

## SECTION 8 DISASSEMBLY AND ASSEMBLY

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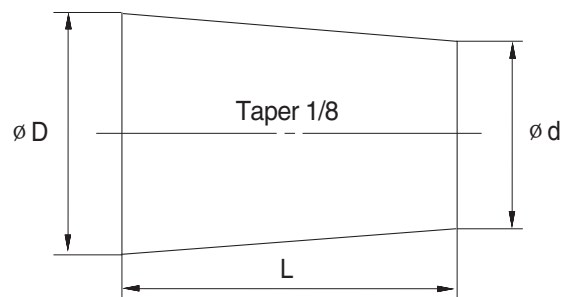
# SECTION 8 DISASSEMBLY AND ASSEMBLY

## 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, nut (FR)	M22 × 2.5	70 ± 7.0	506 ± 51.3
2		Engine mounting bolt, nut (RR)	M24 × 3.0	100 ± 10	723 ± 72.3
3		Gear box mounting bolt	M12 × 1.75	12.3 ± 1.0	89 ± 7.2
4		Radiator mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
5		Oil cooler mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
6		Coupling mounting socket bolt	M10 × 1.5	27.0 ± 3.0	195 ± 21.7
7		Fan pump mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
8	Hydraulic system	Main pump mounting socket bolt	M20 × 2.5	57.9 ± 8.7	419 ± 63
9		Main control valve 1 mounting bolt	M20 × 2.5	42.6 ± 4.2	308 ± 30.3
10		Main control valve 2 mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
11		Fuel tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
12		Hydraulic oil tank mounting bolt	M20 × 2.5	58 ± 6.0	420 ± 43.4
13		Turning joint mounting bolt, nut	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
14	Power train system	Swing motor mounting bolt	M24 × 3.0	100 ± 15	723 ± 108
15		Swing bearing upper part mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
16		Swing bearing lower part mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
17		Travel motor mounting bolt	M30 × 3.5	150 ± 10	1085 ± 72.3
18		Sprocket mounting bolt	M30 × 3.5	199 ± 10	1439 ± 72.3
19	Under carriage	Carrier roller mounting bolt, nut	M20 × 2.5	57.9 ± 8.7	419 ± 63
20		Track roller mounting bolt	M27 × 3.0	140 ± 7.0	1013 ± 50.6
21		Track tension cylinder mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
22		Track shoe mounting bolt, nut	M24 × 1.5	240 ± 2.0	1736 ± 145
23		Track guard mounting bolt	M27 × 3.0	140 ± 7.0	1013 ± 50.6
24	Others	Counterweight mounting bolt	M42 × 3.0	390 ± 40	2821 ± 289
25		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
26		Operator's seat mounting bolt	M 8 × 1.25	4.05 ± 0.8	29.3 ± 5.8

※ For tightening torque of engine and hydraulic components, see engine maintenance guide and service manual.

## 2. TORQUE CHART

Use following table for unspecified torque.

### 1) BOLT AND NUT

#### (1) Coarse thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.73 ~ 4.12	19.7 ~ 29.8
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 79.5	9.8 ~ 15.8	71 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 167
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.5	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 343
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	350 ~ 457	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.5	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1655
M36 × 4.0	174 ~ 236	1261 ~ 1703	250 ~ 310	1808 ~ 2242

#### (2) Fine thread

Bolt size	8T		10T	
	kg · m	lb · ft	kg · m	lb · ft
M 8 × 1.0	2.17 ~ 3.37	15.7 ~ 24.3	3.04 ~ 4.44	22.0 ~ 32.0
M10 × 1.25	4.46 ~ 6.66	32.3 ~ 48.2	5.93 ~ 8.93	42.9 ~ 64.6
M12 × 1.25	7.78 ~ 11.58	76.3 ~ 83.7	10.6 ~ 16.0	76.6 ~ 115
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 130	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 194	26.6 ~ 36.0	193 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 390	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 515	70.7 ~ 95.7	512 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 664	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1338	182 ~ 248	1314 ~ 1795
M36 × 3.0	192 ~ 260	1389 ~ 1879	262 ~ 354	1893 ~ 2561

## 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	130.2
1"	41	21	151.9
1-1/4"	50	35	253.2

## 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	130.2
1-7/16-12	41	21	151.9
1-11/16-12	50	35	253.2

## 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	130.2
1"	41	21	151.9
1-1/4"	50	35	253.2

## 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 : 670 l

(4) Remove the wirings for the pressure sensors and so on.

(5) Remove socket bolts (1) and disconnect hose (3).

(6) Disconnect pilot line hoses (5, 6, 7, 8).

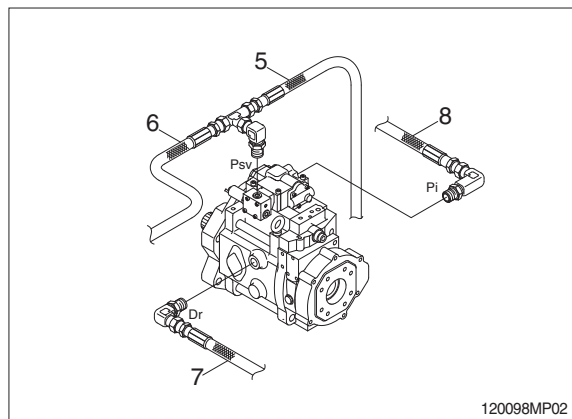
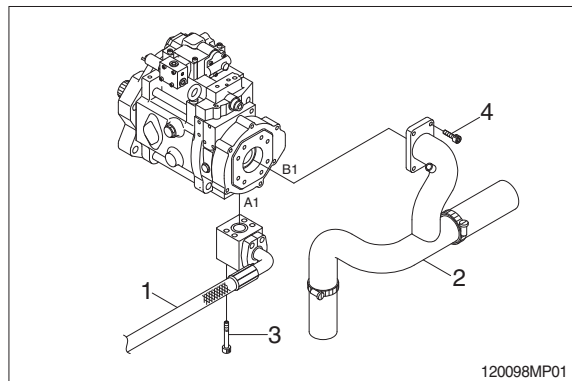
(7) Remove bolts (4) and disconnect pump suction tube (2).

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

(8) Sling the pump assembly and remove the pump mounting bolts.

· Weight : 160 kg × 3 (360 lb × 3)

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



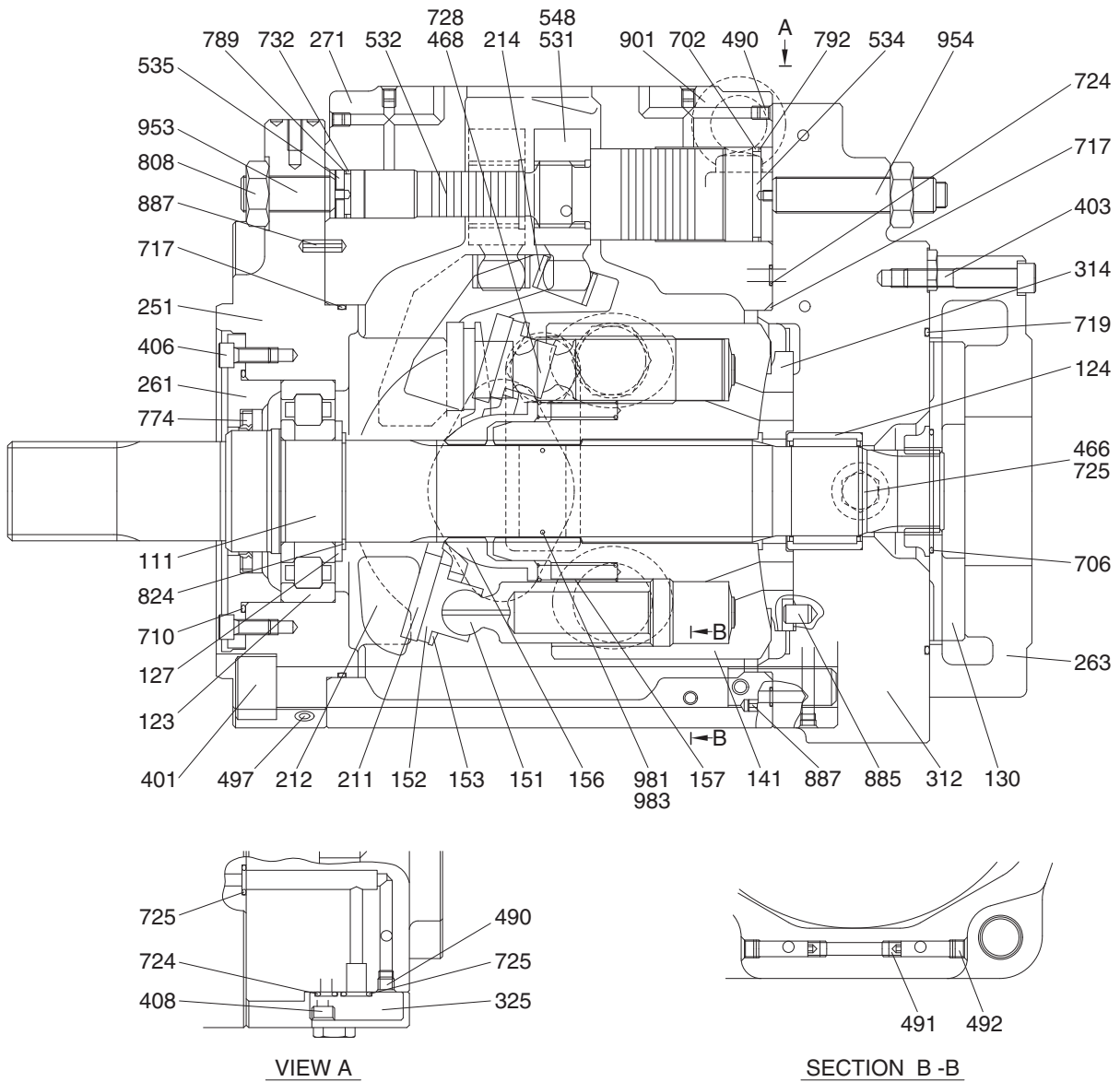


## 2) INSTALL

- (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



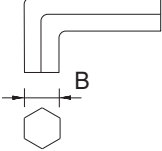

111 Drive shaft	261 Front cover	492 Plug	728 O-ring
113 Roller bearing	263 Booster cover	497 Plug	732 O-ring
114 Needle bearing	271 Pump casing	531 Tilting pin	774 Oil seal
123 Spacer	312 Valve cover	532 Servo piston	789 Back up ring
130 Booster	314 Valve plate (F)	534 Stopper (L)	792 Back up ring
141 Cylinder block	325 Cover	535 Stopper (S)	808 Nut
151 Piston	401 Screw	548 Feed back pin	824 Snap ring
152 Shoe	403 Hexagon screw	702 O-ring	885 Pin
153 Set plate	406 Hexagon screw	706 O-ring	887 Spring pin
156 Bushing	408 Screw	710 O-ring	901 Eye bolt
157 Cylinder spring	466 Plug	717 O-ring	953 Set screw
211 Shoe plate	468 Plug	719 O-ring	954 Set screw
212 Swash plate	490 Plug	724 O-ring	981 Name plate
214 Steel bearing	491 Restrictor	725 O-ring	983 Pin
251 Support			

120092MP02

## 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
	10	M12	BP-1/2	PO-1/2	M20
	17	M20, M22	BP-1	PO-1	-
	22	M30	-	-	-
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	
	30	M20	M20	-	
	36	-	-	VP-3/4	
	46	M30	-	-	
Adjustable angle wrench	Medium size 1 set, Small size 1 set				
Screw driver	Flat-blade 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	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
	M22	45.0	325	0.67	17
PT plug (material : S45C) ※ Wind a seal tape 1.5 to 2 turns round the plug	PT 1/16	1.1	8.0	0.16	4
	PT 1/ 8	1.2	8.7	0.20	5
	PT 1/ 4	2.2	16	0.24	6
VP plug (material : SS400)	PF 1/ 4	3.7	26.8	0.75	19
	PF 3/ 8	7.5	54.2	0.87	22
	PF 1/ 2	11.2	81.0	1.06	27
	PF 3/ 4	17.3	125.0	1.42	36
ROH plug ※ PF 3/8 or less : S45C More than PF 1/2 : SCM435	PF 1/ 4	3.7	26.8	0.75	19
	PF 3/ 8	7.5	54.2	0.87	22
	PF 1/ 2	11.2	81.0	1.06	27
	PF 3/ 4	17.3	125.0	1.42	36

### 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 drain oil from pump casing (271).
- (4) Remove hexagon socket head bolts (412, 413) and remove regulator.

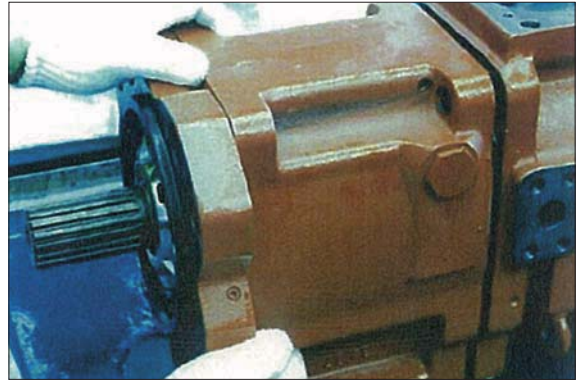


120098MP04

- (5) Remove hexagon socket head bolts (403) which tighten booster cover (263), valve cover (L, 312) and remove booster (130).
- (6) Loosen hexagon socket head bolts (401) which tighten swash plate support (251), pump casing (271) and valve cover (L, 312).
  - ※ **Do not remove hexagon socket head bolts (401).**

- (7) Place pump horizontally on workbench with its regulator-fitting surface down, and remove hexagon socket bolts (401).
- ※ **Before bringing regulator fitting surface down, spread rubber sheet on workbench without fail to prevent this surface from being damaged.**

- (8) Separate pump casing (271) from valve cover (L) (312).



120098MP05

- (9) Pull out cylinder block (141), piston subassembly (011), set plate (153), spherical bush (158) and cylinder springs (157) simultaneously from pump casing (271) straightly over drive shaft (111).
- ※ **Take care not to damage silding surfaces of cylinder block (141), spherical bush (156), shoes (152), swash plate (212), etc.**
  - ※ **Take care not to damage drive shaft (111).**



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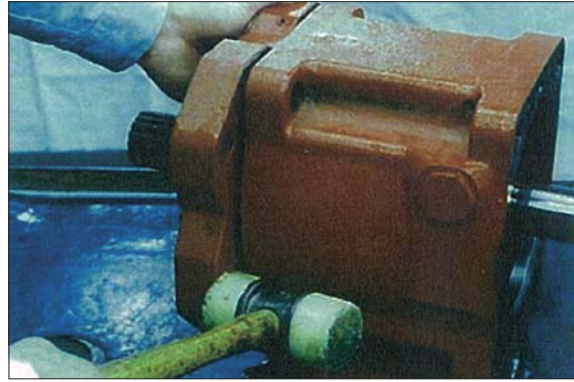
- (10) Remove hexagon socket head bolts (406) and then remove front cover (261).
- ※ **Front cover can be easily removed by screwing M8 bolts into threads on the front cover.**
  - ※ **Since oil seal is fitted on front cover (261), take care not to damage it at removing the cover.**
  - ※ **Remove dust of the input spline part and prevent it from adhering to oil seal.**



120098MP07



(11) Tap the mounting flange portion of the swash plate support (251) lightly from the pump casing side, and separate the swash plate support and the pump casing.



120098MP08

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



120098MP09

(13) Tapping shaft end of drive shaft (111) lightly with plastic hammer, remove it from the swash plate support (251).



120098MP10

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

※ These may be removed in work 8.



120098MP11

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

※ **When removing tilting pin, use a protector to prevent pin head from being damaged.**

※ **Since adhesive (No. 1305N of threebond make) is applied to fitting areas of tilting pin (531) and servo piston (532), take care not to damage servo piston (532).**

※ **Do not remove needle bearing (124) unless it is considered to be out of its life span.**

※ **Do not loosen hexagon nuts of valve cover (312) and swash plate support (251).**

**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.

(2) Attach the swash plate support (251) by tapping it lightly with plastic hammer to the pump casing (271).

※ In case the servo piston, tilting pin, stopper (L), and stopper (S) have been removed, attach them to the pump casing in advance.

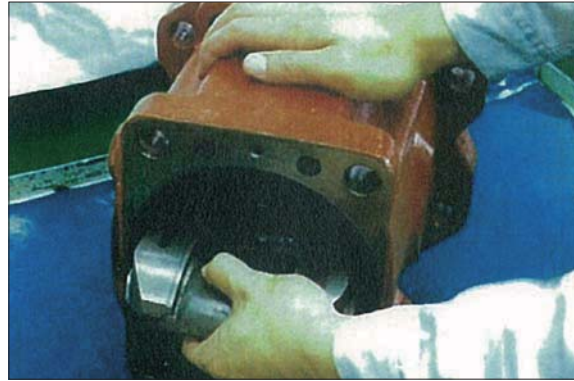
※ In the tightening work of the servo piston and the tilting pin, use the tool not to damage the head of the tilting pin and the feed back pin. Besides, apply adhesive (No. 1305N of threebond make) to the thread portion.



120098MP12

(3) Attach the shoe plate (211) to the swash plate (212). Place the pump casing with its regulator-mounting face directed downward, attach the tilting bush of the swash plate to the tilting pin (531), and properly attach the swash plate and shoe plate of the swash plate support (251).

- ※ **Confirm with fingers of both hands that swash plate can be moved smoothly.**
- ※ **Apply grease to sliding sections of swash plate (212) and swash plate support (251), and drive shaft (111) can be fitted easily.**
- ※ **Take care not to damage shoe plate (211) surface.**



120098MP13

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

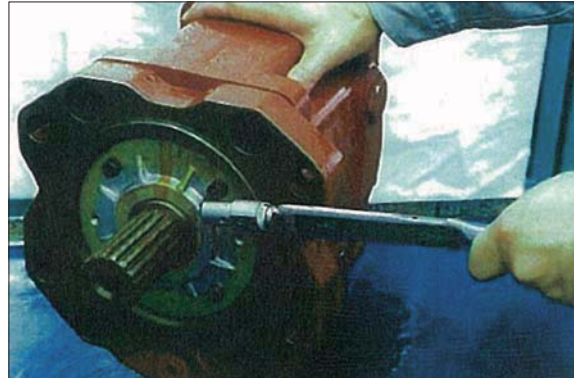
- ※ **Do not tap drive shaft (111) with hammer or so on.**
- ※ **Tapping outer race of bearing lightly with plastic hammer, etc. Fit them fully, using steel care not to damage it.**



120098MP14

(5) Assemble front cover (F, 261) to swash plate support (251) and fix it with hexagon socket head bolts (406).

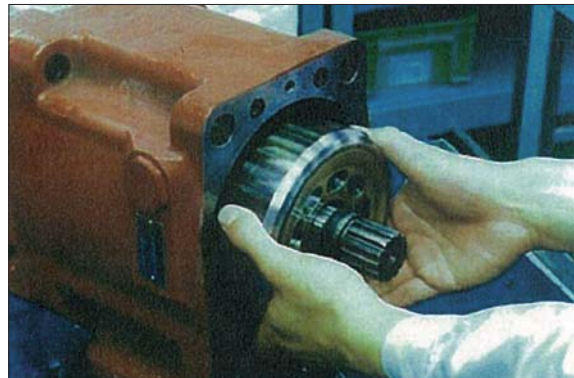
- ※ **Apply grease lightly to oil seal in front cover (261).**
- ※ **Assemble front cover with great care not to damage the oil seal.**



120098MP15

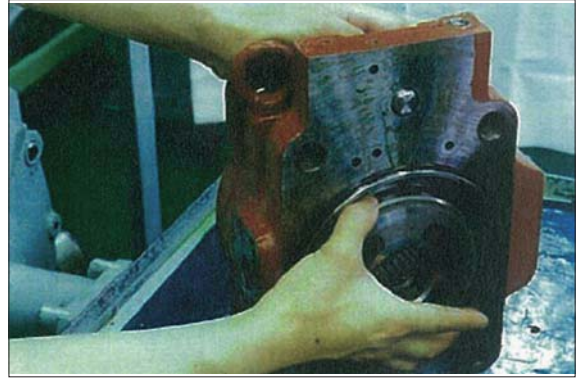
(6) Insert the piston cylinder subassembly (cylinder block (141), piston sub-assembly (011), set plate (153), spherical bushing (156) and cylinder spring (157)) into pump casing (271) with phasing splines on cylinder, spherical bush (156) and drive shaft (111).

- ※ **Take care not to damage drive shaft (111).**
- ※ **Confirm that swash plate has not come off.**



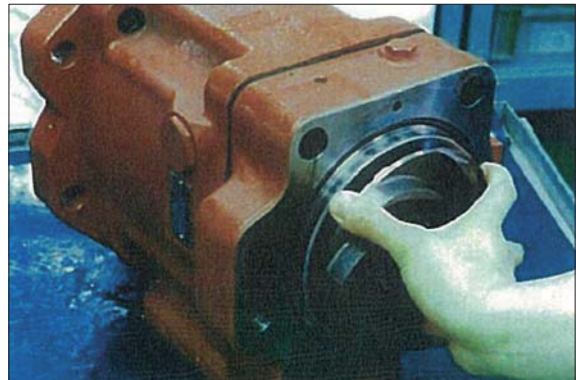
120098MP16

- (7) Fit valve plate (L, 314) to valve cover (L, 312), locating pin (885) into pin hole.  
\* **Take care not to mistake suction / delivery directions of valve plate (314).**



120098MP17

- (8) Fit valve block (312) to pump casing (271) with hexagon socket head bolts (401).  
\* **Before bringing regulator fitting surface down, spread rubber sheet on workbench without fail to prevent this surface from being damaged.**  
\* **Take care not to damage needle bearing (124).**



120098MP18

- (9) Assemble booster (130) to drive shaft (111) and fit booster cover (263) with hexagon socket head bolts (403).  
\* **Take care not to mistake direction of booster.**

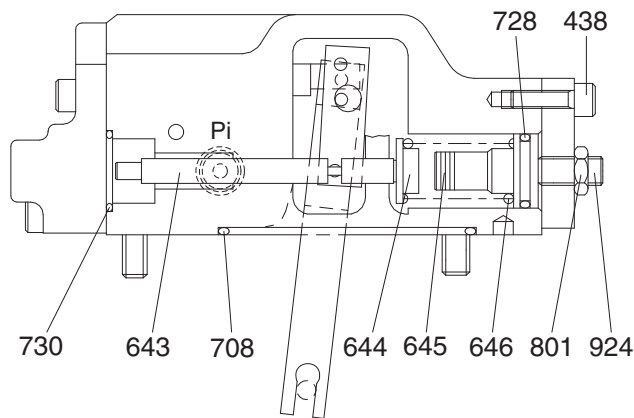
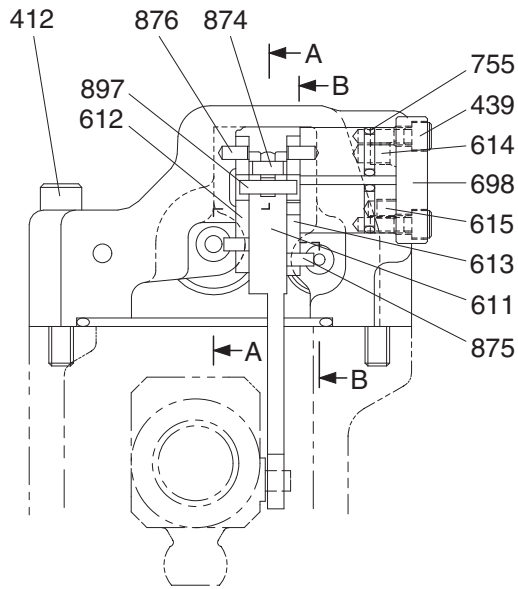
- (10) Putting feedback lever of regulator into feedback pin (548) of tilting pin (531), fit regulator with hexagon socket head bolts.



