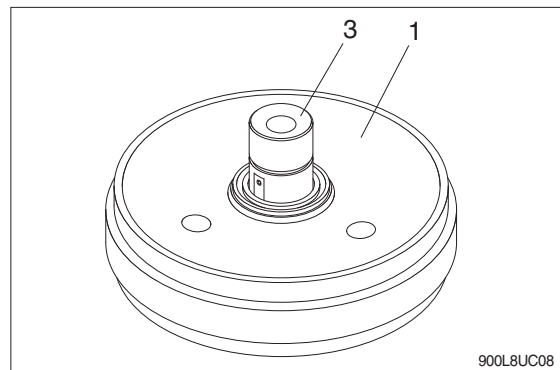
- ② Coat O-ring (4) with grease thinly, and install it to shaft (2).
- ③ Insert shaft (2) into bracket (6) and drive in the taper pin (7).



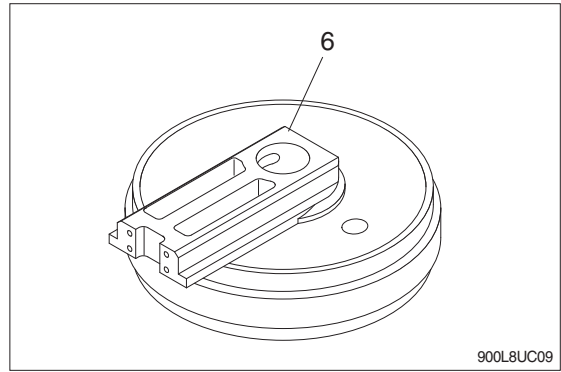
- ④ Install seal (5) to shell (1) and bracket (5).



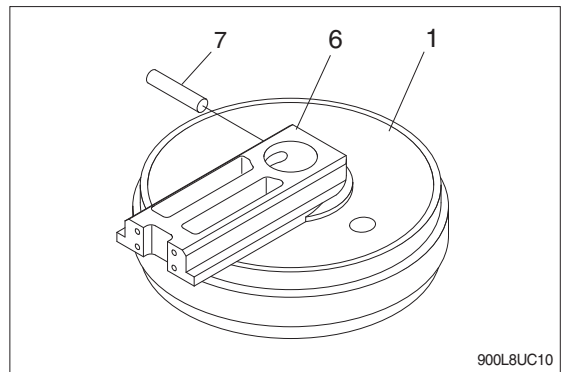
- ⑤ Install shaft (3) to shell (1).



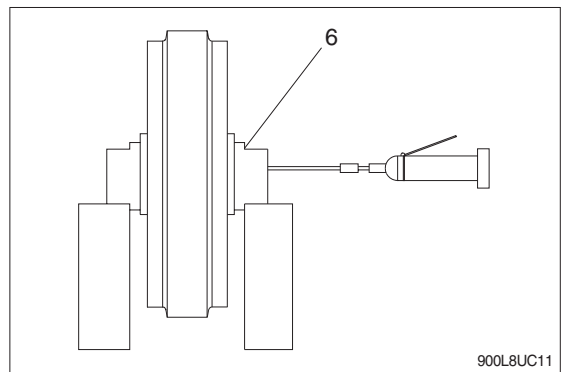
⑥ Install bracket (6) attached with seal (5).



⑦ Knock in the pin (7) with a hammer.

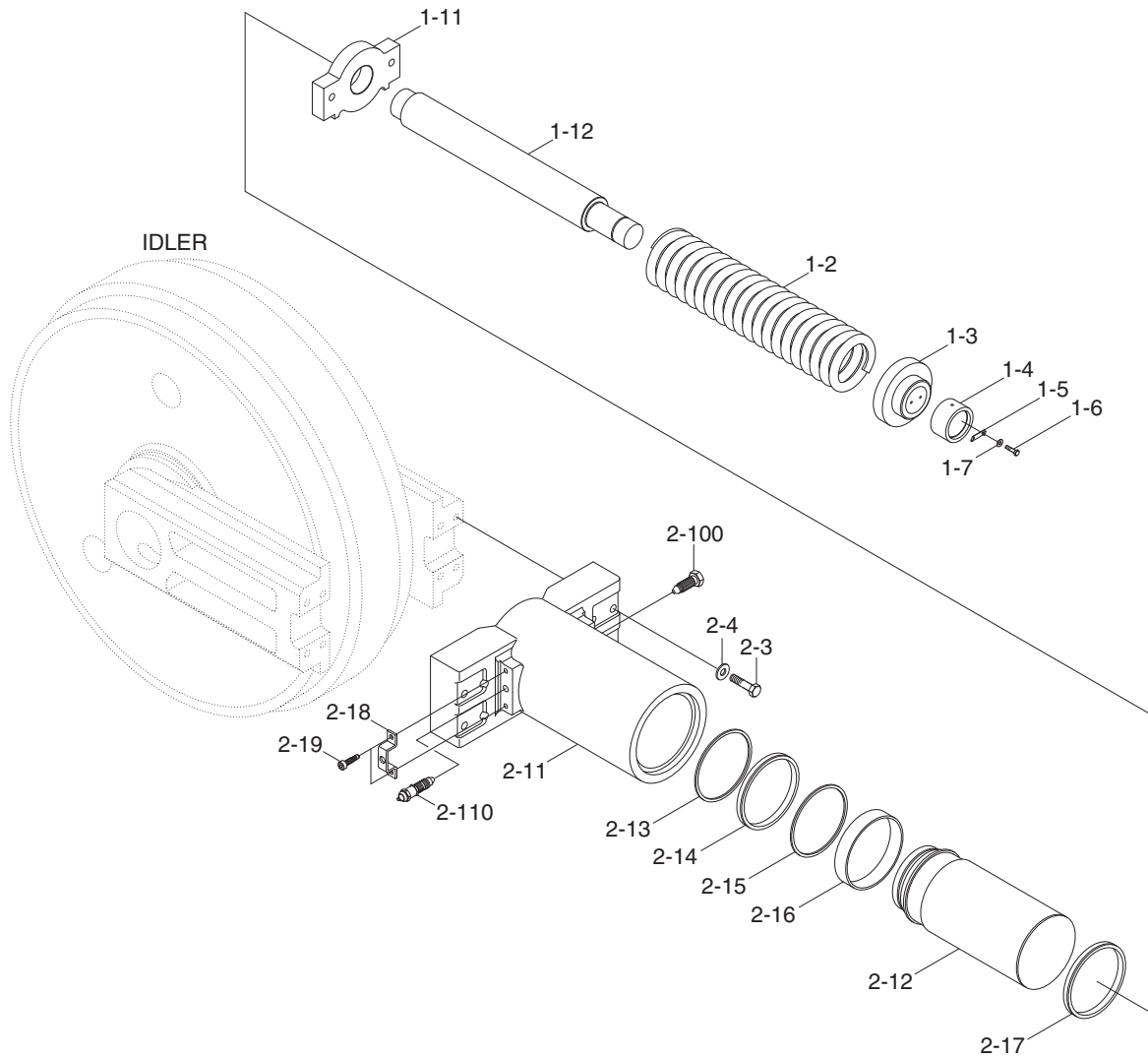


⑧ Lay bracket (6) on its side.
Supply engine oil to the specified level,
and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



80098UC12

1	T/Cylinder assembly	1-6	Bolt	2-16	Guide ring
1-1	Main rod assembly	1-7	Spring washer	2-17	Dust seal (wiper)
1-11	Front flange	2	Tension body assembly	2-18	Locking plate
1-12	Rod	2-11	Cylinder body	2-19	Socket bolt
1-2	Spring	2-12	Piston rod	2-100	Plug bolt
1-3	Rear flange	2-13	Lock ring	2-110	Grease valve
1-4	Locking ring	2-14	Seal (U-packing)	2-3	Hex bolt
1-5	Locking plate	2-15	Back up ring	2-4	Hardened washer

(2) Disassembly

① Apply pressure on spring (1-2) with a press.

※ The spring is under a large installed load. This is dangerous, so be sure to set properly.