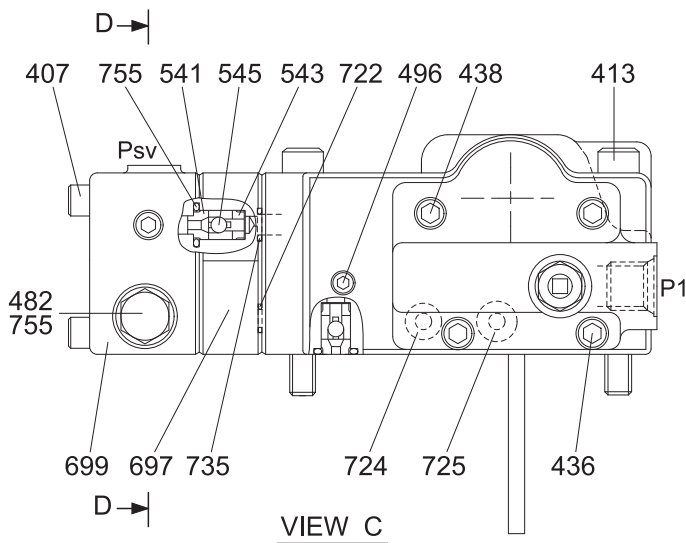
120098MP19

- (11) Fit drain port plug (468) to pump casing (271).  
This is the end of reassembling procedure.

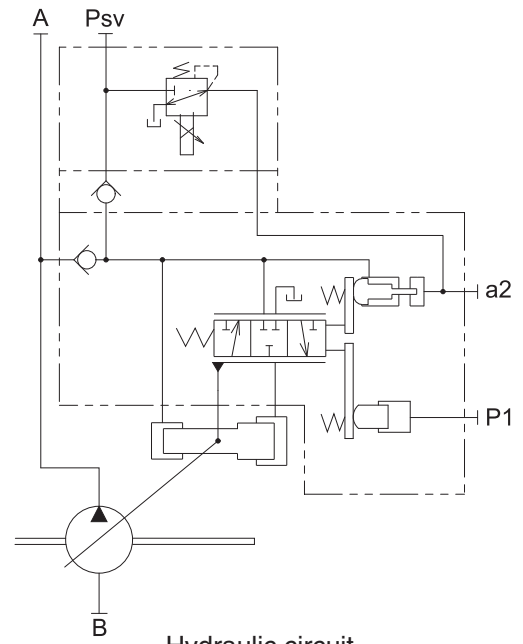
## 5) REGULATOR (1/2)



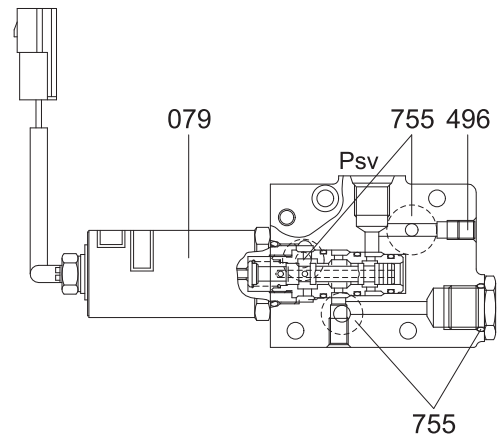
SECTION B-B



VIEW C



Hydraulic circuit



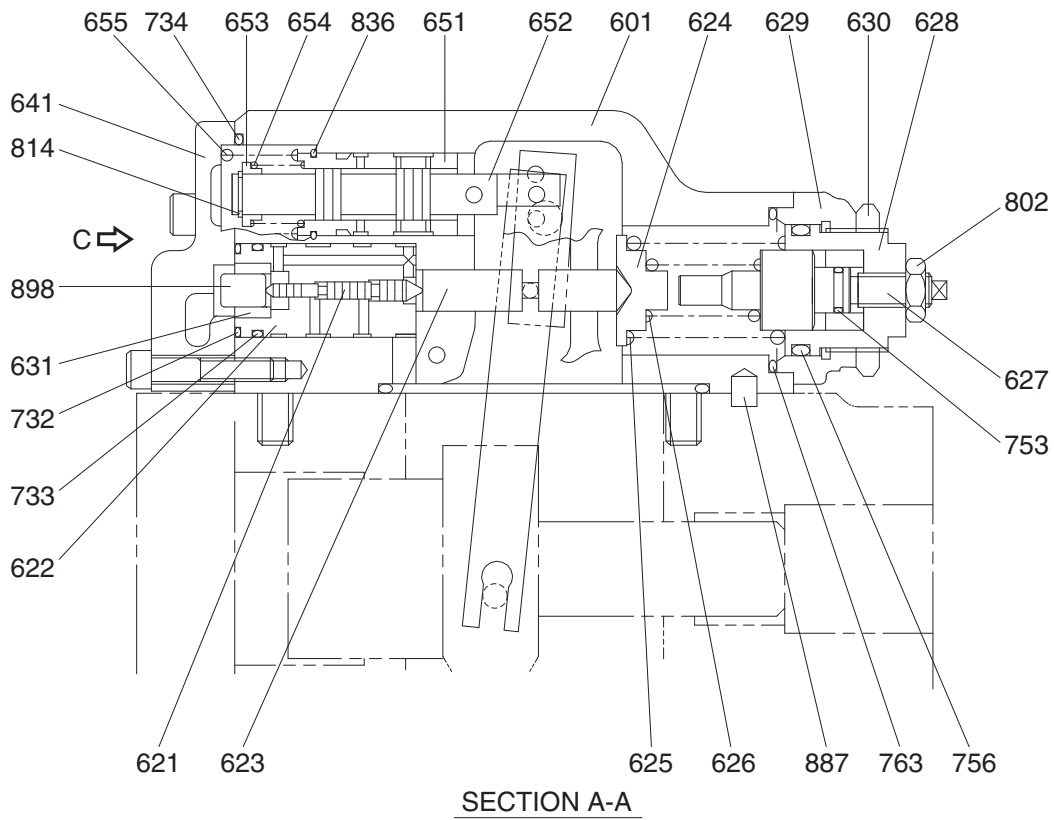
SECTION D-D

Port	Port name	Port size
P1	Pilot port	PF 1/4 - 15
Psv	Servo assist port	PF 1/4 - 13
a2	Sensor port	PF 1/4 - 13

120092RG01



REGULATOR(2/2)



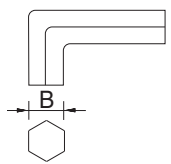

120092RG02

079	EPPR valve	626	Inner spring	725	O-ring
407	Hexagon socket screw	627	Adjust stem (C)	728	O-ring
412	Hexagon socket screw	628	Adjust screw (C)	730	O-ring
413	Hexagon socket screw	629	Cover (C)	732	O-ring
436	Hexagon socket screw	630	Lock nut	733	O-ring
438	Hexagon socket screw	631	Sleeve	734	O-ring
439	Hexagon socket screw	641	Pilot cover	735	O-ring
466	Plug	643	Pilot piston	753	O-ring
496	Plug	644	Spring seat (Q)	755	O-ring
541	Seat	645	Adjust stem (Q)	756	O-ring
543	Stopper	646	Pilot spring	763	O-ring
545	Steel ball	651	Sleeve	801	Nut
601	Casing	652	Spool	802	Nut
611	Feed back lever	653	Spring seat	814	Snap ring
612	Lever (1)	654	Return spring	836	Snap ring
613	Lever (2)	655	Set spring	874	Pin
614	Center plug	697	Plate	875	Pin
615	Adjust plug	698	Cover	876	Pin
621	Compensator piston	699	Casing	887	Pin
622	Piston case	708	O-ring	897	Pin
623	Compensator rod	722	O-ring	898	Pin
624	Spring seat (C)	724	O-ring	924	Set screw
625	Valve casing				

## 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	BP1/ 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 36 mm				
Screw driver	Minus type screw driver, Medium size, 2 sets				
Hammer	Plastic hammer, 1 set				
Pliers	For snap ring, TSR-160				
Steel bar	4x100 mm				
Torque wrench	Capable of tightening with the specified torques				
Pincers	-				
Bolt	M4, Length : 50 mm				

## (2) Tightening torque

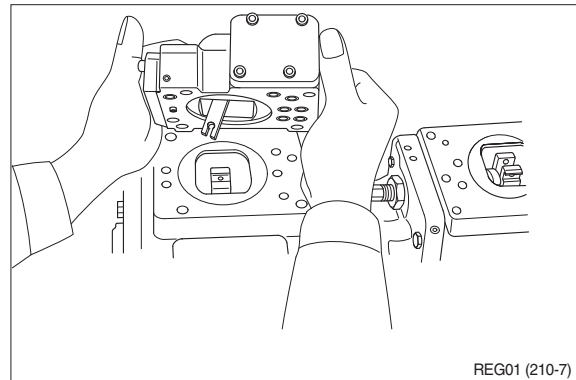
Part name	Bolt size	Torque		Wrench size	
		kgf · m	lbf · ft	in	mm
Hexagon socket head bolt (Material : SCM435)	M 5	0.7	5.1	0.16	4
	M 6	1.2	8.7	0.20	5
	M 8	3.0	21.7	0.24	6
	M10	5.8	42.0	0.31	8
	M12	10.0	72.3	0.39	10
	M14	16.0	116	0.47	12
	M16	24.0	174	0.55	14
	M18	34.0	246	0.55	14
	M20	44.0	318	0.67	17
PT Plut (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 Plut (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

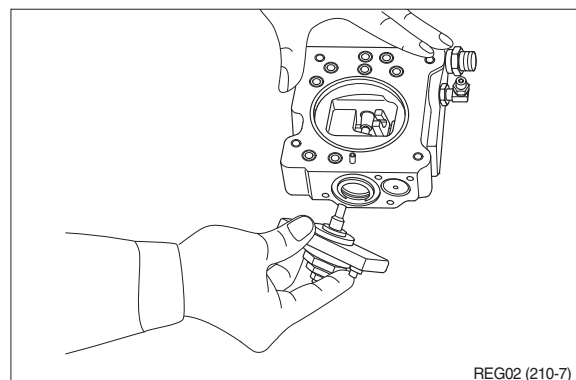
Since the regulator consists of small precision finished parts, disassembly and assembly are rather complicated.

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), 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.**

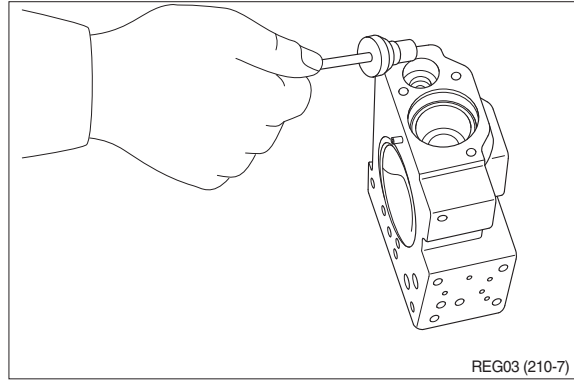




(5) After removing cover (C, 629) subassembly, take out outer spring (625), inner spring (626) and spring seat (C, 624) from compensating section.

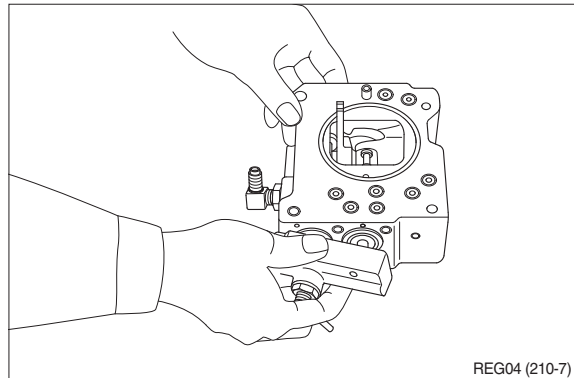
Then draw out adjusting ring (Q, 645), pilot spring (646) and spring seat (644) from pilot section.

※ **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.

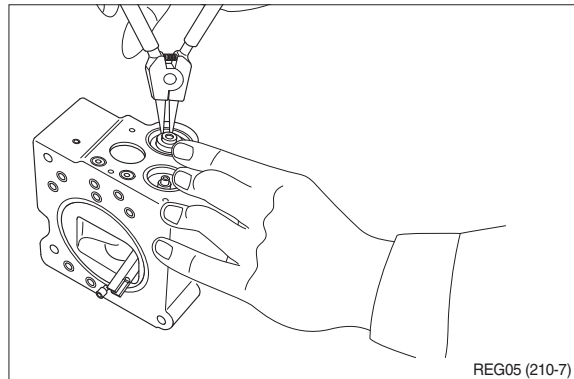


(7) Remove snap ring (814) and take out spring seat (653), return spring (654) and sleeve (651).

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

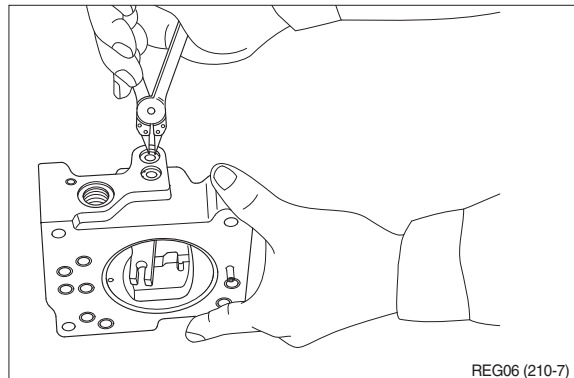
※ **When removing snap ring (814), return spring (654) may pop out.**

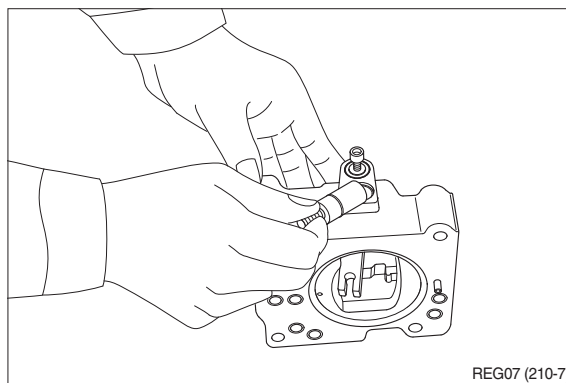
**Take care not to lose it.**



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

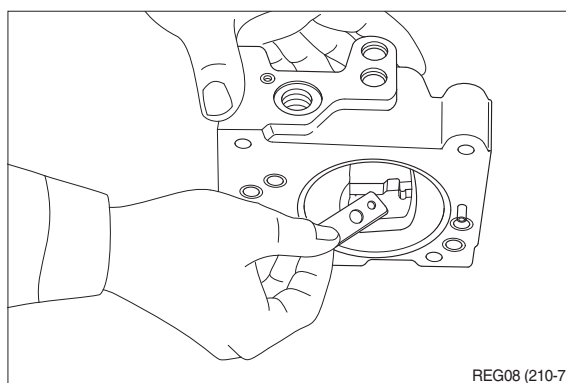
※ **Fulcrum plug (614) and adjusting plug (615) can easily be taken out with M6 bolt.**





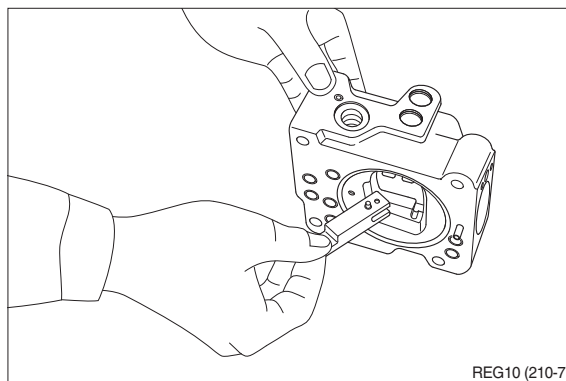
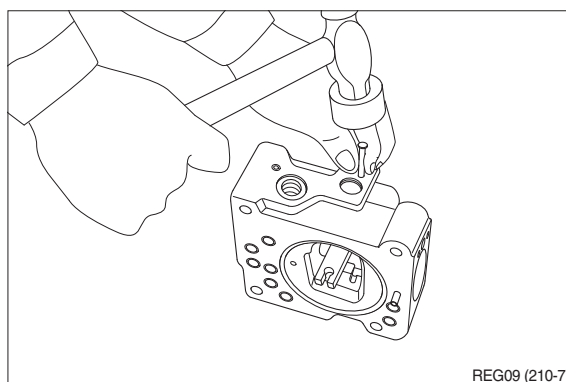
(9) Remove lever 2 (613). Do not draw out pin (875).

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



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

Push out pin (874, 4mm 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.
- ③ 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.  
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.

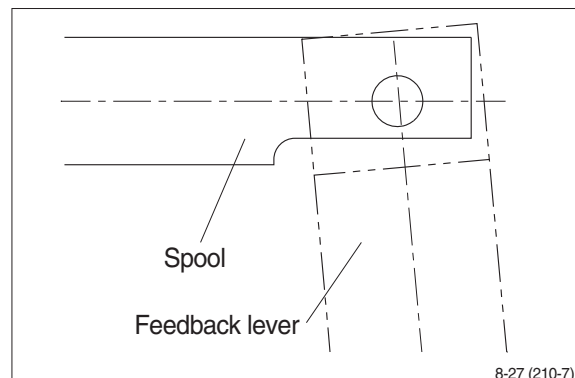
(2) Put compensating rod (623) into compensating hole of casing (601).

(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.**

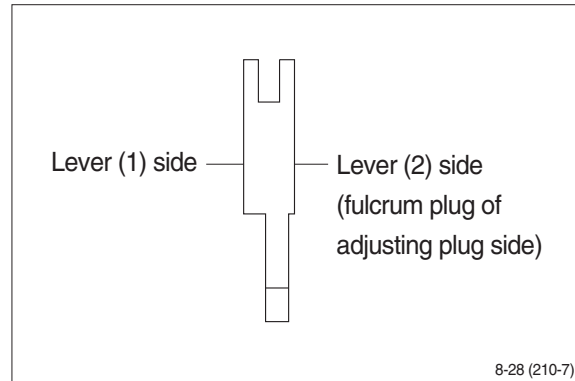
※ **Pay attention to orientation of spool.**



(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.**

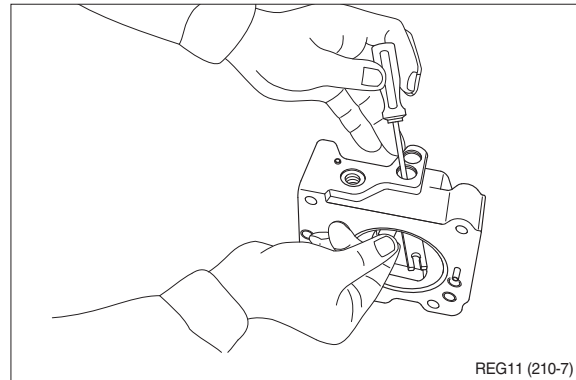
※ **Take care not to mistake direction of feedback lever.**



(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).

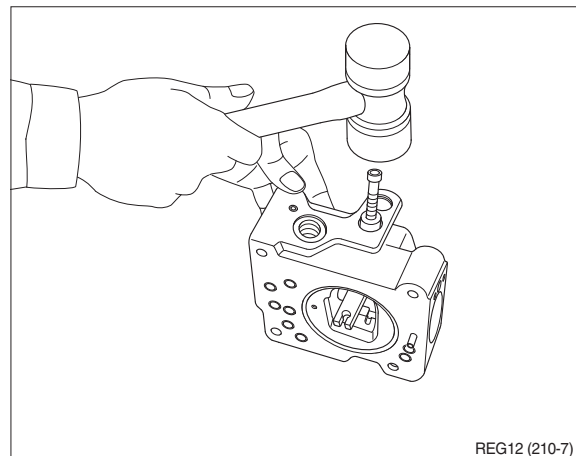


(8) Fit fulcrum plug (614) so that pin force-fitted in fulcrum plug (614) can be put into pin hole of lever 2.  
Then fix locking ring (858).

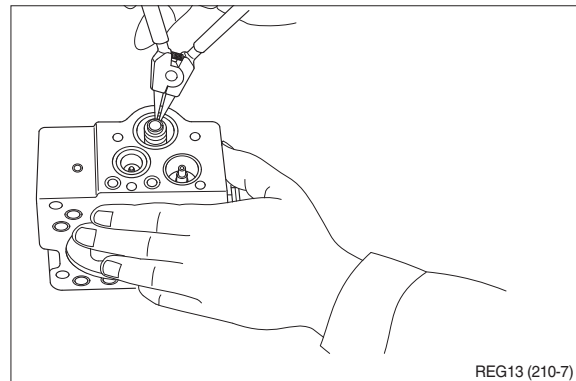
(9) Insert adjusting plug (615) and fit locking ring.

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

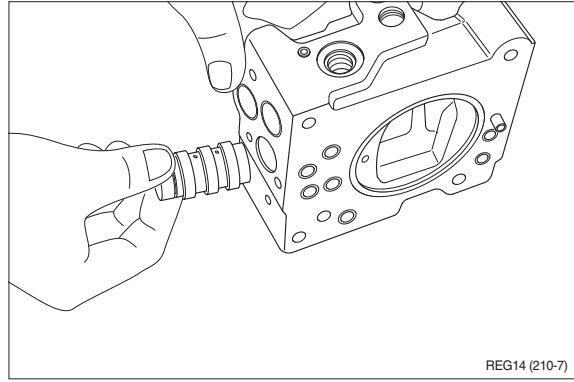
**At this point in time move feedback lever to confirm that it has no large play and is free from binding.**



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

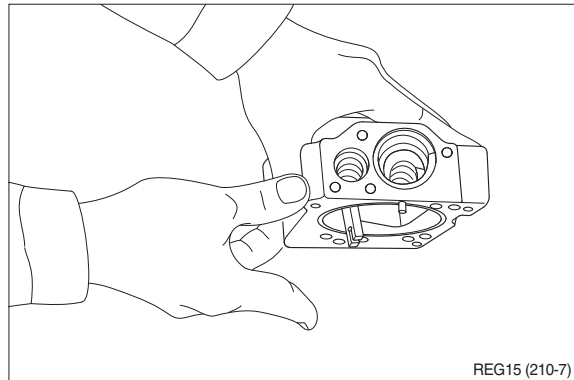


- (11) Fit set spring (655) to spool hole and put compensating piston (621) and piston case (622) into compensating hole.  
Fit pilot cover (641) and tighten it with hexagonal socket head screws (436, 438).

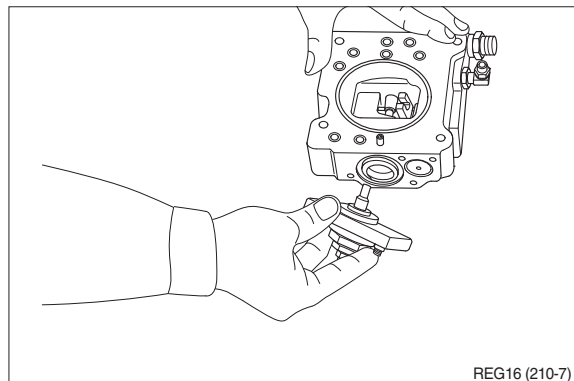


- (12) Put spring seat (644), pilot spring (646) and adjusting ring (Q, 645) into pilot hole.  
Then fix spring seat (624), inner spring (626) and outer spring (625) into compensating hole.

※ **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 (802) and adjusting screw (924).  
Then tighten them with hexagonal socket head screws (438).



This completes assembly.

## GROUP 4 MAIN CONTROL VALVE

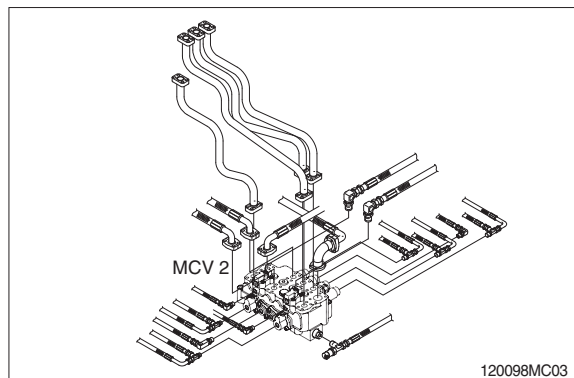
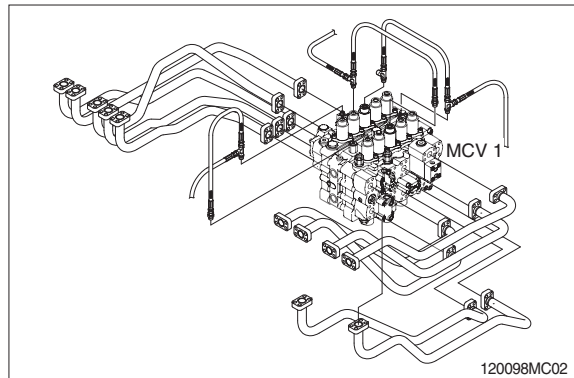
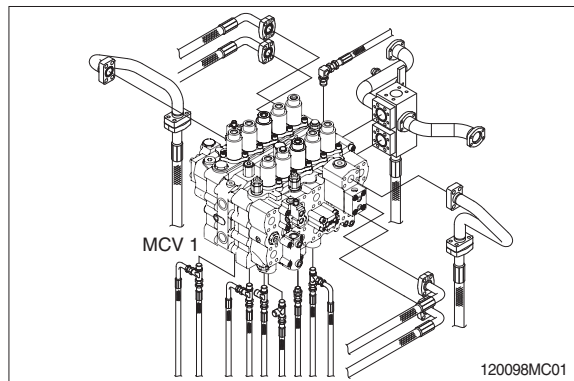
### 1. REMOVAL AND INSTALL

#### 1) REMOVAL

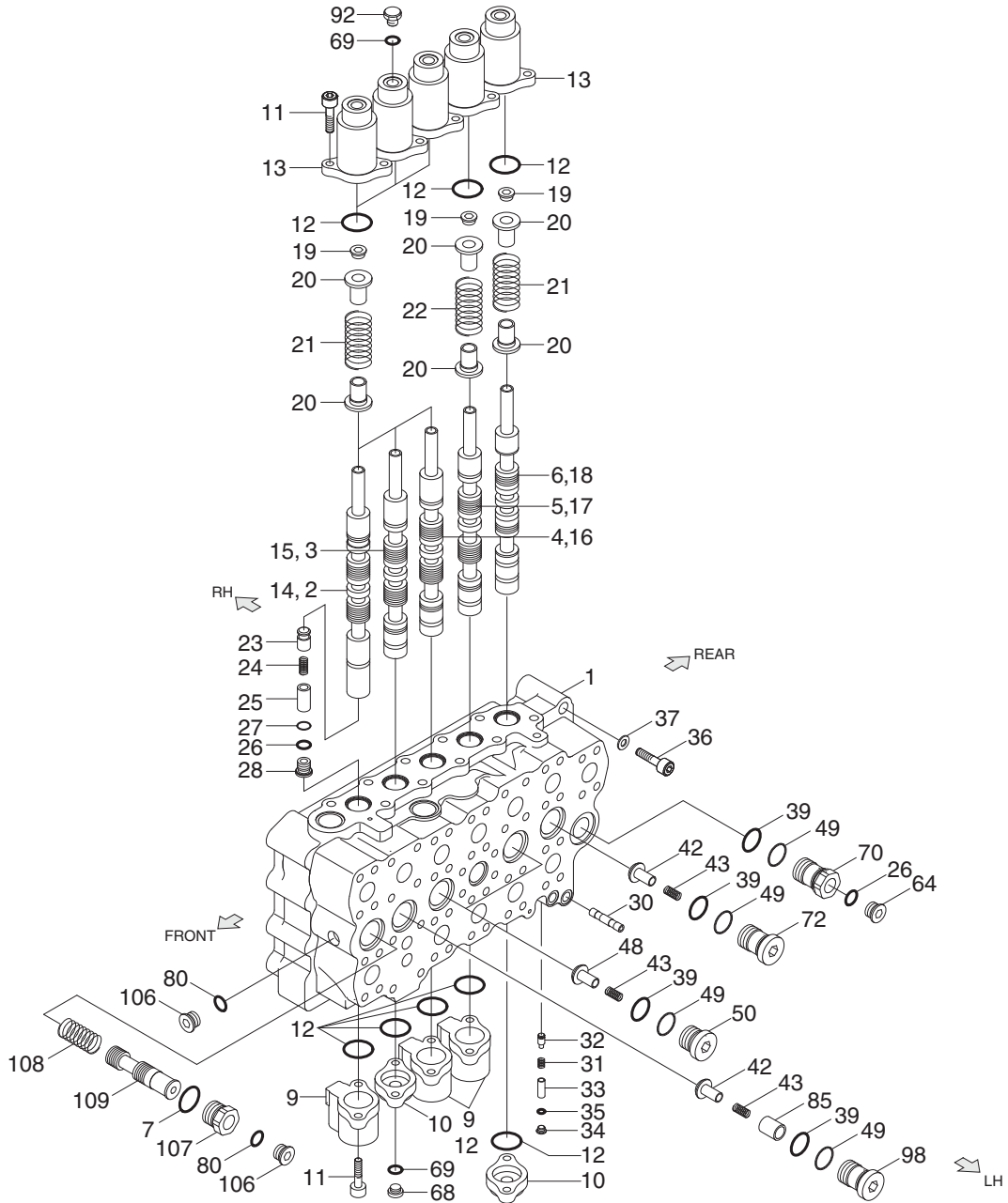
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure 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 the wirings for the pressure sensor and so on.
- (5) Remove bolts and disconnect pipe.
- (6) Disconnect pilot line hoses.
- (7) Disconnect pilot piping.
- (8) Sling the control valve assembly and remove the control valve mounting bolt.
  - MCV 1 weight : 450 kg (990 lb)
  - MCV 2 weight : 160 kg (350 lb)
- (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 (MCV 1, 1/5)

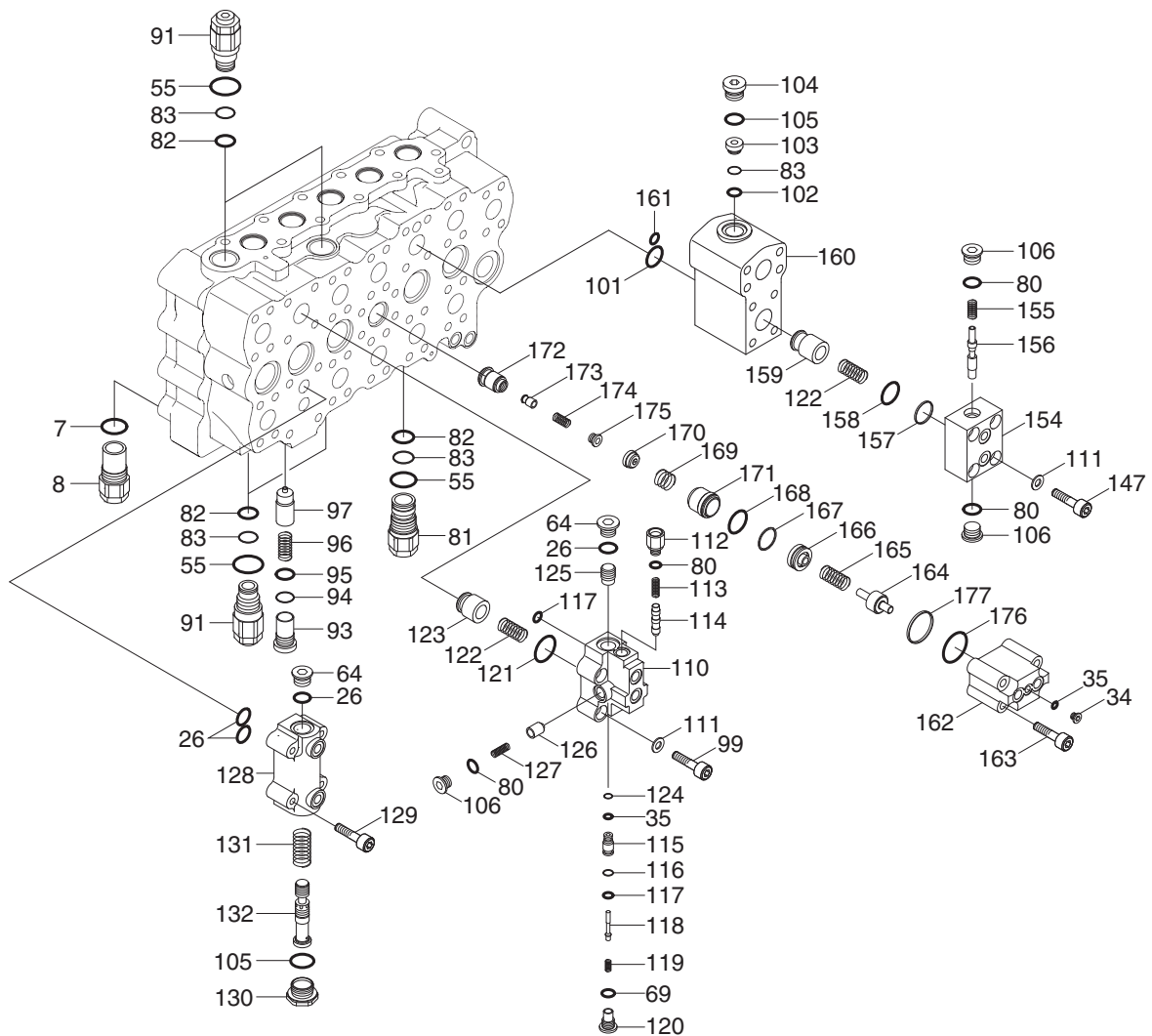


120098MC04

1	Housing	16	Plunger	31	Spring	68	Cap
2	Plunger assy	17	Plunger	32	Check	69	O-ring
3	Plunger assy	18	Plunger	33	Spacer	70	Cap
4	Plunger assy	19	Cap	34	Cap	72	Cap
5	Plunger assy	20	Spring guide	35	O-ring	80	O-ring
6	Plunger assy	21	Spring	36	Socket bolt	85	Cap
7	O-ring	22	Spring	37	Washer	92	Plug
9	Cover	23	Check	39	O-ring	98	Cap
10	Cover	24	Spring	42	Check	106	Cap
11	Socket bolt	25	Spacer	43	Spring	107	Cap
12	O-ring	26	O-ring	48	Check	108	Spring
13	Cover	27	Back up ring	49	Back up ring	109	Spool
14	Plunger	28	Cap	50	Cap		
15	Plunger	30	Orifice	64	Cap		



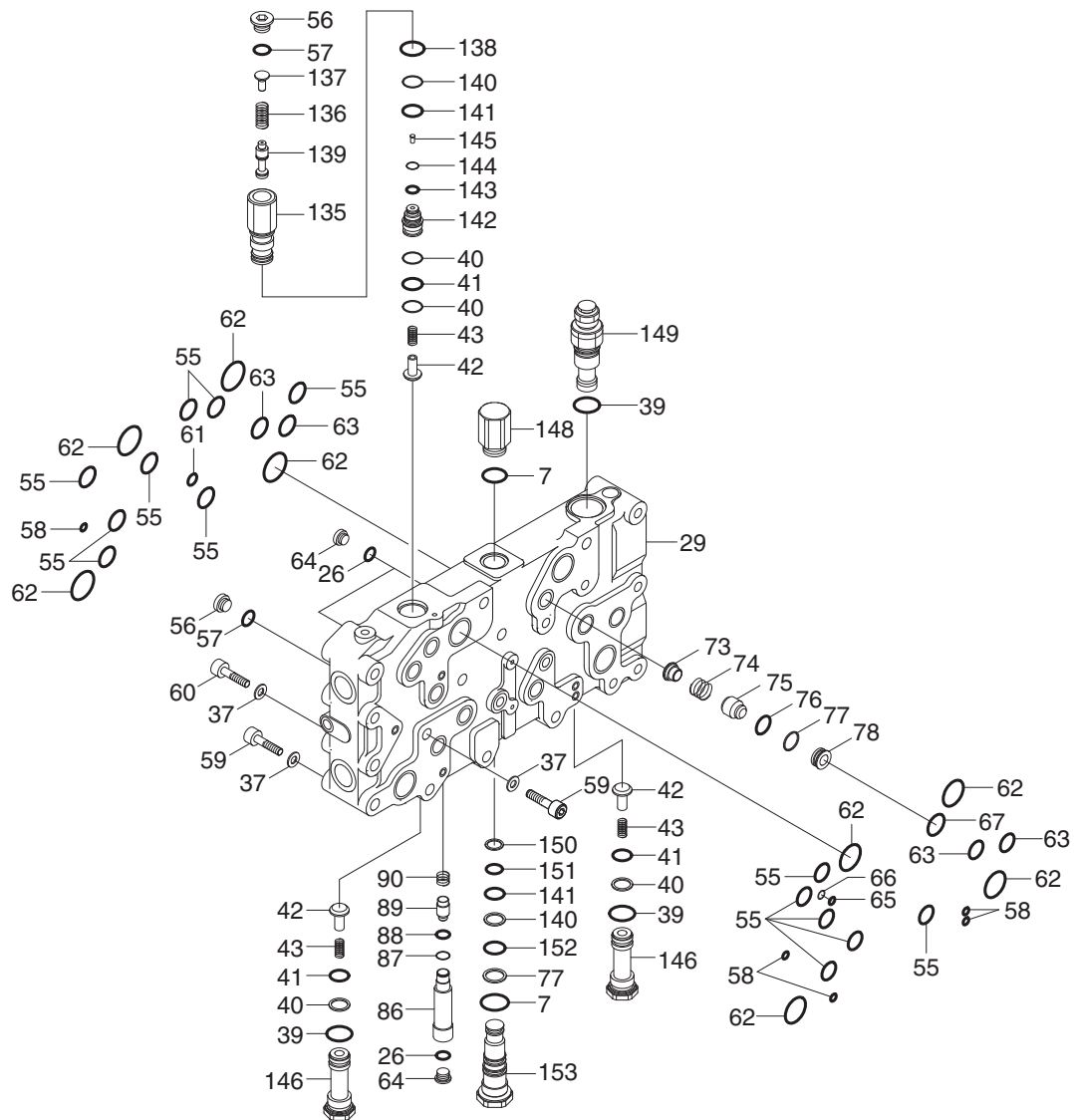
# STRUCTURE (MCV1, 2/5)



120098MC05

7	O-ring	101	O-ring	122	Spring	160	Mainfold
8	Foot relief valve assy	102	O-ring	123	Poppet	161	O-ring
26	O-ring	103	Plug	124	Back up ring	162	Cover
34	Cap	104	Cap	125	Piston	163	Socket bolt
35	O-ring	105	O-ring	126	Check	164	Pisotn
55	O-ring	106	Cap	127	Spring	165	Spring
64	Cap	110	Cover assy	128	Cover	166	Plate
69	O-ring	111	Lock washer	129	Socket bolt	167	Back up ring
80	O-ring	112	Cap	130	Cap	168	O-ring
81	Make up assy	113	Spring	131	Spring	169	Spring
82	O-ring	114	Piston	132	Spool	170	Spring guide
83	Back up ring	115	Sleeve	147	Socket bolt	171	Sleeve
91	Overload relief valve	116	Back up ring	154	Cover	172	Poppet
93	Cap	117	O-ring	155	Spring	173	Check
94	Back up ring	118	Poppet	156	Spool	174	Spring
95	O-ring	119	Spring	157	Back up ring	175	Cap
96	Spring	120	Cap	158	O-ring	176	O-ring
97	Check	121	O-ring	159	Poppet	177	Back up ring
99	Socket bolt						

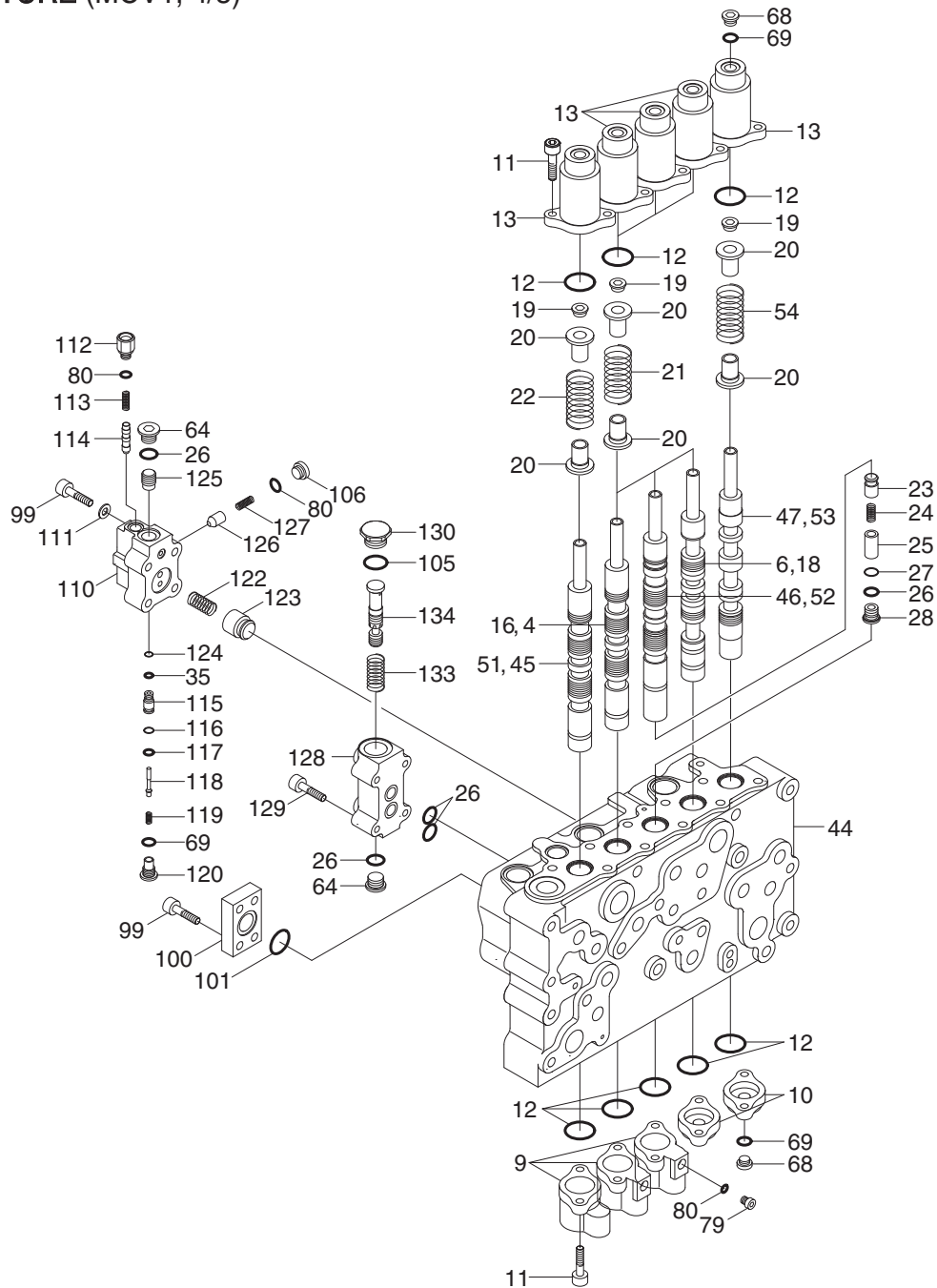
# STRUCTURE (MCV1, 3/5)