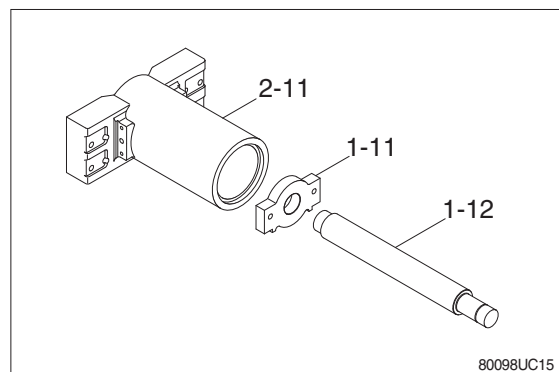
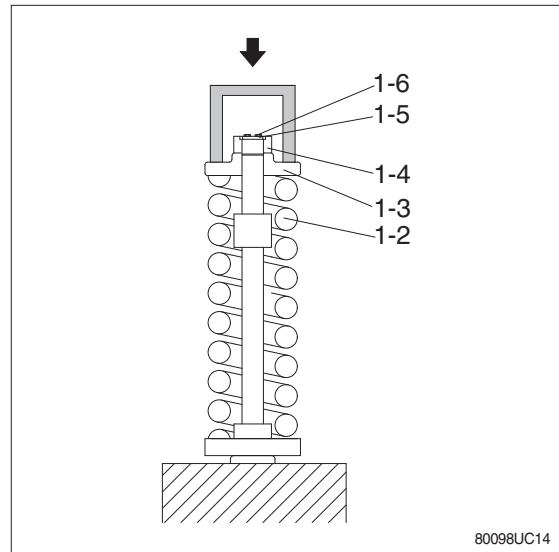
· Spring set load : 49986 kg (110200 lb)

② Remove bolt (1-6), locking plate (1-5) and locking ring (1-4).

③ Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.

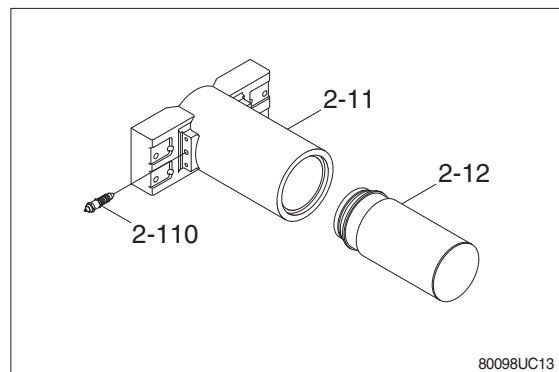
④ Lighten the press load slowly and remove rear flange (1-3) and spring (1-2).

⑤ Remove rod (1-12) and front flange (1-11) from body (2-11).

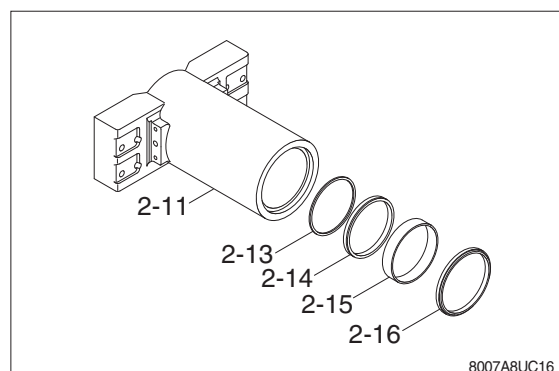


⑥ Remove grease valve (2-110) from body (2-11).

⑦ Remove rod (2-12) from body (2-11).



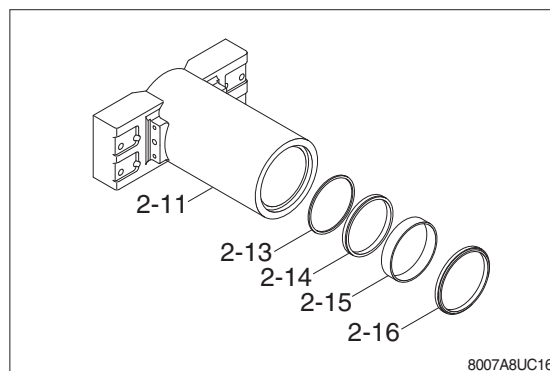
⑧ Remove guide ring (2-16), back up ring (2-15), packing seal (2-14) and lock ring (2-13).