120098MC06

7	O-ring	59	Socket bolt	77	Back up ring	141	O-ring
26	O-ring	60	Socket bolt	78	Seat	142	Sleeve
29	Manifold	61	O-ring	86	Cap	143	O-ring
37	Washer	62	O-ring	87	Back up ring	144	Back up ring
39	O-ring	63	O-ring	88	O-ring	145	Pisotn
40	Back up ring	64	Cap	89	Check	146	Cap
41	O-ring	65	O-ring	90	Spring	148	Boost check valve
42	Check	66	Back up ring	135	Sleeve	149	Main relief valve assy
43	Spring	67	O-ring	136	Spring	150	Back up ring
55	O-ring	73	Spring guide	137	Spring	151	O-ring
56	Cap	74	Spring	138	O-ring	152	O-ring
57	O-ring	75	Check	139	Spool	153	Cap
58	O-ring	76	O-ring	140	Back up ring		

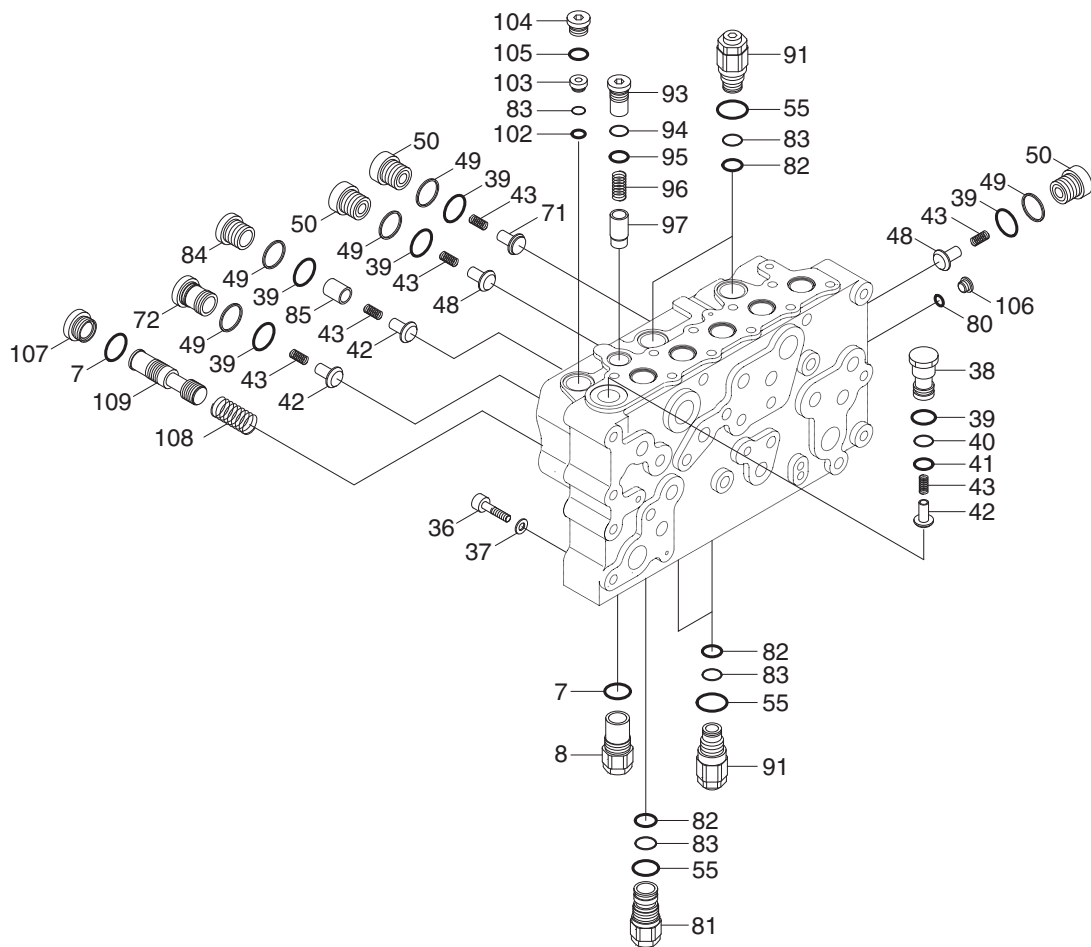
# STRUCTURE (MCV1, 4/5)



120098MC07

4	Plunger assy	25	Spacer	69	O-ring	117	O-ring
6	Plunger assy	26	O-ring	79	Plug	118	Poppet
9	Cover	27	Back up ring	80	O-ring	119	Spring
10	Cover	28	Cap	99	Socket bolt	120	Cap
11	Socket bolt	35	O-ring	100	Flange	122	Spring
12	O-ring	44	Housing	101	O-ring	123	Poppet
13	Cover	45	Plunger assy	105	O-ring	124	Back up ring
16	Plunger	46	Plunger assy	106	Cap	125	Piston
18	Plunger	47	Plunger assy	110	Cover assy	126	Check
19	Plunger cap	51	Plunger	111	Lock washer	127	Spring
20	Spring guide	52	Plunger	112	Cap	128	Cover
21	Spring	53	Plunger	113	Spring	129	Socket bolt
22	Spring	54	Spring	114	Piston	130	Cap
23	Check	64	Cap	115	Sleeve	133	Spring
24	Spring	68	Cap	116	Back up ring	134	Spool

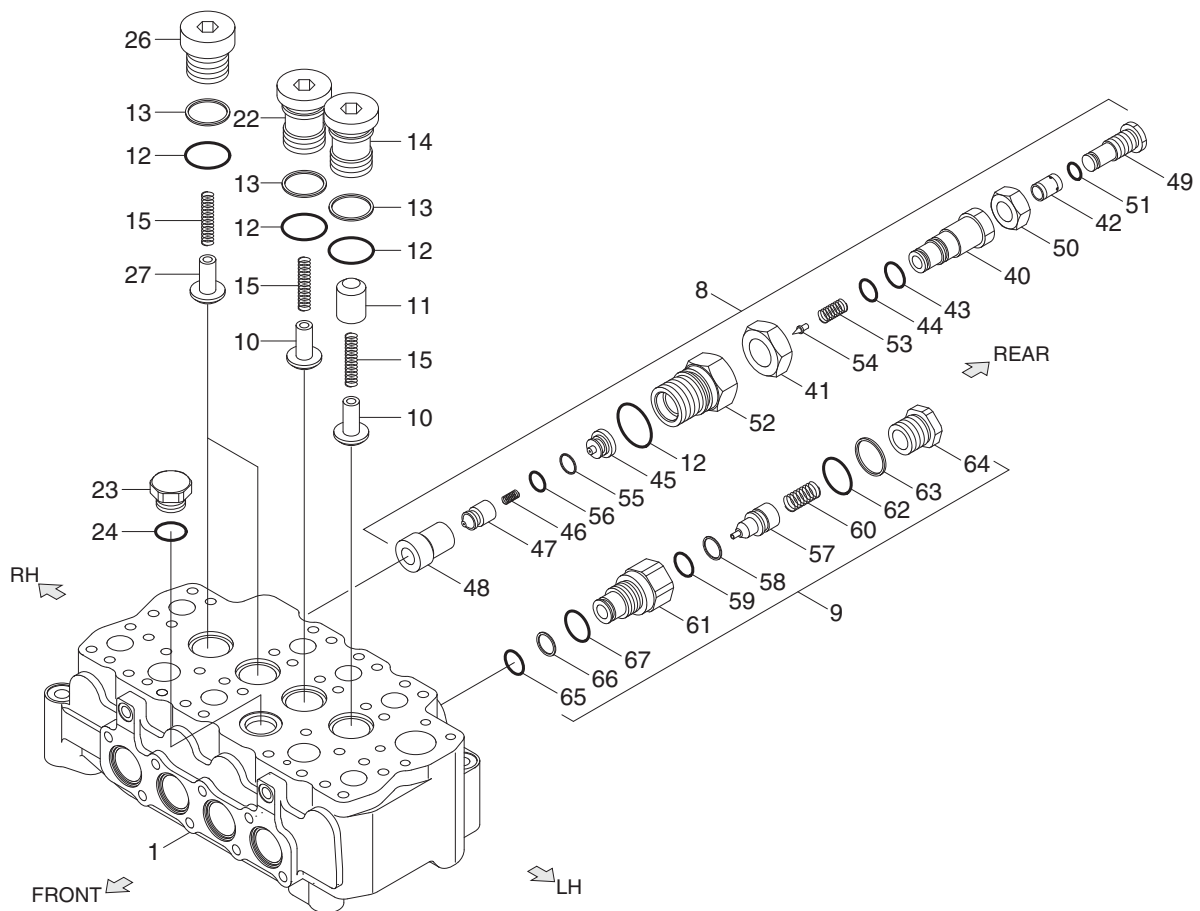
# STRUCTURE (MCV1, 5/5)



120098MC08

- |    |                        |    |                       |     |              |
|----|------------------------|----|-----------------------|-----|--------------|
| 7  | O-ring                 | 50 | Cap                   | 94  | Back up ring |
| 8  | Foot relief valve assy | 55 | O-ring                | 95  | O-ring       |
| 36 | Socket bolt            | 71 | Check                 | 96  | Spring       |
| 37 | Washer                 | 72 | Cap                   | 97  | Check        |
| 38 | Cap                    | 80 | O-ring                | 102 | O-ring       |
| 39 | O-ring                 | 81 | Make up assy          | 103 | Plug         |
| 40 | Back up ring           | 82 | O-ring                | 104 | Cap          |
| 41 | O-ring                 | 83 | Back up ring          | 105 | O-ring       |
| 42 | Check                  | 84 | Cap                   | 106 | Cap          |
| 43 | Spring                 | 85 | Check                 | 107 | Cap          |
| 48 | Check                  | 91 | Overload relief valve | 108 | Spring       |
| 49 | Back up ring           | 93 | Cap                   | 109 | Spool        |

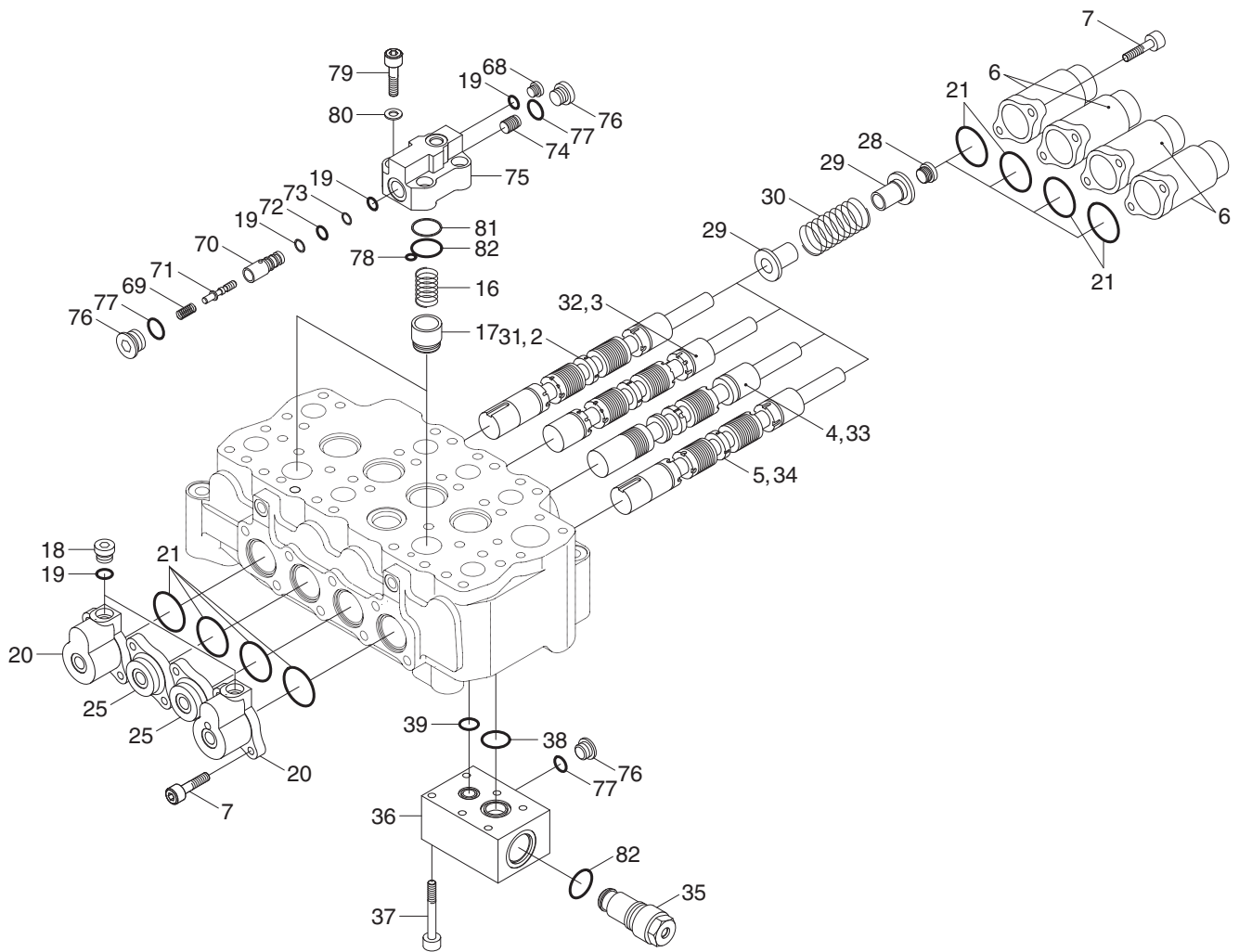
# STRUCTURE (MCV2, 1/2)



120098MC09

- |    |                        |    |              |    |               |
|----|------------------------|----|--------------|----|---------------|
| 1  | Housing                | 40 | Sleeve       | 54 | Pilot poppet  |
| 8  | Main relief valve assy | 41 | Hex nut      | 55 | Back up ring  |
| 9  | Make up assy           | 42 | Piston       | 56 | O-ring        |
| 10 | Check                  | 43 | O-ring       | 57 | Poppet        |
| 11 | Check                  | 44 | O-ring       | 58 | Back up ring  |
| 12 | O-ring                 | 45 | Pilot sheet  | 59 | O-ring        |
| 13 | Back up ring           | 46 | Spring       | 60 | Spring        |
| 14 | Cap                    | 47 | Poppet       | 61 | Relief sleeve |
| 15 | Spring                 | 48 | Sleeve       | 62 | O-ring        |
| 22 | Cap                    | 49 | Adjust screw | 63 | Back up ring  |
| 23 | Cap                    | 50 | Hex nut      | 64 | Cap           |
| 24 | O-ring                 | 51 | O-ring       | 65 | O-ring        |
| 26 | Cap                    | 52 | Cap          | 66 | Back up ring  |
| 27 | Check                  | 53 | Spring       | 67 | O-ring        |

# STRUCTURE (MCV2, 2/2)



120098MC10

- |    |              |    |                        |    |              |
|----|--------------|----|------------------------|----|--------------|
| 2  | Plunger assy | 29 | Spring guide           | 70 | Sleeve       |
| 3  | Plunger assy | 30 | Spring                 | 71 | Poppet       |
| 4  | Plunger assy | 31 | Plunger                | 72 | O-ring       |
| 5  | Plunger assy | 32 | Plunger                | 73 | Back up ring |
| 6  | Cover        | 33 | Plunger                | 74 | Piston       |
| 7  | Socket bolt  | 34 | Plunger                | 75 | Cover        |
| 16 | Spring       | 35 | Foot relief valve assy | 76 | Cap          |
| 17 | Poppet       | 36 | Manifold               | 77 | O-ring       |
| 18 | Plug         | 37 | Socket bolt            | 78 | O-ring       |
| 19 | O-ring       | 38 | O-ring                 | 79 | Socket bolt  |
| 20 | Cover        | 39 | O-ring                 | 80 | Lock washer  |
| 21 | O-ring       | 68 | Cap                    | 81 | Back up ring |
| 25 | Cover        | 69 | Spring                 | 82 | O-ring       |
| 28 | Cap          |    |                        |    |              |

### **3. DISASSEMBLY AND ASSEMBLY**

#### **1) GENERAL PRECAUTIONS**

- (1) Hydraulic machinery precisely. Please make disassembly and assembly have a small gap at a place without the dust.
- (2) When remove it from an actual machine, wash a plumbing part and a plug, and dust and water do not enter.
- (3) Examine a structure figure before work, and prepare a part depending on a purpose. In addition, prepare by a parts list beforehand because there is a part of the need to change in sub-assembly.

#### **(4) Disassembly**

- ① Handle the components carefully not to drop them or bump them with each other as they are made with precision.
- ② Do not force the work by hitting or twisting as burred or damaged component may not be assembled or result in oil leakage or low performance.
- ③ When disassembled, tag the components for identification so that they can be reassembled correctly.
- ④ Once disassembled, O-ring and back-up rings are usually not to be used again. (Remove them using a wire with its end made like a shoehorn. Be careful not to damage the slot)
- ⑤ If the components are left disassembled or half-disassembled, they may get rust from moisture or dust. If the work has to be interrupted, take care to prevent rust and dust.

#### **(5) Assembly**

- ① Take the same precautions as for disassembly.
- ② When assembling the components, remove any metal chips or foreign objects and check them for any burrs or dents. Remove nurrs and dents with oil-stone, if any.
- ③ O-rings and back-up rings are to be replaced with new ones, as a rule.
- ④ When installing O-ring and back-up rings, be careful not to damage them. (Apply a little amount of grease for smoothness)
- ⑤ Tighten the bolts and caps with specified torque.

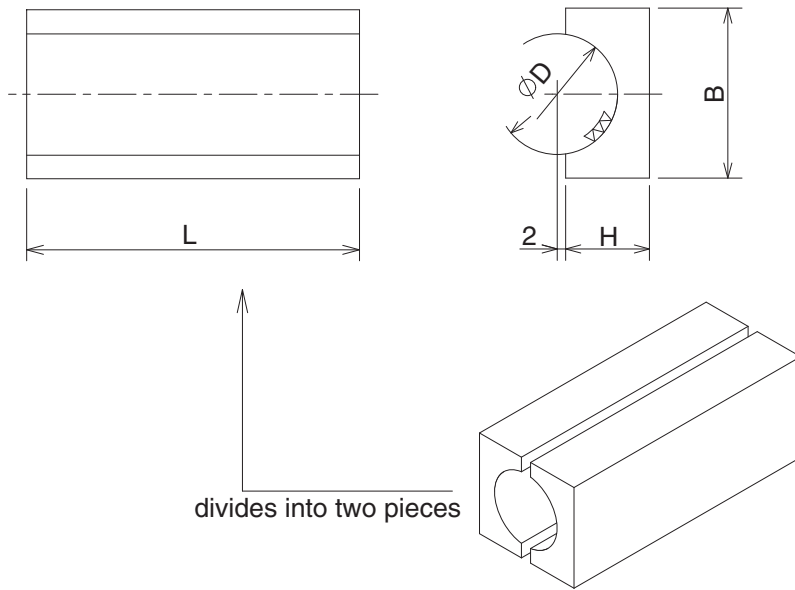
## 2) TOOLS

(1) Before disassembling the control valve, prepare the following tools beforehand.