(3) Assembly

① Install lock ring (2-13), packing seal (2-14), back up ring (2-15) and guide ring (2-16).

※ When installing packing seal (2-14) take full care so as not to damage the lip.



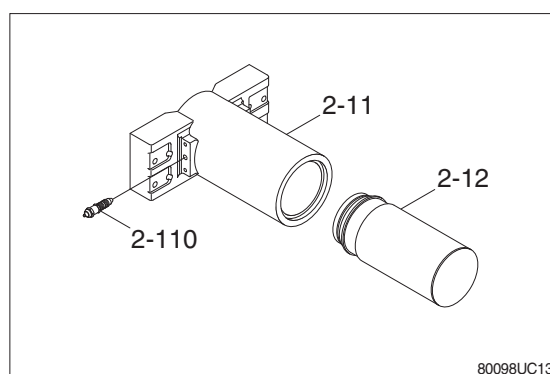
② Pour grease into body (2-11), then push in rod (2-12) by hand.

After take grease out of grease valve mounting hole, let air out.

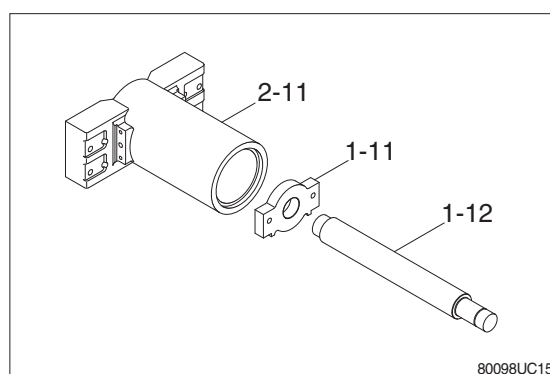
※ If air letting is not sufficient, it may be difficult to adjust the tension of crawler.

③ Fit grease valve (2-110) to body (2-11).

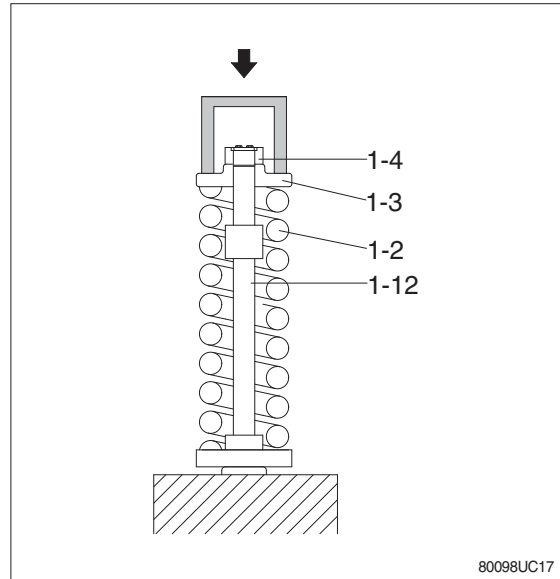
· Tightening torque : 7.0 ± 1.0 kgf · m
(50.6 ± 7.2 lbf · ft)



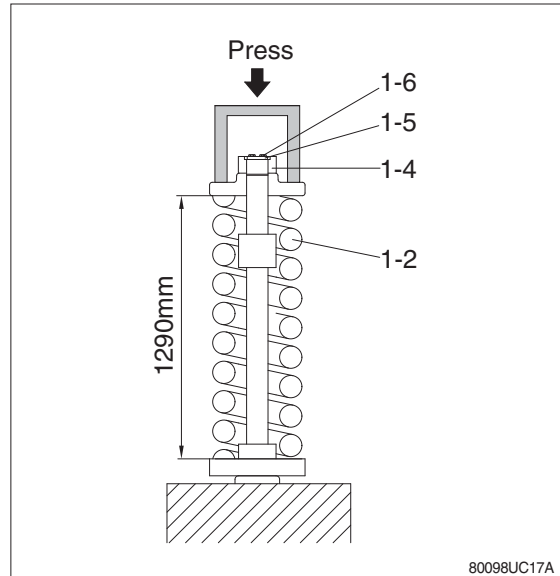
④ Install rod (1-12) and front flange (1-11) to body (2-11).