### ① Holder

Item	∅ D	L	B	H
Main plunger	36	90	50	25
Priority valve poppet assy	25	30	35	20

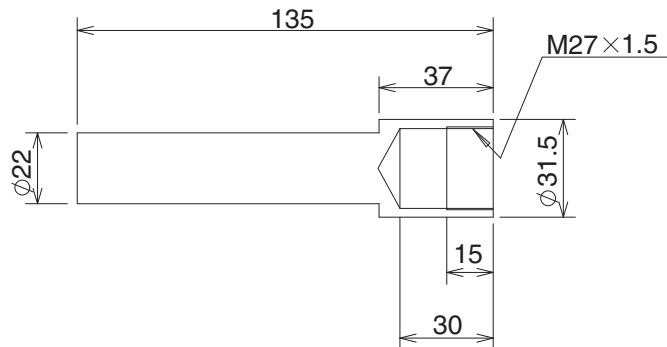
※ Material : Brass



120098MC11

### ② Arm regeneration valves sleeve pull out device

※ Material : Steel

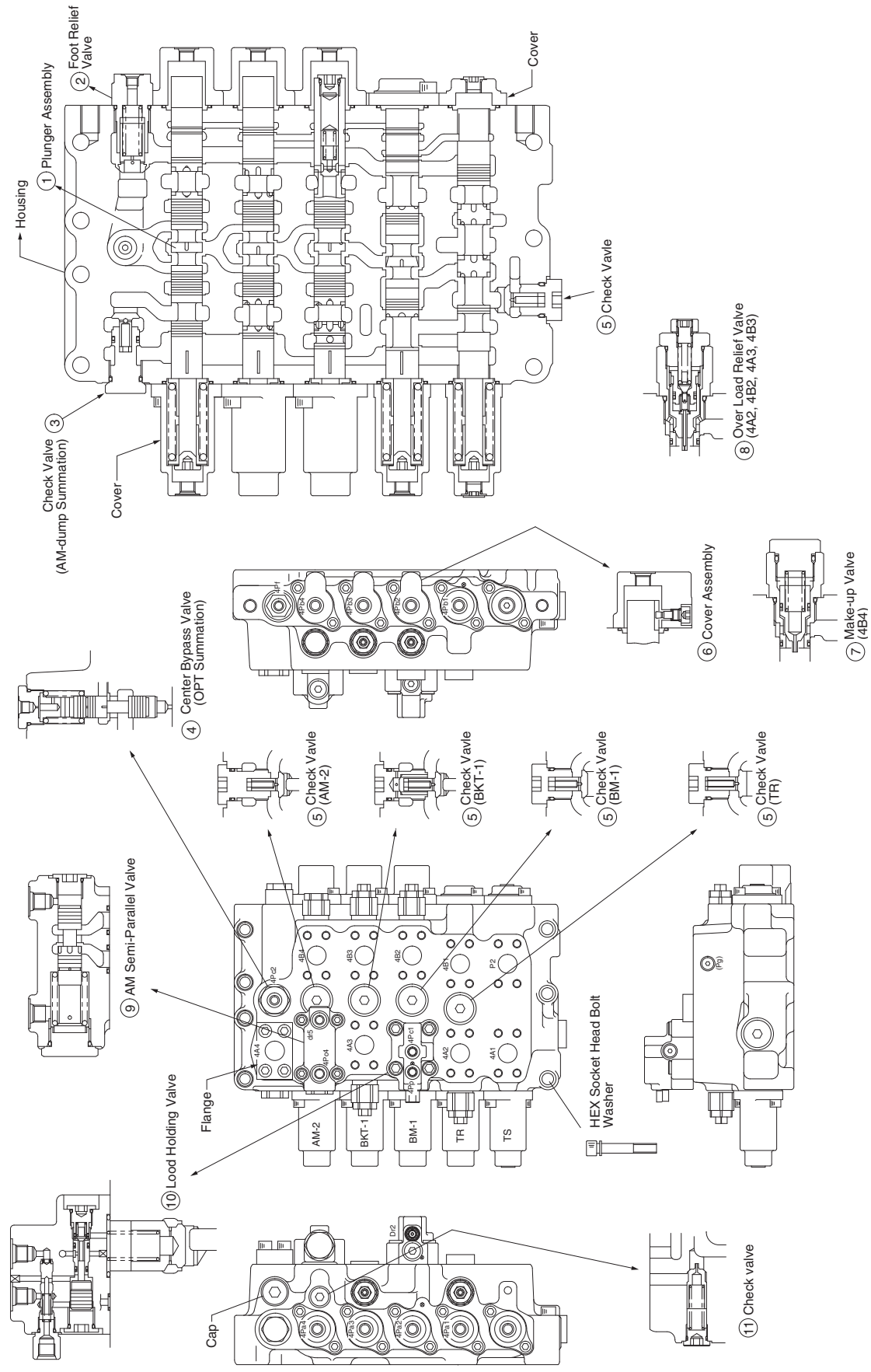


120098MC12

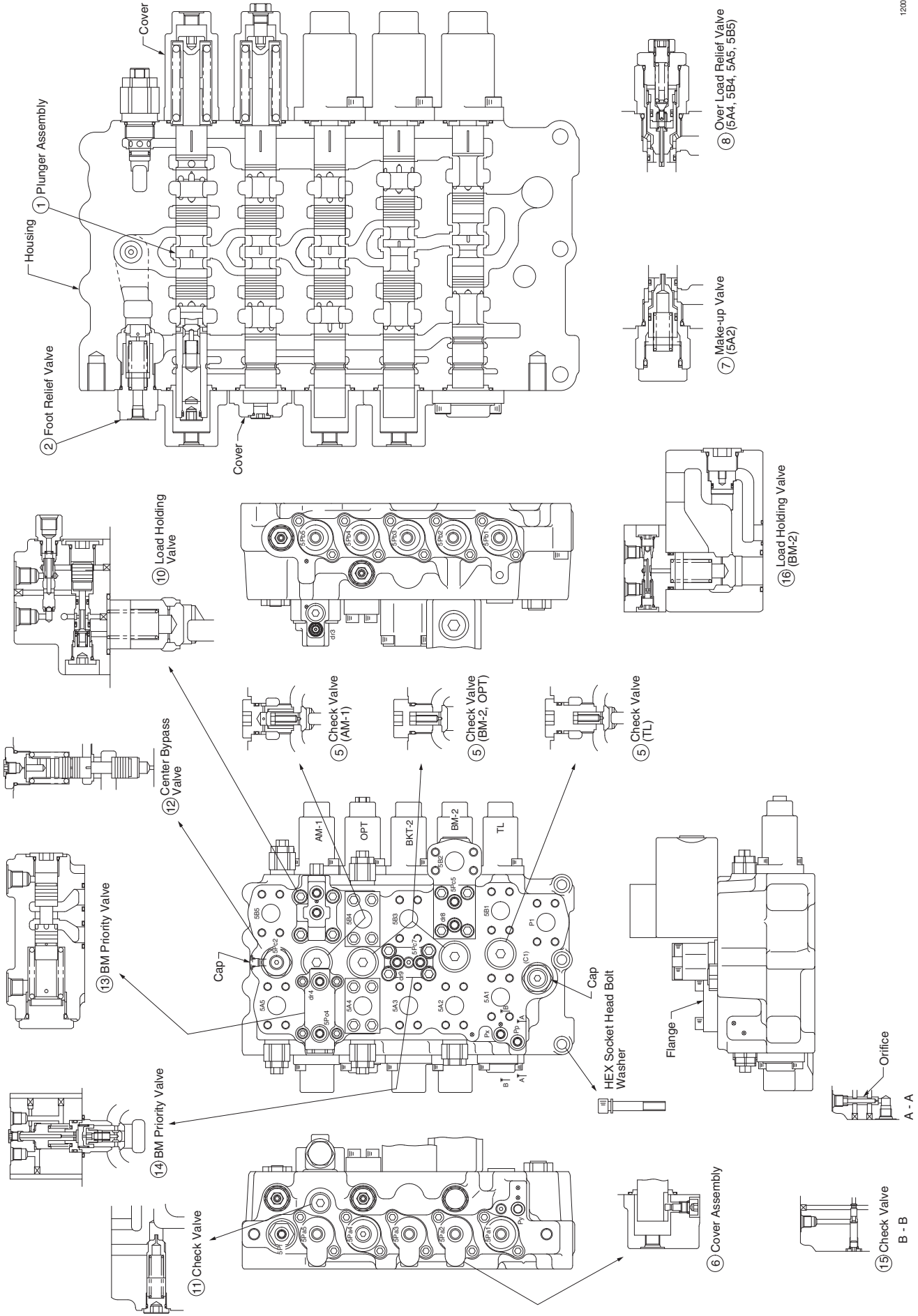


### 3) MOUNTING AND DISMOUNTING VALVES

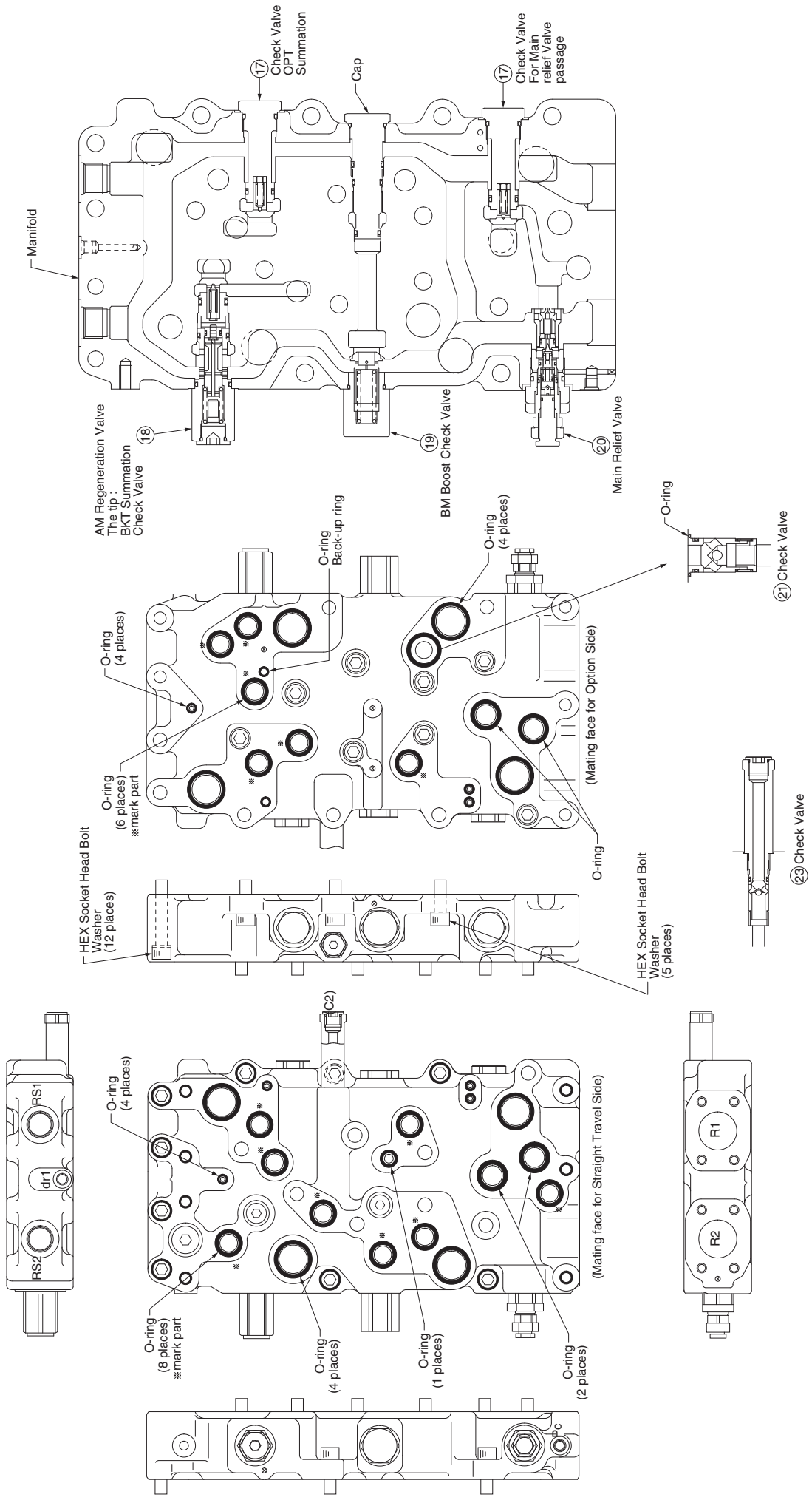
- Straight travel side valve (MCV 1)



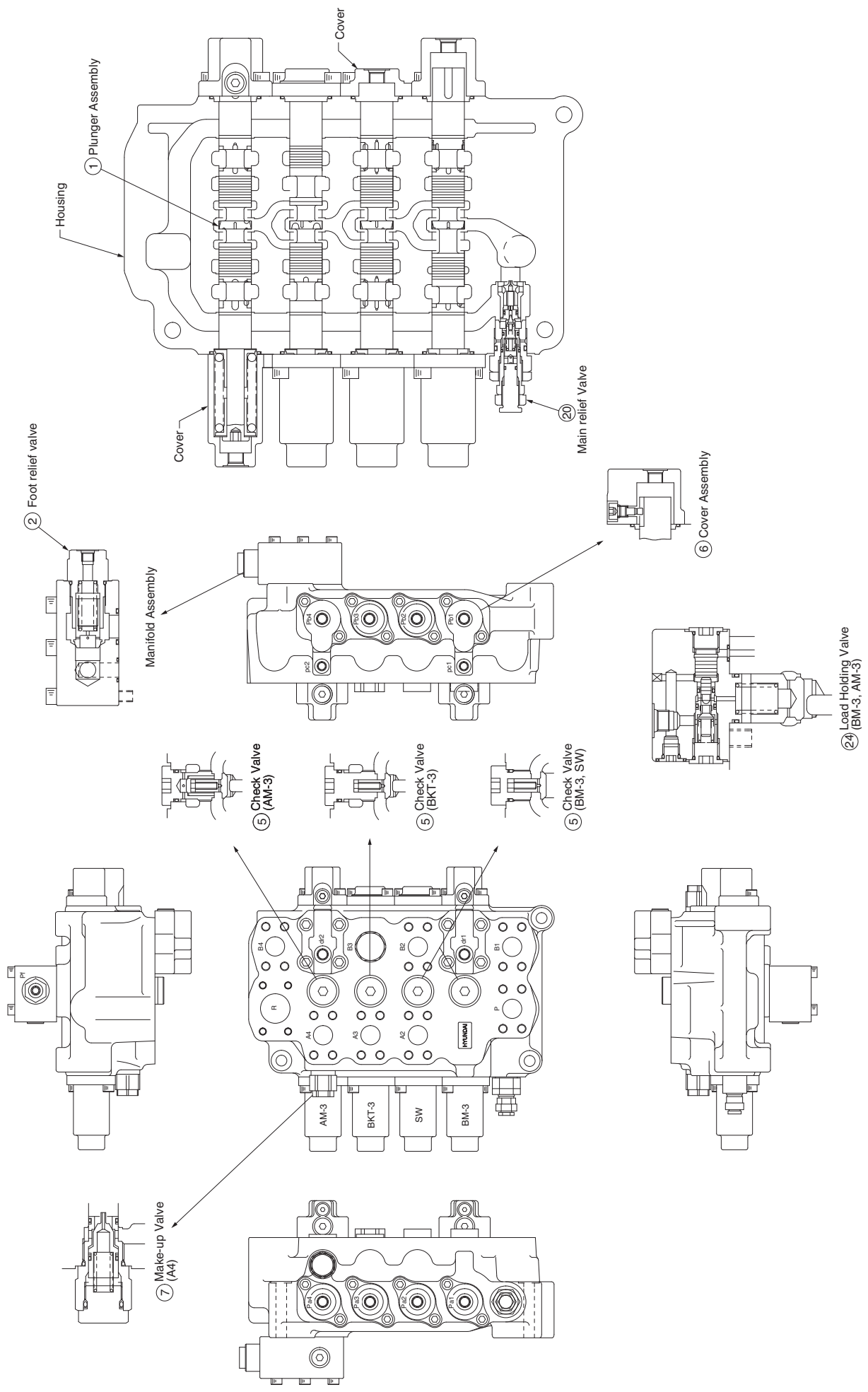
Option side valve (MCV 1)



· Manifold assembly (MCV 1)



· **Swing side valve (MCV 2)**



### (1) Main plunger

- ※ Reassembly in the reverse order to disassembly.
- ※ Attach an identification tag immediately after disassembly.

① Remove hexagon socket bolts (1) then remove cover (2).

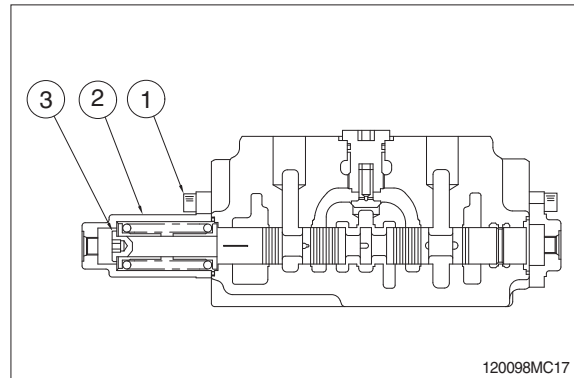
※ **Hexagon socket bolt**

Width across flat : 10 mm

Tightening torque : 10 kgf · m (72.3 lbf · ft)

※ **When reassembly**

Install cover (2) after making sure that O-ring is placed on the edge of the valve hole.



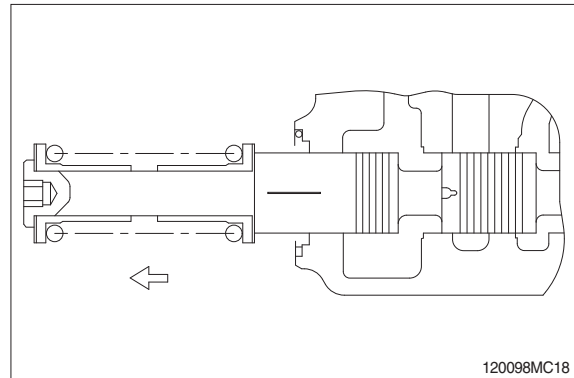
② Pull out plunger sub-assembly.

※ **Do not pull out the plunger all at once.**

Pull slowly while confirming the fitness with the housing hole.

※ **When reassembly**

AM, BM, and BKT match the key groove of the cover.



③ Place the plunger between holders and loosen the plunger cap (3) by using vise.

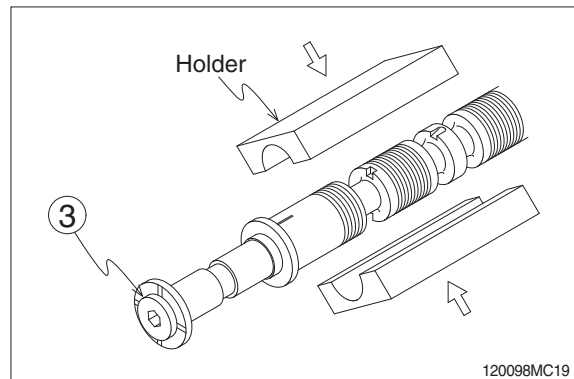
- Plunger cap

Width across flat : 10 mm

Tightening torque : 10 kgf · m

(72.3 lbf · ft)

- ※ Put the plunger between the holders and clamp them by a vise after degreasing the plunger and holders as a special tool.

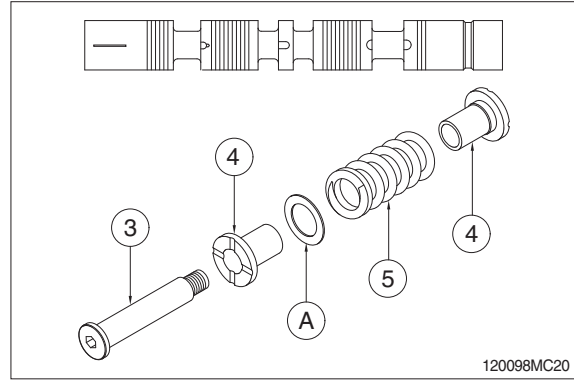


- ④ Remove the plunger cap (3), spring guide (4), spring (5).

※ Spring is different according to the plunger.

※ AM-2 plunger only.

The spacer (A) is built in.



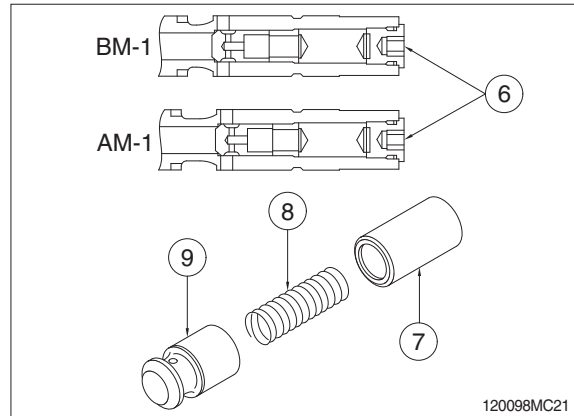
- ⑤ BM-1, AM-1 plunger only.

Remove cap (6), spacer (7), spring (8), and check (9).

· Cap

Width across flat : 10 mm

Tightening torque : 8.2 kgf · m  
(59.3 lbf · ft)



## (2) Foot relief valve

※ Reassembly in the reverse order to disassembly.

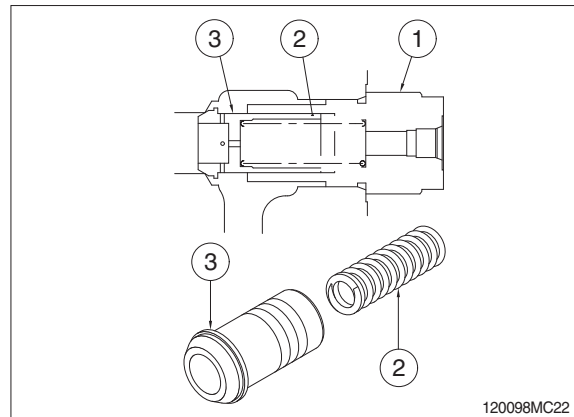
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spring (2) and poppet (3).

· Cap

Width across flat : 36 mm

Tightening torque : 25.5 kgf · m  
(184 lbf · ft)



**(3) Check valve (Arm dump summation)**

※ Reassembly in the reverse order to disassembly.

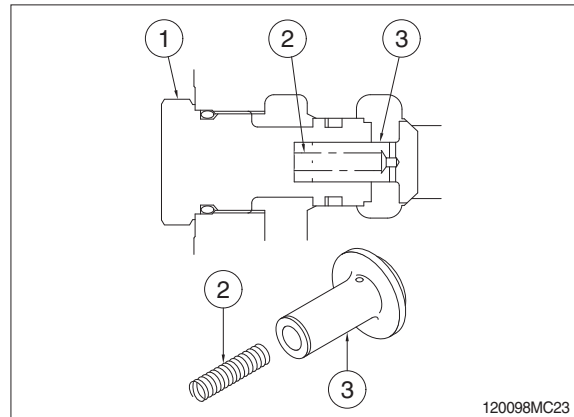
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spring (2) and check (3).

· Cap

Width across flat : 41 mm

Tightening torque : 18.4 kgf · m  
(133 lbf · ft)



**(4) Center bypass valve (Opt summation)**

※ Reassembly in the reverse order to disassembly.

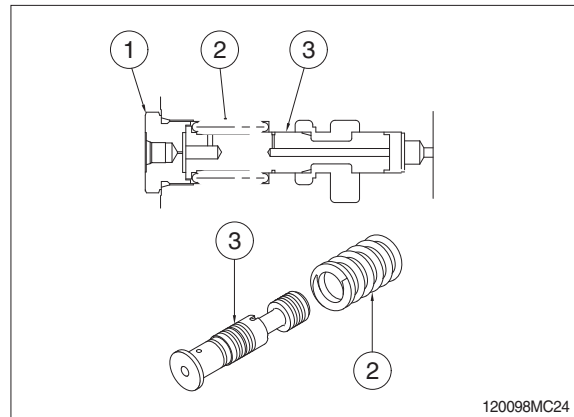
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spool (3) and spring (2).

· Cap

Width across flat : 46 mm

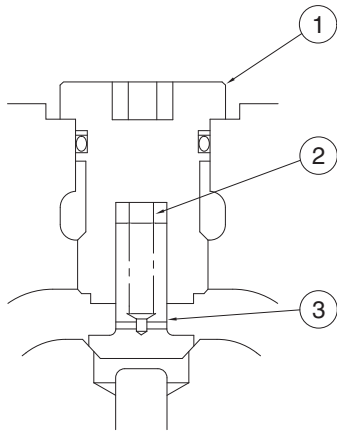
Tightening torque : 25.5 kgf · m  
(184 lbf · ft)



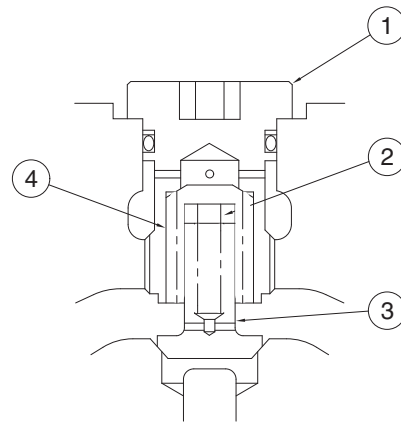
(5) Check valve

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

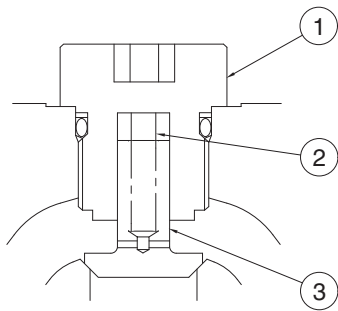


AM-2L, TL, BKT-3

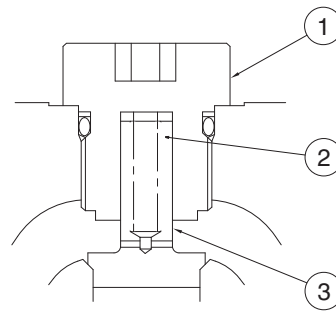


BKT-1, AM-1, AM-3

CAP : The squeezing diameter is different



BM-1, BM-2, BM-3  
SW, OPT, OTHER



(TR) CHECK : Outer orifice

120098MC25

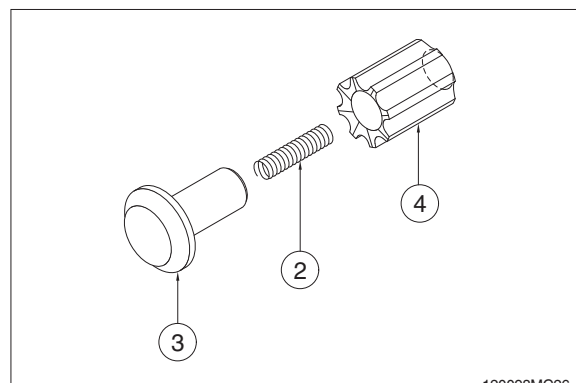
• It explains with BKT-1.

① Remove cap (1) and pull out check (4), spring (2) and check (3).

• Cap

Width across flat : 14 mm

Tightening torque : 35.7 kgf · m  
(258 lbf · ft)



120098MC26



**(6) Cover assy**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

- ① Remove hexagon socket bolts (1) then remove cover assy (2).

※ **Hexagon socket bolt**

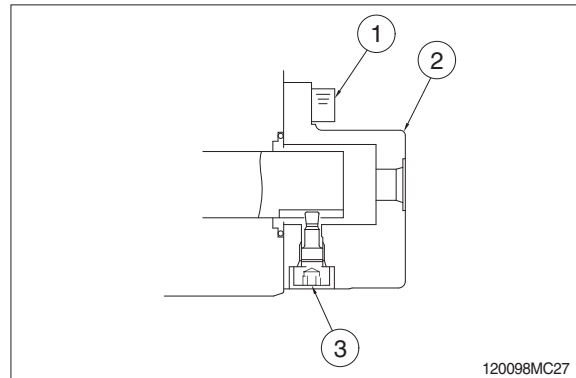
Width across flat : 10 mm

Tightening torque : 10 kgf · m (72.3 lbf · ft)

※ **When reassembly**

Install cover (2) after making sure that O-ring is placed on the edge of the valve hole.

The direction of the installation of the cover is noted.

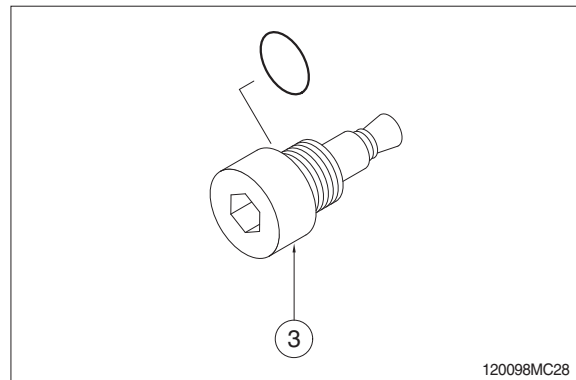


- ② Remove plug (3).

· Plug

Width across flat : 8 mm

Tightening torque : 8.2 kgf · m  
(59.3 lbf · ft)



## (7) Make up valve

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

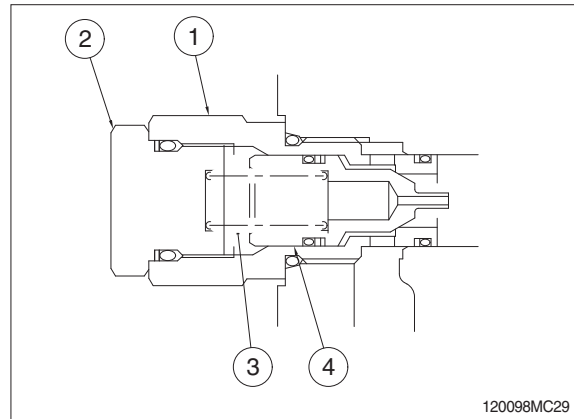
- ① Loosen sleeve (1) and remove make-up valve.

· Sleeve

Width across flat : 41 mm

Tightening torque : 10 kgf · m

(72.3 lbf · ft)



120098MC29

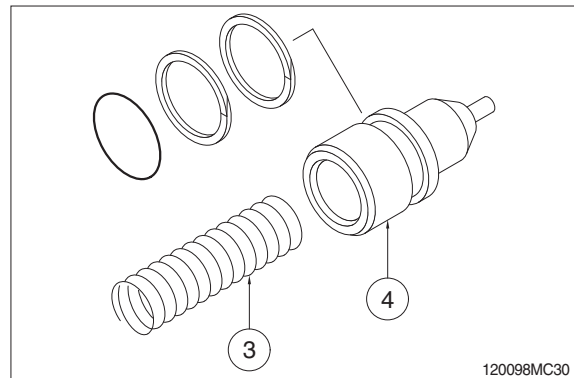
- ② Remove cap (2) and pull out spring (3) and poppet (4).

· Cap

Width across flat : 36 mm

Tightening torque : 10 kgf · m

(72.3 lbf · ft)



120098MC30

## (8) Overload relief valve

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

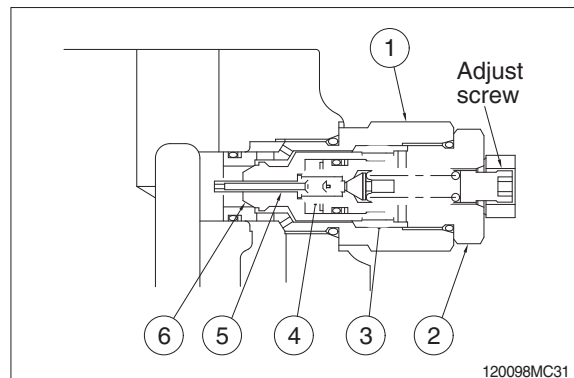
- ① Loosen sleeve (1) and remove relief valve.

· Sleeve

Width across flat : 41 mm

Tightening torque : 10 kgf · m

(72.3 lbf · ft)



120098MC31

- ② Loosen and remove relief seat (2) sub-assembly and remove spring (3), (4), piston (5) and main poppet (6).

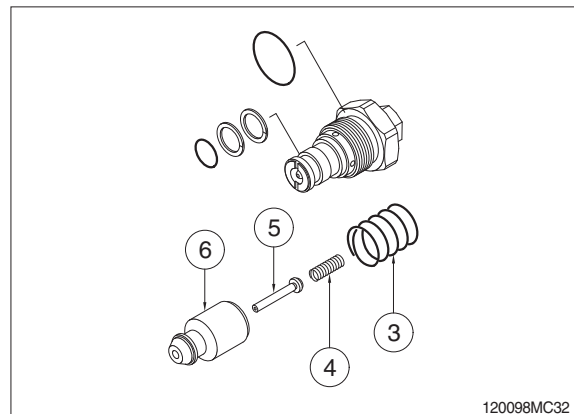
· Relief sleeve

Width across flat : 36 mm

Tightening torque : 10 kgf · m

(72.3 lbf · ft)

※ Do not disassemble adjusting screw.  
It's impossible to readjust setting pressure exactly on the machine.



120098MC32

**(9) Arm semi para valve**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

① Loosen hexagon socket bolts (1) and remove cover assembly.

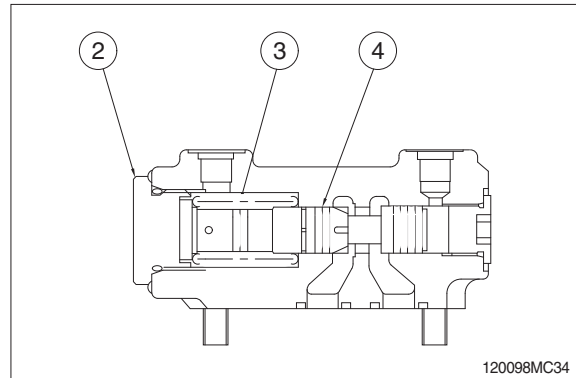
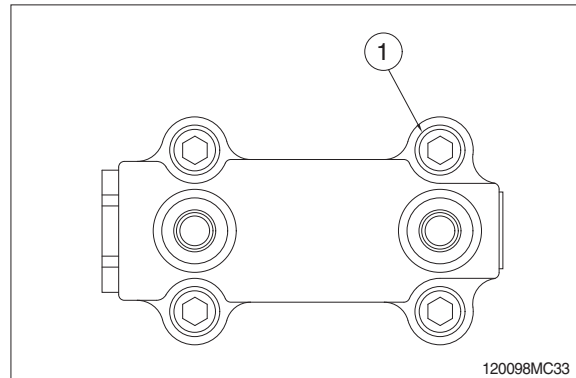
· Hexagon socket bolt

Width across flat : 8 mm

Tightening torque : 6.12 kgf · m  
(44.3 lbf · ft)

※ **When reassembly**

Install cover assy after making sure that O-ring is placed on the edge of the cover hole.

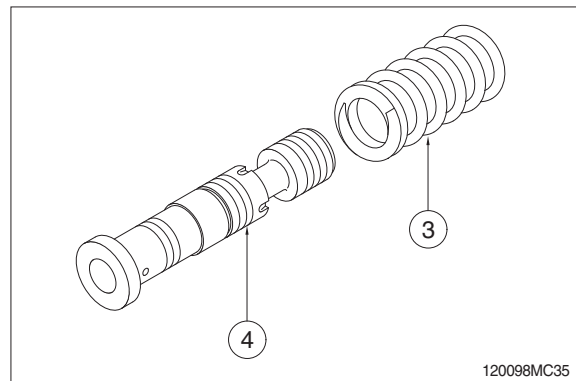


② Remove cap (2) and pull out spool (4) and spring (3).

· Cap

Width across flat : 41 mm

Tightening torque : 10 kgf · m  
(72.3 lbf · ft)



(10) Holding valve (Arm 1, Boom 1)

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

① Loosen hexagon socket bolts (1) and remove cover assembly.

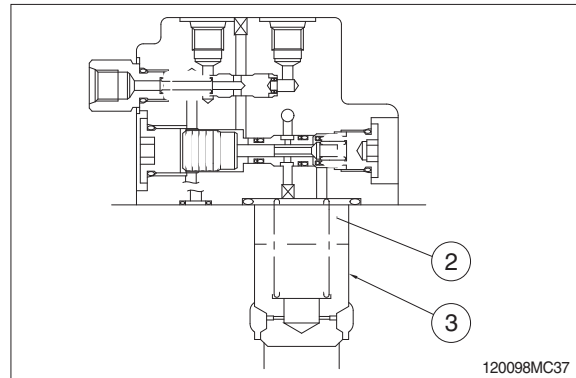
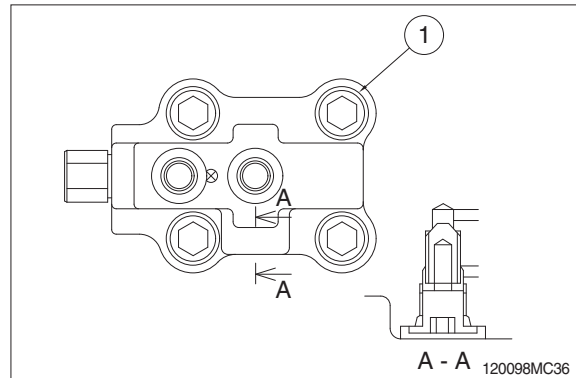
· Hexagon socket bolt

Width across flat : 12 mm

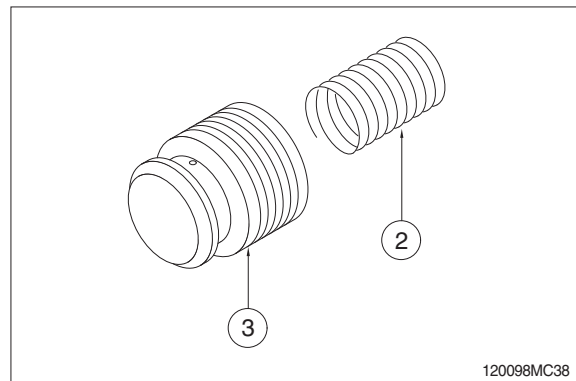
Tightening torque : 18.4 kgf · m  
(133 lbf · ft)

※ **When reassembly**

Install cover assy after making sure that O-ring is placed on the edge of the cover hole.



② Remove spring (2) and poppet (3).



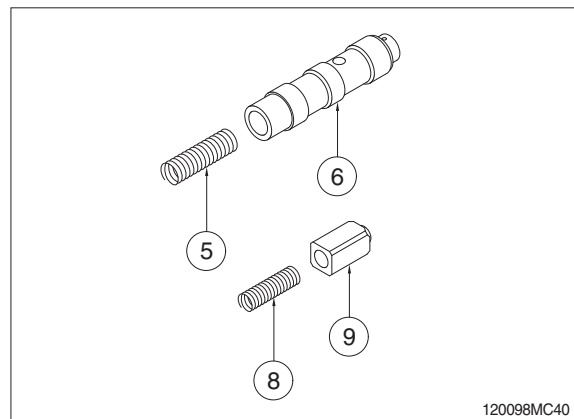
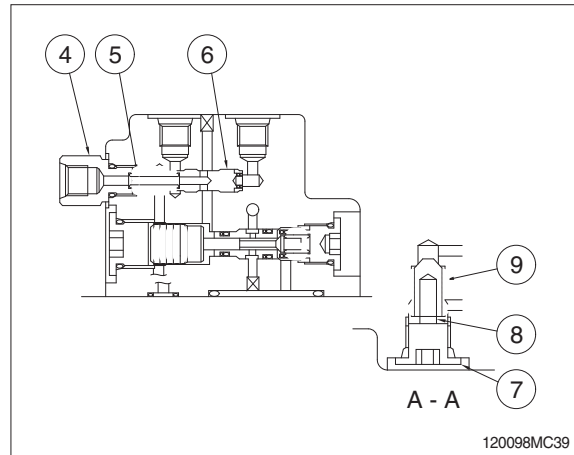
③ Cover assembly

- a. Remove cap (4) and pull out spring (5), and piston (6).

- Cap  
Width across flat : 19 mm  
Tightening torque : 3.1 kgf · m  
(22.4 lbf · ft)

- b. Remove cap (7) and pull out spring (8), and check (9).

- Cap  
Width across flat : 6 mm  
Tightening torque : 3.1 kgf · m  
(22.4 lbf · ft)

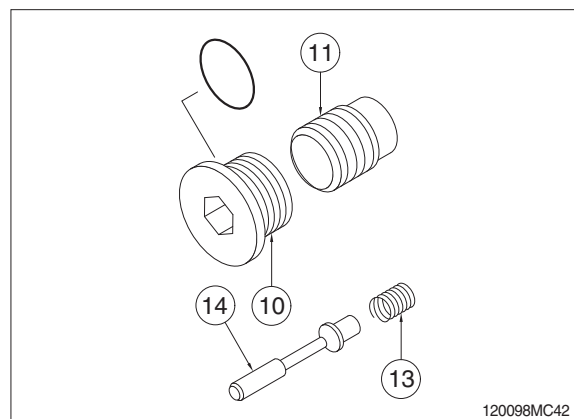
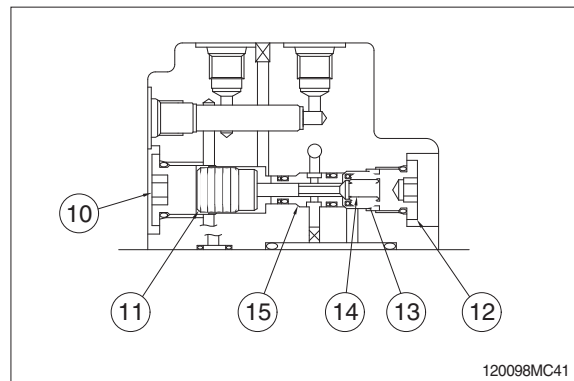


- c. Remove cap (10) and piston (11).

- Cap  
Width across flat : 10 mm  
Tightening torque : 6.1 kgf · m  
(44.1 lbf · ft)

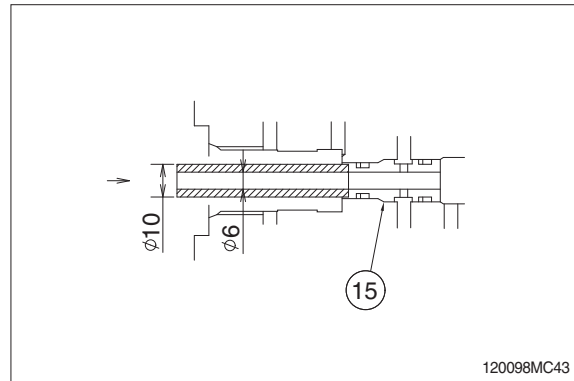
- d. Remove cap (12) and pull out spring (13), and poppet (14).

- Cap  
Width across flat : 8 mm  
Tightening torque : 5.1 kgf · m  
(36.9 lbf · ft)



※ There is a case where the poppet cannot be taken by the seat edge.

e. It begins to beat the sleeve with the pipe lightly.



**(11) Check valve (Arm semi para, Boom priority)**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

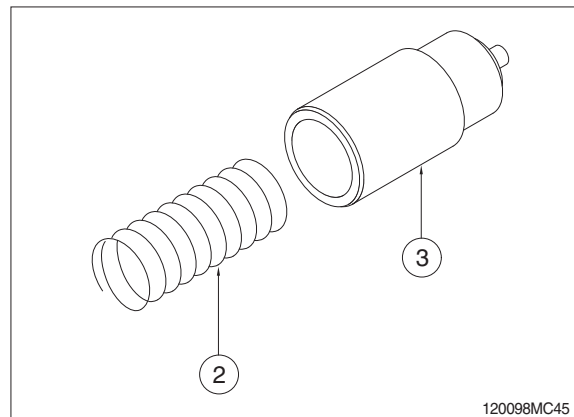
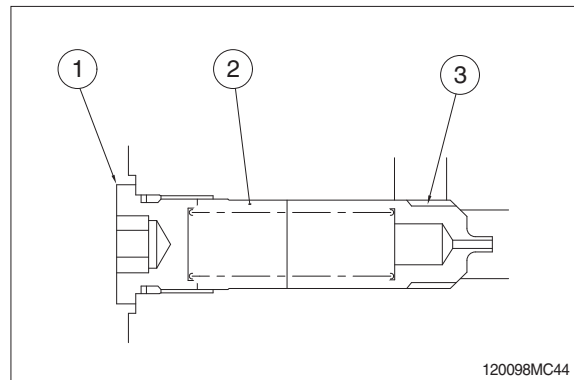
① Remove cap (1) and pull out spring (2), and check (3).

· Cap

Width across flat : 12 mm

Tightening torque : 15.3 kgf · m

(111 lbf · ft)



### (12) Center bypass valve

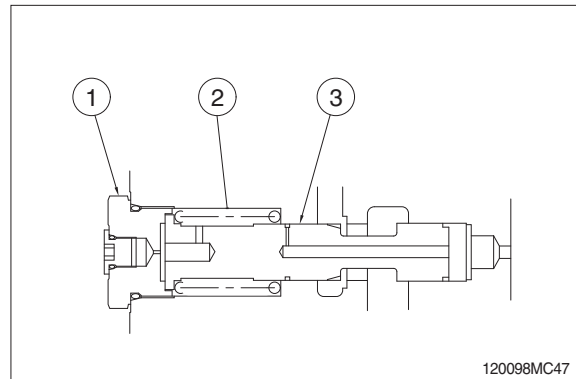
- ※ Reassembly in the reverse order to disassembly.
- ※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spool (3), and spring (2).

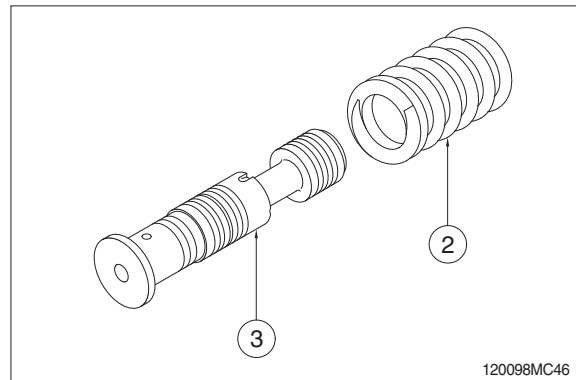
· Cap

Width across flat : 46 mm

Tightening torque : 25.5 kgf · m  
(184.4 lbf · ft)



120098MC47



120098MC46

### (13) Boom priority valve 1

- ※ Reassembly in the reverse order to disassembly.
- ※ Attach an identification tag immediately after disassembly.

- ① Loosen hexagon socket bolts (1) and remove cover assembly.

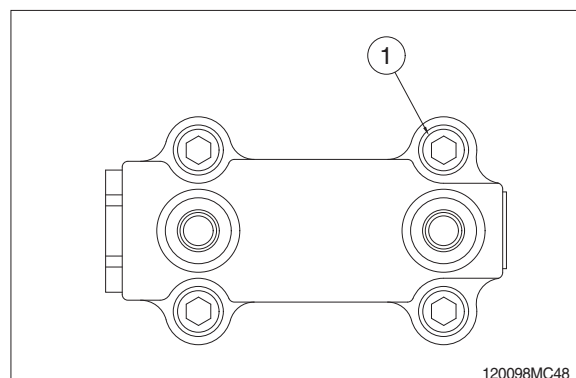
· Hexagon socket bolt

Width across flat : 8 mm

Tightening torque : 6.1 kgf · m  
(44.1 lbf · ft)

※ **When reassembly**

Install cover assy after making sure that O-ring is placed on the edge of the cover hole.