- ⑤ Install spring (1-2) and rear flange (1-3) to rod (1-12).
- ⑥ Apply pressure to spring (1-2) with a press and tighten locking ring (1-4).
- ※ Apply sealant before assembling.
- ※ During the operation, pay attention specially to prevent the press from slipping out.

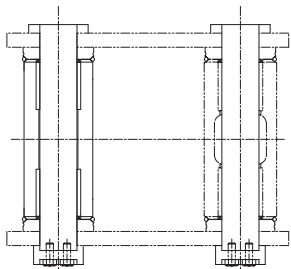
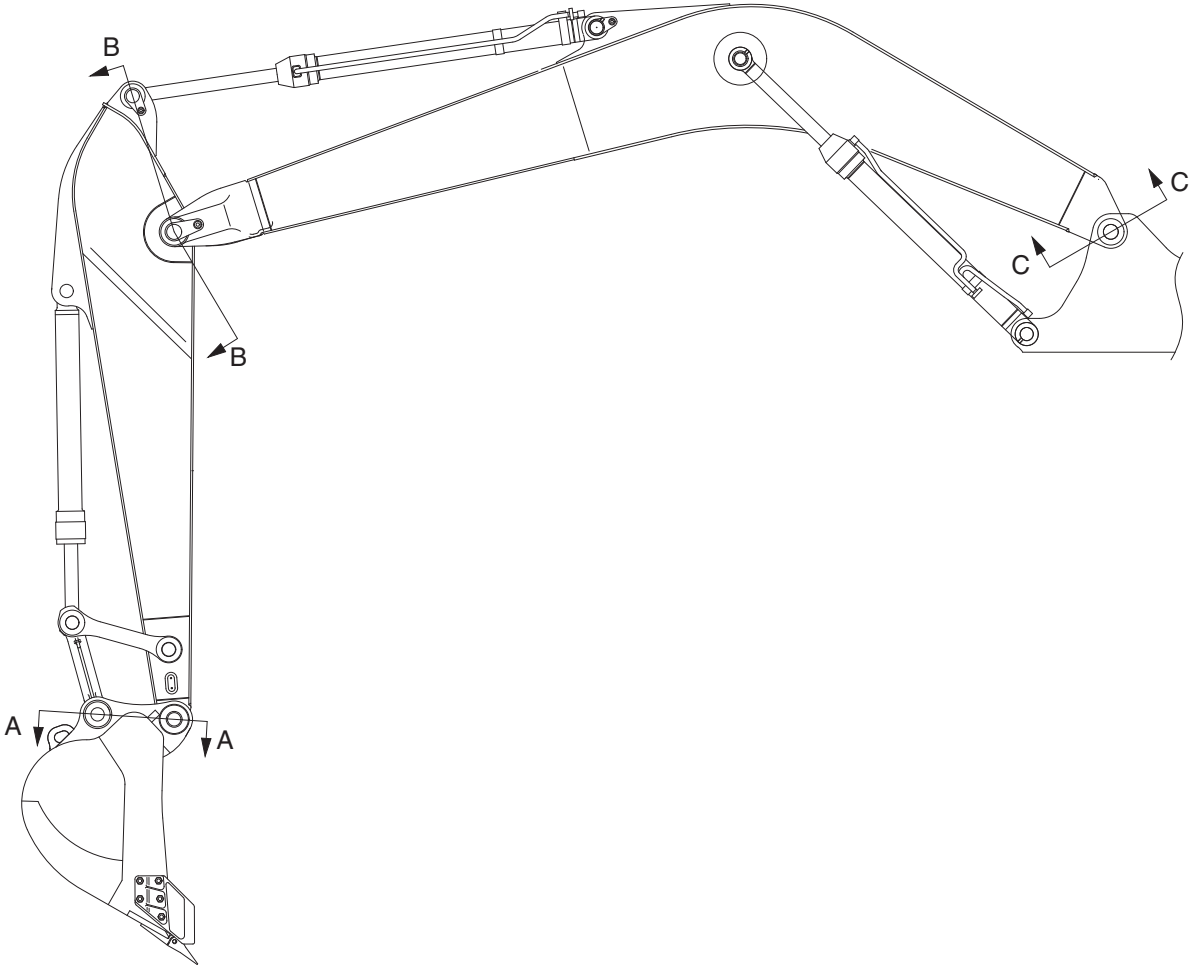


- ⑦ Lighten the press load and confirm the set length of spring (1-2).
- ⑧ After the setting of spring (1-2), install locking ring (1-4), locking plate (1-5) and bolt (1-6).

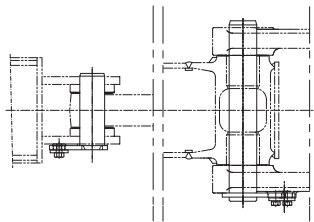


GROUP 11 WORK EQUIPMENT

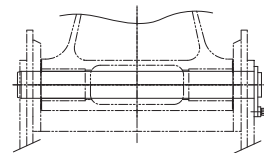
1. STRUCTURE



SECTION A



SECTION B



SECTION C

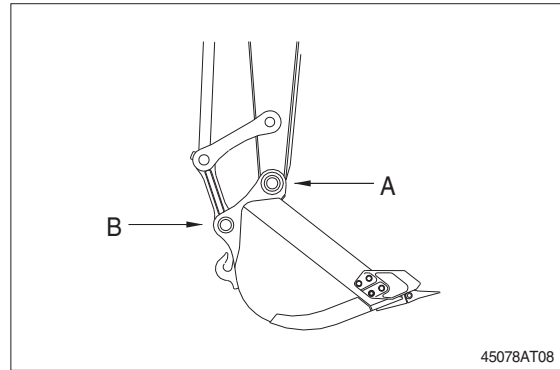
8007A8WE01

2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

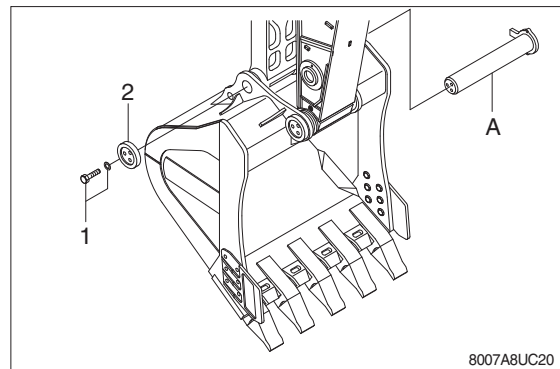
(1) Removal

- ① Lower the work equipment completely to ground with back of bucket facing down.



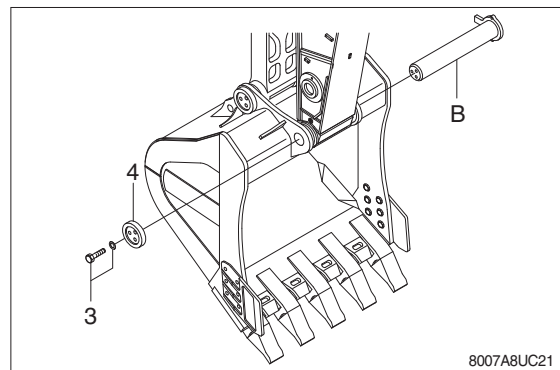
- ② Remove bolt (1), stopper (2) and draw out the pin (A).

- Tightening torque : $100 \pm 15 \text{ kgf} \cdot \text{m}$
($723 \pm 109 \text{ lbf} \cdot \text{ft}$)



- ③ Remove bolt (3), stopper (4) and draw out the pin (B).