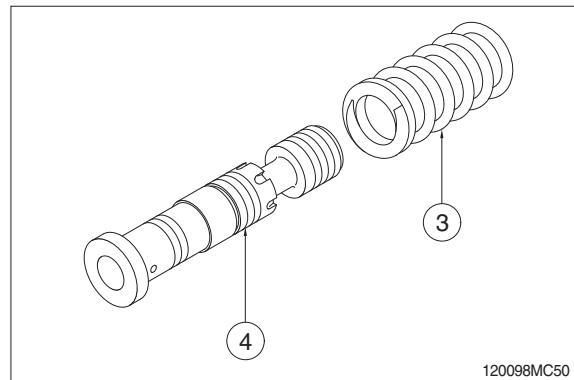
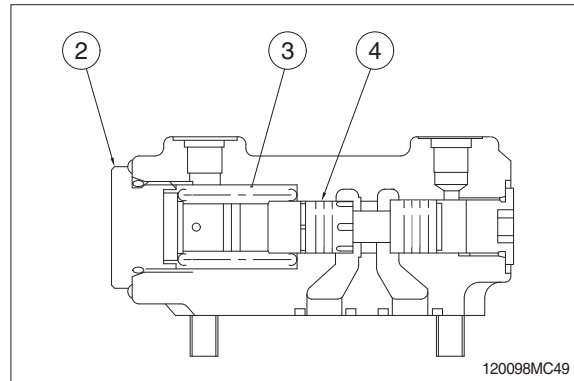
120098MC48

- ② Remove cap (2) and pull out spool (4), and spring (3).

· Cap

Width across flat : 41 mm

Tightening torque : 10 kgf · m  
(72.3 lbf · ft)



#### (14) Boom priority valve 2

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

- ① Loosen hexagon socket bolts (1) and remove cover assembly (2).

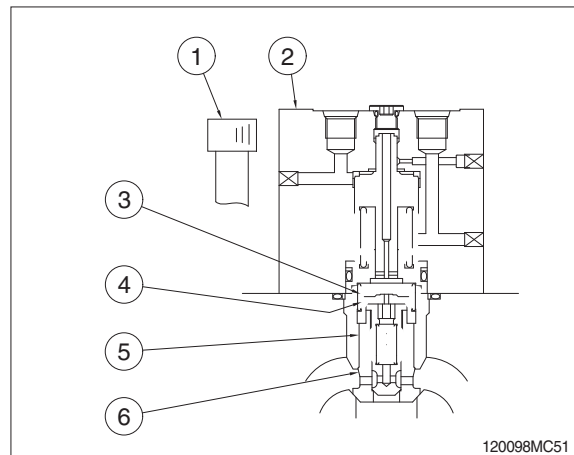
· Hexagon socket bolt

Width across flat : 12 mm

Tightening torque : 18.4 kgf · m  
(133 lbf · ft)

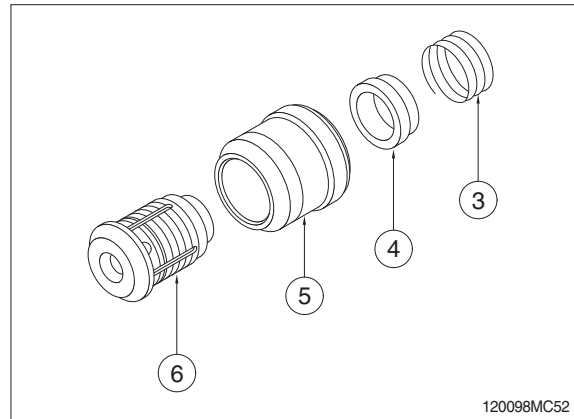
※ **When reassembly**

Install cover assy (2) after making sure that O-ring and back-up ring is placed on the edge of the valve hole.





- ② Remove spring (3), spring guide (4), sleeve (5) and poppet sub-assembly (6).



- ③ Place the poppet between holders and loosen the cap (7) by using vise.

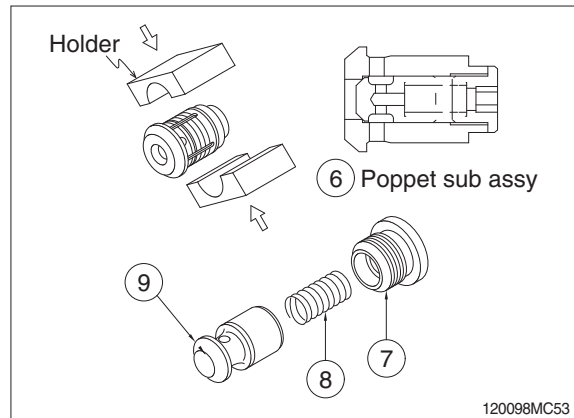
Remove cap (7), spring (8) and check (9).

· Cap

Width across flat : 6 mm

Tightening torque : 3.6 kgf · m  
(26 lbf · ft)

- ※ Put the poppet between the holders and clamp them by a vise after degreasing the poppet and holders as a special tool.



- ④ Cap (10) removed and a plate (11) is extracted by the press.

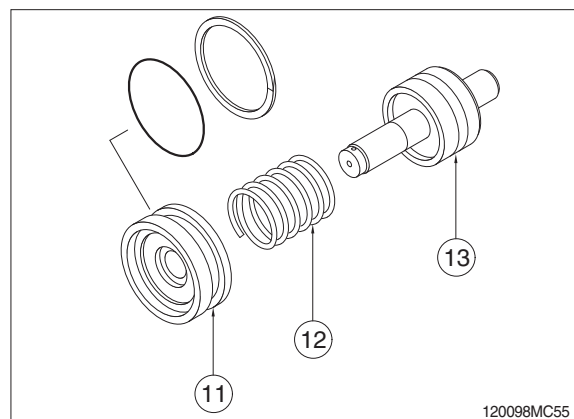
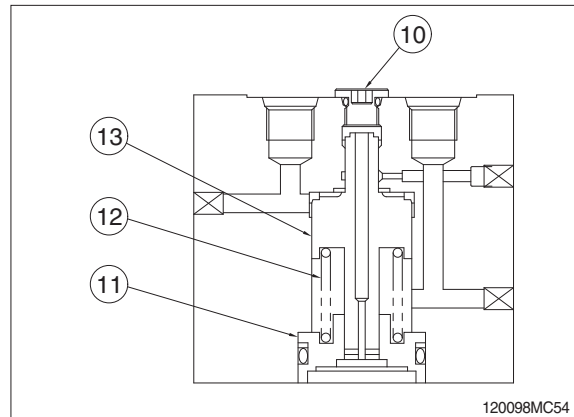
Remove spring (12) and piston (13).

· Cap

Width across flat : 5 mm

Tightening torque : 21 kgf · m  
(14.5 lbf · ft)

- ※ It takes care that to not fly, when a plate (11) with spring anti-power separates.



**(15) Check valve (Travel straight)**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

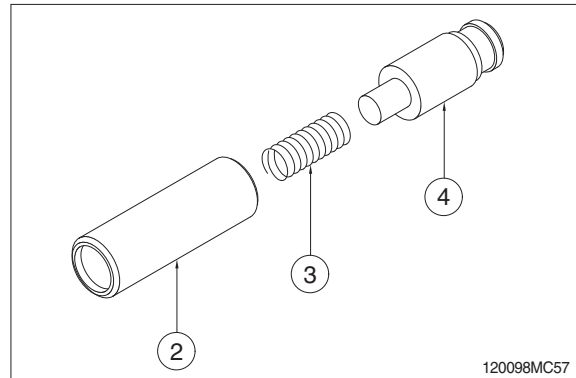
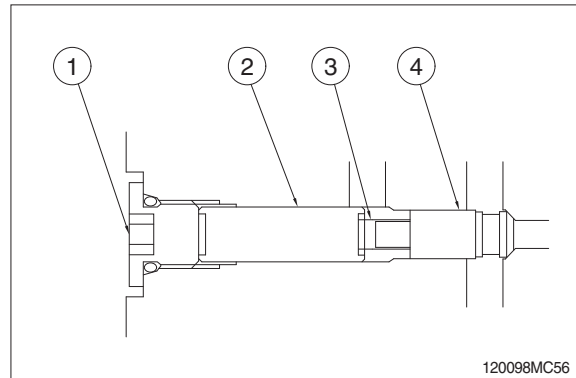
- ① Remove cap (1) and pull out spacer (2), spring (3) and check (4).

· Cap

Width across flat : 5 mm

Tightening torque : 21 kgf · m

(14.5 lbf · ft)



**(16) Load holding valve (Boom 2)**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

① Loosen hexagon socket bolts (1) and remove cover assembly.

· Hexagon socket bolt

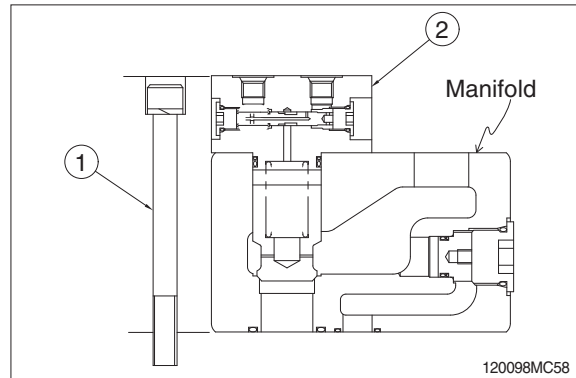
Width across flat : 12 mm

Tightening torque : 18.6 kgf · m

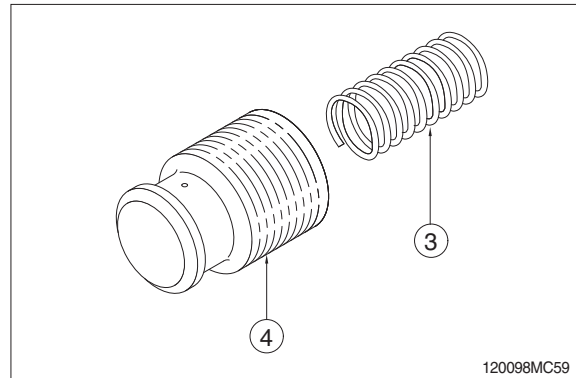
(134.5 lbf · ft)

※ **When reassembly**

Install cover assy after making sure that O-ring is placed on the edge of the cover hole.



② Remove spring (3) and poppet (4).



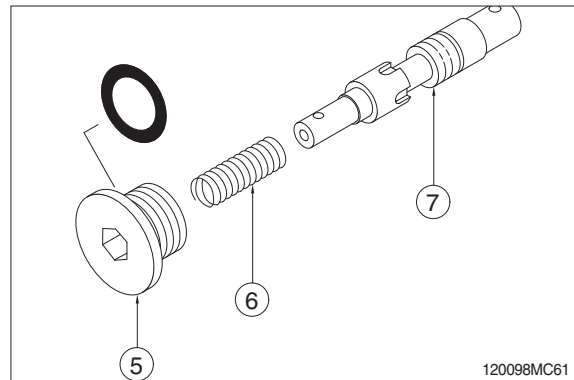
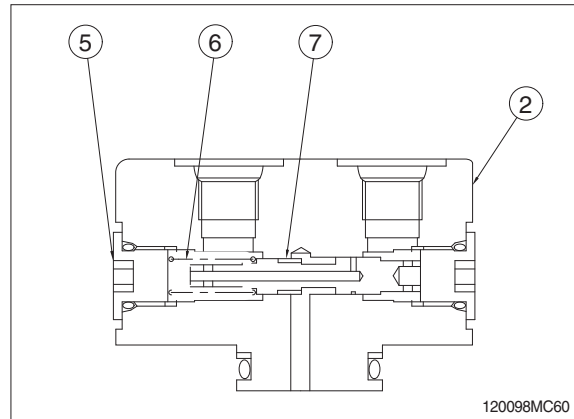
③ Cover assembly

Remove cap (5) and pull out spring (6), and spool (7).

· Cap

Width across flat : 6 mm

Tightening torque : 3.1 kgf · m  
(22.4 lbf · ft)



(17) Check valve (Opt summation, main relief valve passage)

※ Reassembly in the reverse order to disassembly.

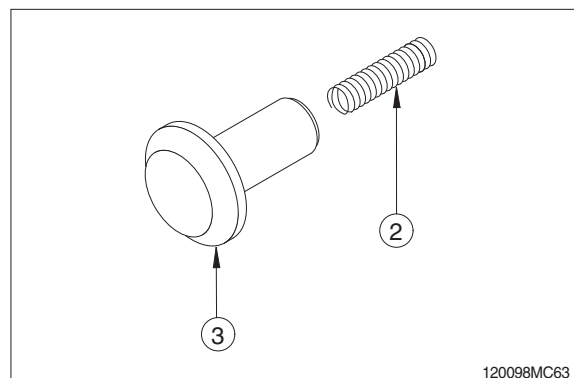
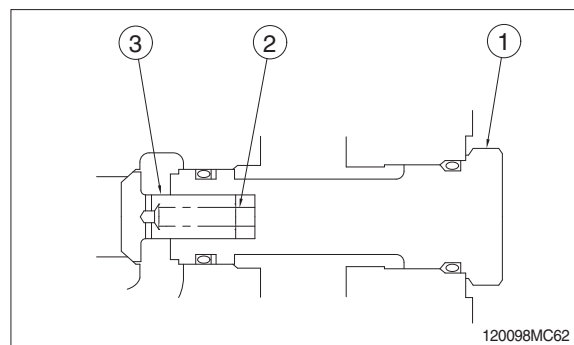
※ Attach an identification tag immediately after disassembly.

① Remove cap (1) and pull out spool (2) and check (3).

· Cap

Width across flat : 41 mm

Tightening torque : 18.4 kgf · m  
(133 lbf · ft)



**(18) Arm regeneration valve**

※ Reassembly in the reverse order to disassembly.

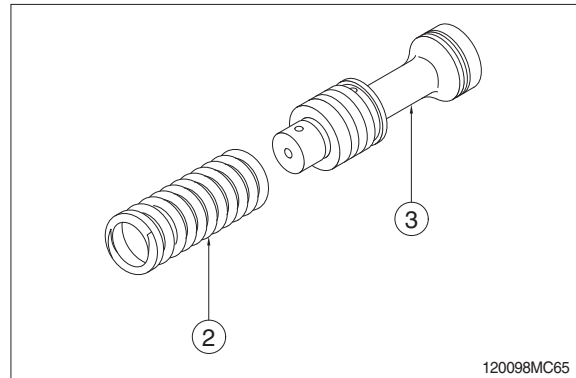
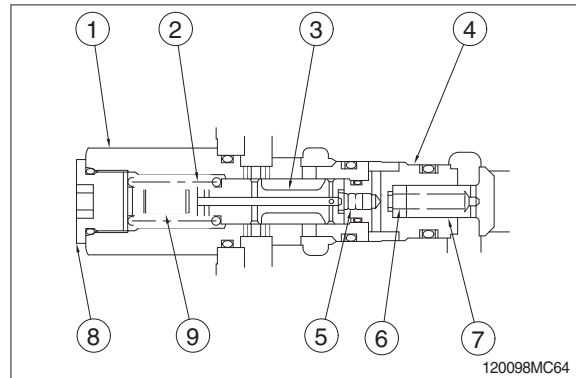
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spring (2) and spool (3).

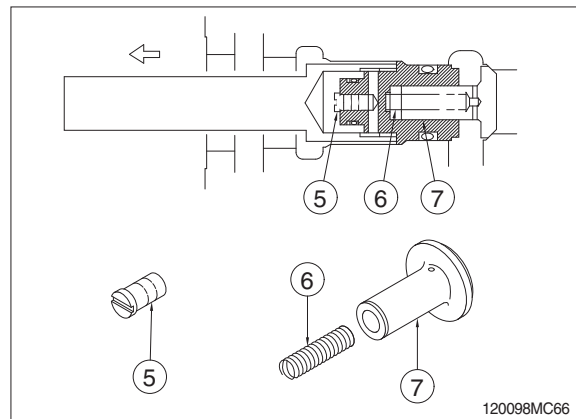
· Cap

Width across flat : 41 mm

Tightening torque : 18.4 kgf · m  
(133 lbf · ft)



- ② Sleeve (4) is pull out with a special tool.  
Remove piston (5), spring (6) and check (7).

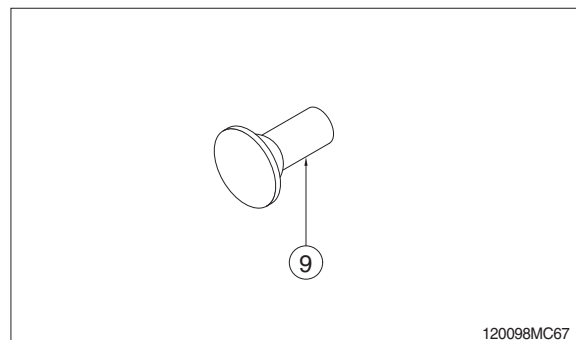


- ③ Remove cap (8) and pull out spring guide (9).

· Cap

Width across flat : 12 mm

Tightening torque : 10 kgf · m  
(72.3 lbf · ft)



**(19) Boom boost check valve**

※ Reassembly in the reverse order to disassembly.

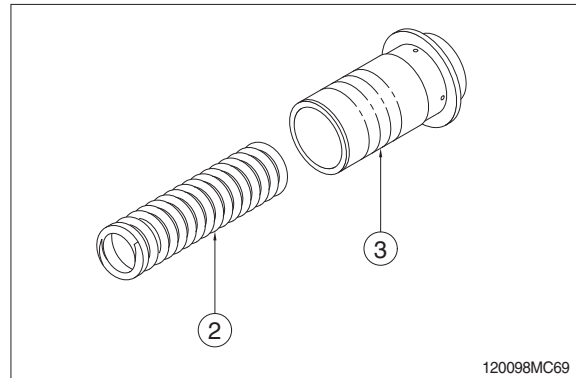
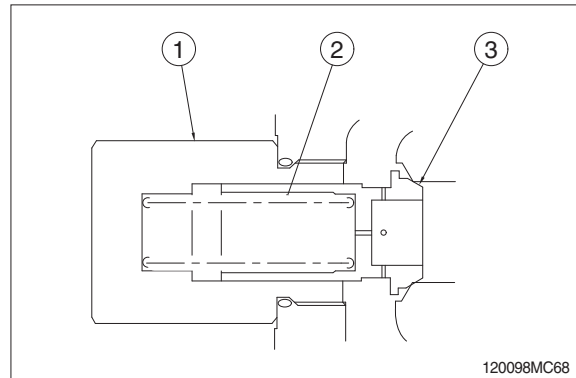
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out spring (2) and poppet (3).

· Cap

Width across flat : 46 mm

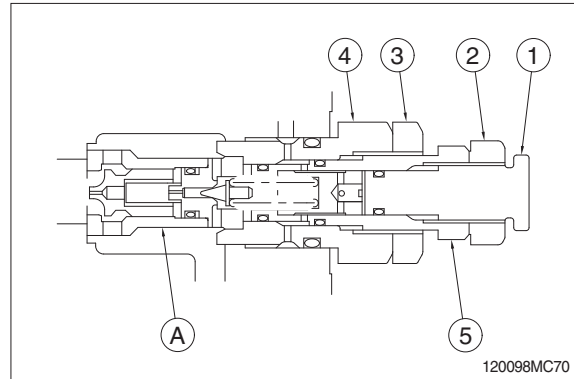
Tightening torque : 18.4 kgf · m  
(133 lbf · ft)



## (20) Main relief valve

### · Disassembly

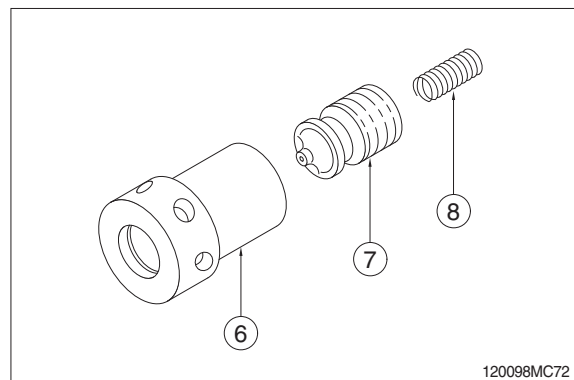
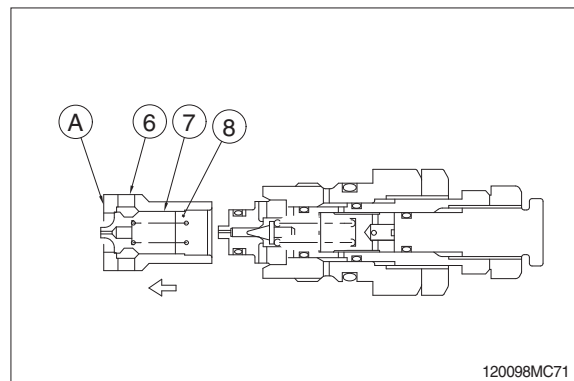
- ① Loosen nut (2) while holding adjusting screw (1).
- ② Loosen nut (3) while holding cap (4).
- ③ Remove main relief valve from valve body.



- ④ Pull out main poppet sub assy (A) and remove main poppet (7) and spring (8) from sleeve (6).