- Tightening torque : $100 \pm 15 \text{ kgf} \cdot \text{m}$
($723 \pm 109 \text{ lbf} \cdot \text{ft}$)

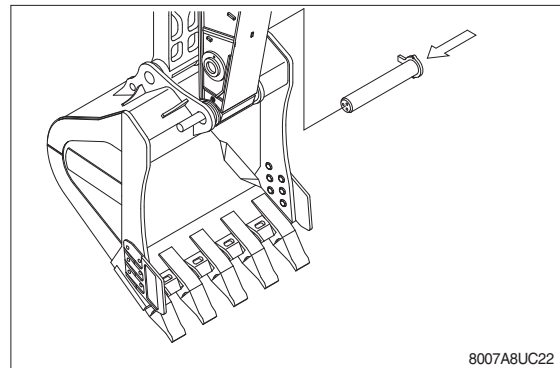


(2) Install

- ① Carry out installation in the reverse order to removal.

▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.

- ※ Adjust the bucket clearance.
For detail, see **operation manual**.



2) ARM ASSEMBLY

(1) Removal

- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

- ① Remove bucket assembly.
For details, see **removal of bucket assembly.**

- ② Disconnect bucket cylinder hoses (1) and put plugs (5) on cylinder pipes.

▲ Fit blind plugs in the piping at the chassis end securely to prevent oil from spurting out when the engine is started.

- ③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

- ※ Tie the rod with wire to prevent it from coming out.

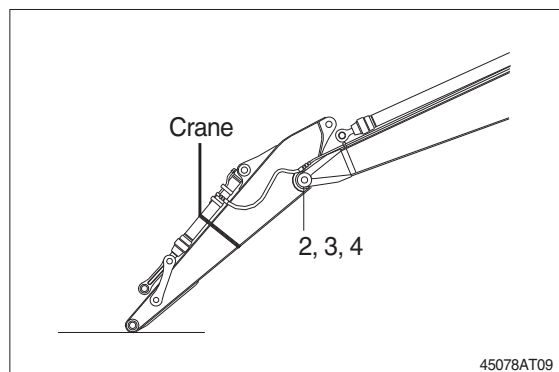
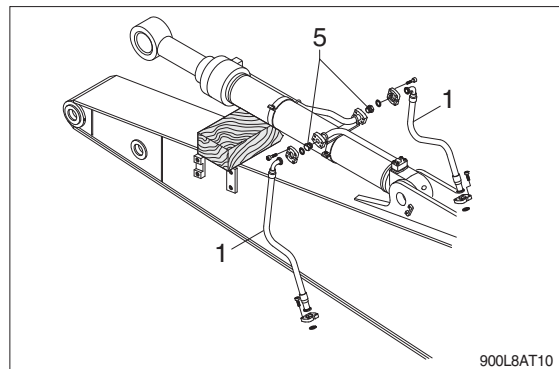
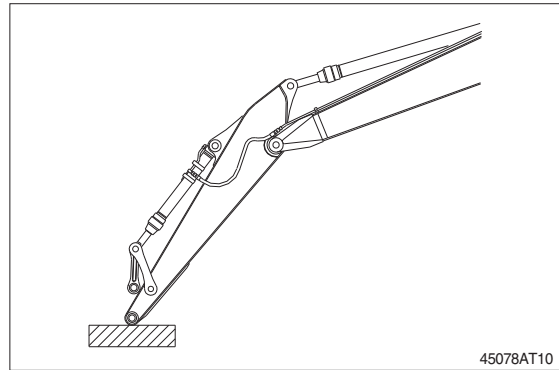
- ④ For details, see **removal of arm cylinder assembly.**

Place a wooden block under the cylinder and bring the cylinder down to it.

- ⑤ Remove bolt (2), plate (3) and pull out the pin (4) then remove the arm assembly.

- Weight : 4950 kg (10910 lb)
- Tightening torque (2) : $29.7 \pm 45 \text{ kgf} \cdot \text{m}$
($215 \pm 32.5 \text{ lbf} \cdot \text{ft}$)

- ※ When lifting the arm assembly, always lift the center of gravity.



(2) Install

- ① Carry out installation in the reverse order to removal.

▲ When lifting the arm assembly, always lift the center of gravity.

- ※ Bleed the air from the cylinder.