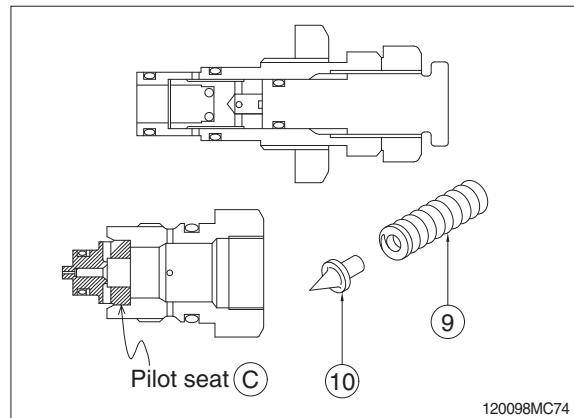
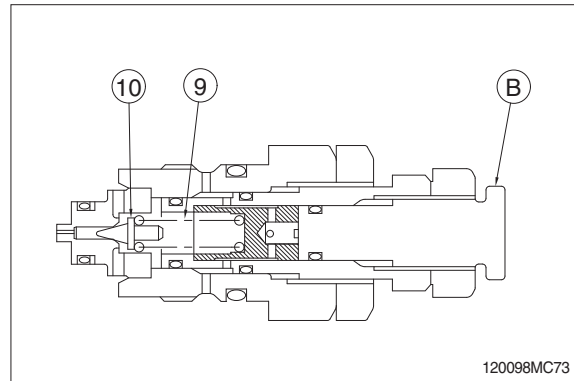
Width across flat

- 1 Adjust screw : 22 mm
- 2 Hexagon nut : 30 mm
- 3 Hexagon nut : 41 mm
- 4 Cap : 41 mm
- 5 Sleeve : 27 mm



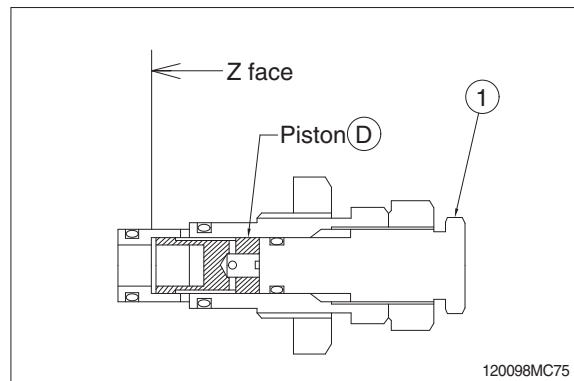
⑤ Remove adjusting sub-assy (B) then remove spring (9) and pilot poppet (10).

※ Do not disassembly pilot seat (C). (Press fitting)

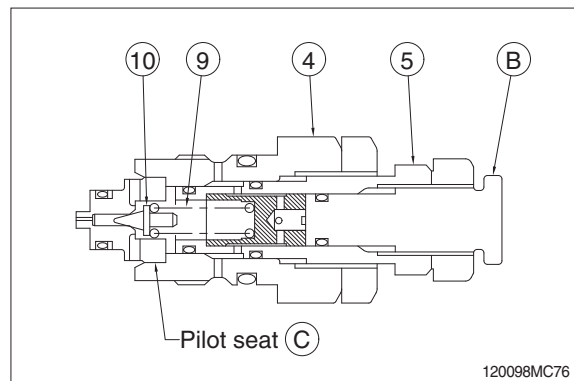


· Reassembly

① Screw low pressure adjusting screw (1) until piston (D) touches "Z" face, in this position, relief setting pressure is high level.

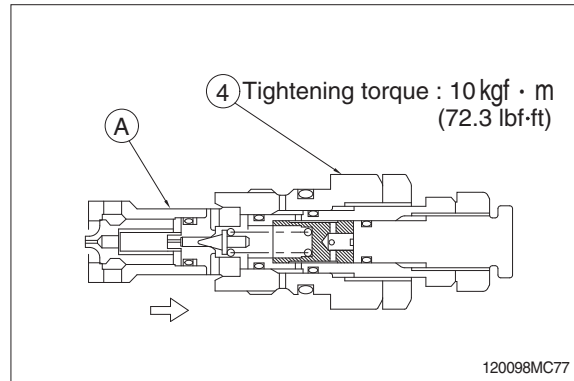


② Install pilot poppet (10), spring (9) and adjusting screw sub-assy (B). Set adjusting screw sub-assy (B) temporarily in the position that pilot poppet (10) contacts to pilot seat (C). Then pressure adjusting spring (9) begins to be effective.





- ③ Assemble main poppet sub-assy (A), and install the main relief valve which is set temporarily in main body. Tighten cap (4) with a torque wrench.



· **Resetting relief pressure**

① **High pressure**

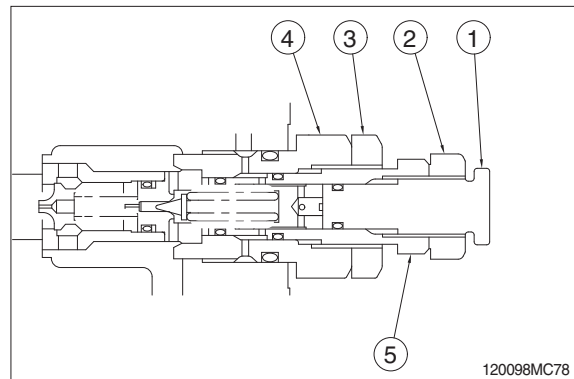
Set the prescribed pressure correctly adjusting sleeve (5), while reading the pressure gauge. Tighten lock nut (3) with torque wrench holding sleeve (5).

※ **One quarter turn of sleeve (5) equals about 4.5 MPa.**

② **Low pressure**

Set the prescribed pressure correctly adjusting screw (1), while reading the pressure gauge. Tighten lock nut (2) with torque wrench holding adjusting screw (1).

※ **One quarter turn of adjusting screw (1) equals about 4.5 MPa.**



Tightening torque

- 1 Adjust screw : -
- 2 Hexagon nut : 6.1 kgf · m (44.1 lbf · ft)
- 3 Hexagon nut : 10 kgf · m (72.3 lbf · ft)
- 4 Cap : 10 kgf · m (72.3 lbf · ft)
- 5 Sleeve : -

(21) Check valve (Boom up summation)

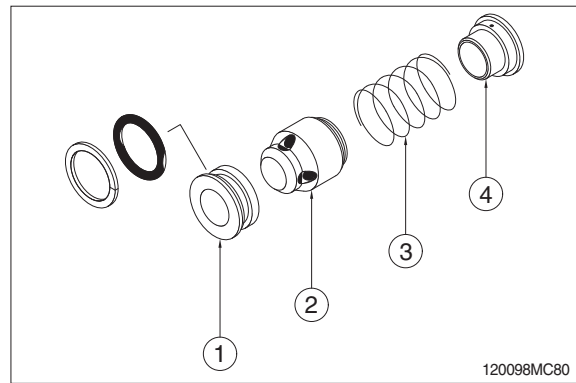
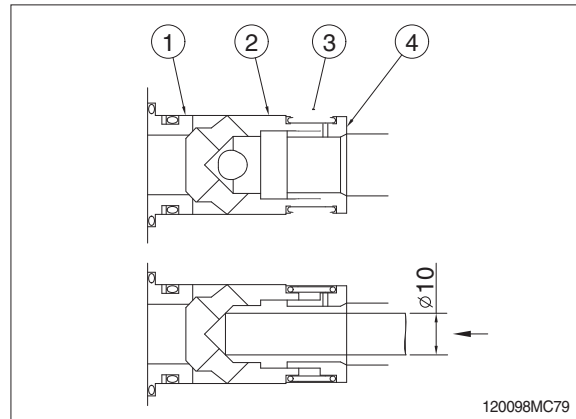
※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

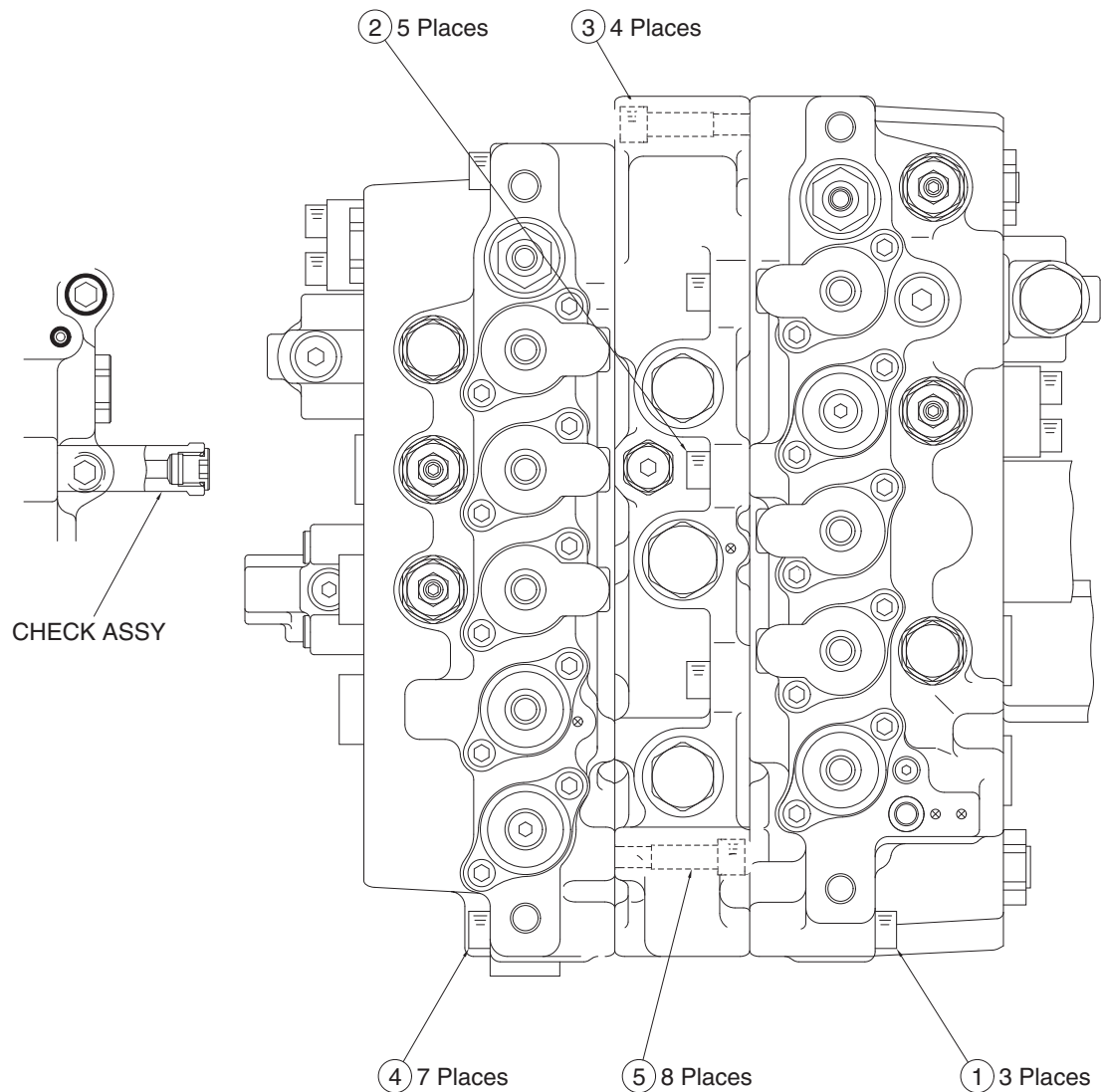
※ There is a necessity for separating housing and manifold. (refer to page 8-66)

① It begins to beat the check with the pipe lightly.

Remove seat (1), check (2), spring (3) and spring guide (4).



## (22) Separation/union of valve



120098MC81

### ① Separation

1-1. Loosen hexagon socket bolts (1), (2), (3) and remove OPT side valve.

1-2. Loosen hexagon socket bolts (4), (5) and remove TS side valve.

· Hexagon socket bolt

Width across flat : 14mm

※ Remove check assemble of the manifold earlier. (refer to page 8-67)

### ② Union

2-1. Installation respect is made smooth.

2-2. United at TS side valve earlier.

2-3. United at OPT side valve.

· Hexagon socket bolt

Tightening torque : 25.5 kgf · m (184.4 lbf · ft)

※ Install valve assy after making sure that O-ring is placed on the edge of the manifold hole.

**(23) Check valve (Boom summation)**

※ Reassembly in the reverse order to disassembly.

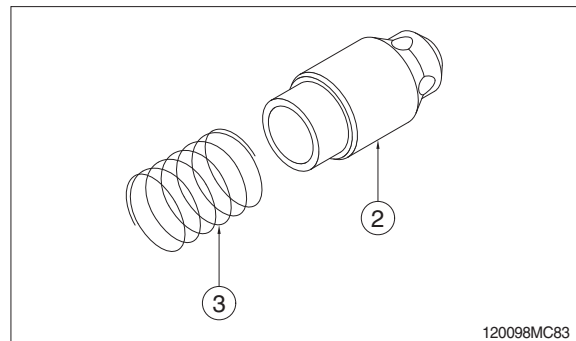
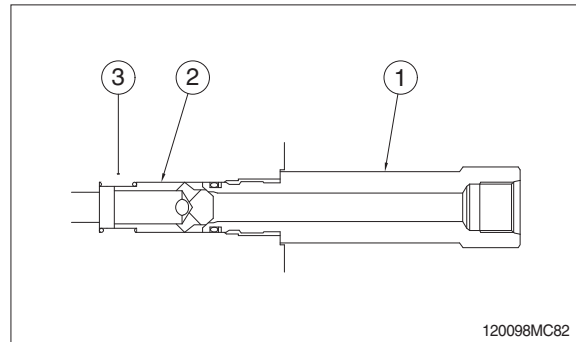
※ Attach an identification tag immediately after disassembly.

- ① Remove cap (1) and pull out check (2) and spring (3).

· Cap

Width across flat : 32 mm

Tightening torque : 10 kgf · m  
(72.3 lbf · ft)



**(24) Load holding valve (Arm 3, Boom 3)**

※ Reassembly in the reverse order to disassembly.

※ Attach an identification tag immediately after disassembly.

- ① Loosen hexagon socket bolts (1) and remove cover assembly (2).

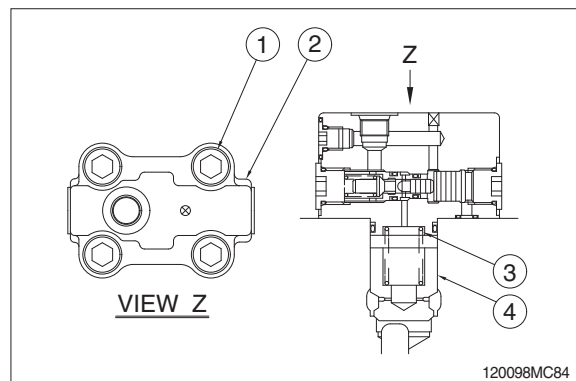
· Hexagon socket bolt

Width across flat : 12 mm

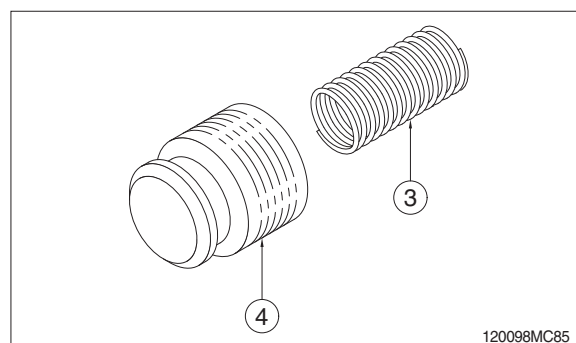
Tightening torque : 18.4 kgf · m  
(133 lbf · ft)

※ **When reassembly**

Install cover assy after making sure that O-ring is placed on the edge of the cover hole.



- ② Remove spring (3) and poppet (4).



③ Cover assembly

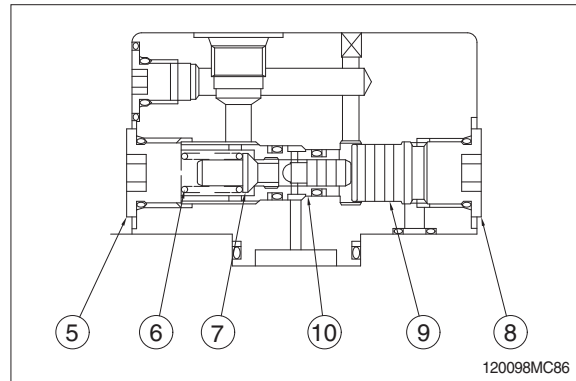
- a. Remove cap (5) and pull out spring (6), and poppet (7).

· Cap

Width across flat : 10 mm

Tightening torque : 5.1 kgf · m  
(36.9 lbf · ft)

※ There is a case where the poppet cannot be taken by the seat edge.

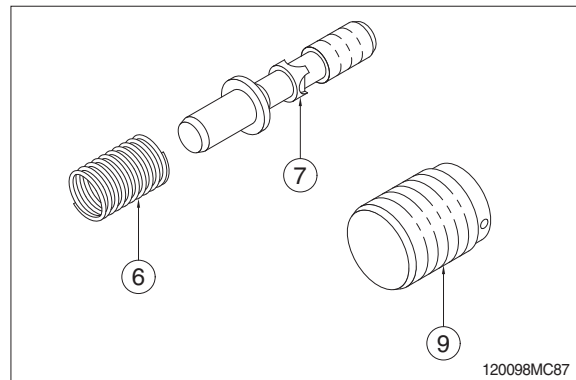


- b. Remove cap (8) and piston (9).

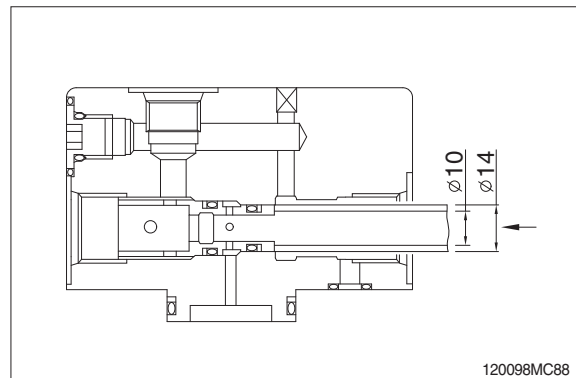
· Cap

Width across flat : 10 mm

Tightening torque : 5.1 kgf · m  
(36.9 lbf · ft)



- c. It begins to beat the sleeve with the pipe lightly.



## 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.**

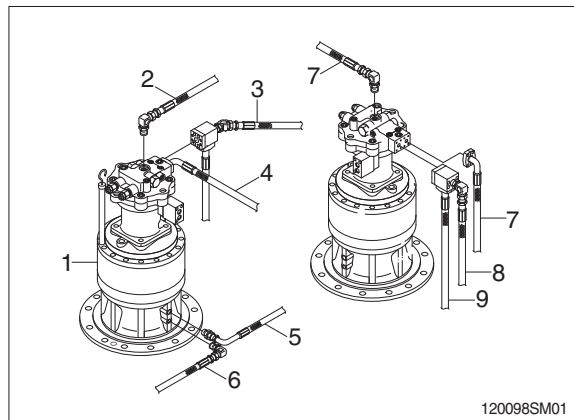
(3) Disconnect pilot line hoses (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16).

(4) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (17).

- Motor device weight : 90 kg (200 lb)
- Tightening torque :  $25 \pm 2.5 \text{ kgf} \cdot \text{m}$   
( $180 \pm 18 \text{ lbf} \cdot \text{ft}$ )

(5) Remove the swing motor assembly.

**※ When removing the swing motor assembly, check that all the piping have been disconnected.**



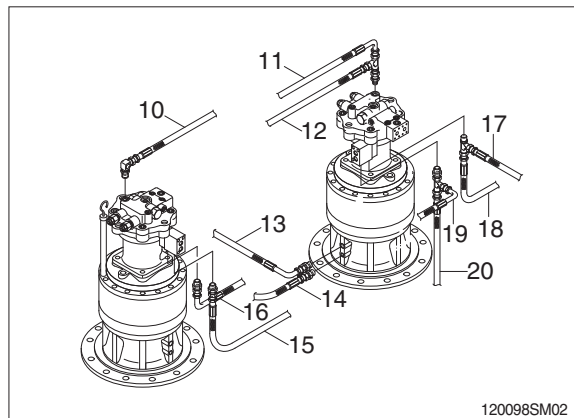
#### 2) INSTALL

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

(2) Bleed the air from the swing motor.

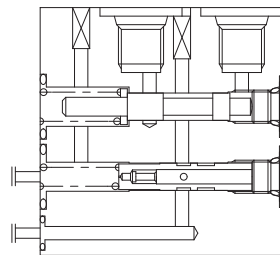
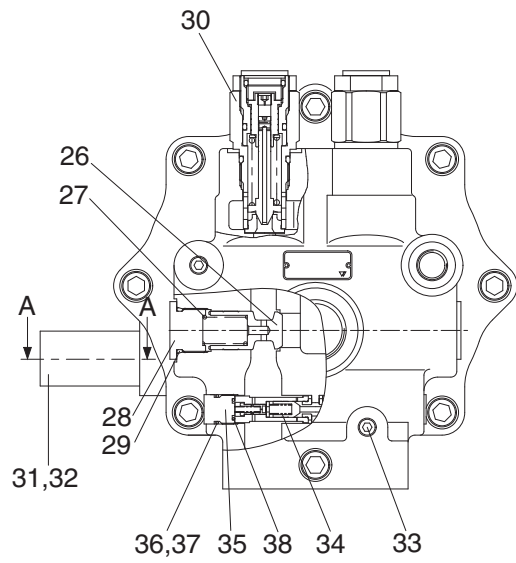
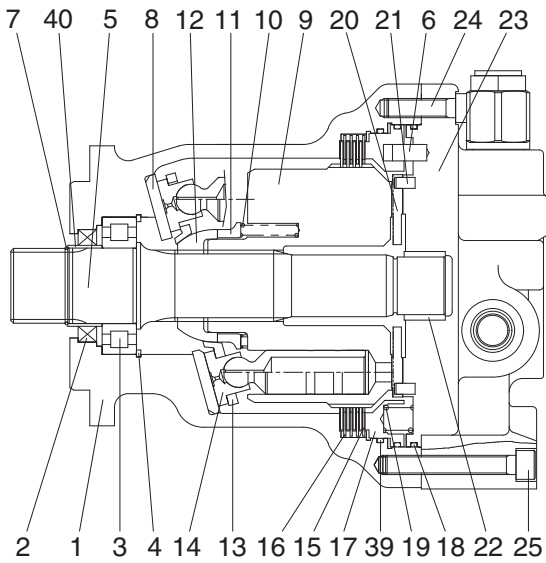
- ① Remove the air vent plug.
- ② Pour in hydraulic oil until it over flows from the port.
- ③ Tighten plug lightly.
- ④ Start the engine, run at low idling, and check oil come out from plug.
- ⑤ Tighten plug fully.

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



## 2. SWING MOTOR

### 1) STRUCTURE



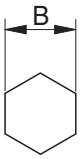
SECTION A-A

120092SM02

1	Body	15	Friction plate	29	O-ring
2	Oil seal	16	Plate	30	Relief valve assy
3	Roller bearing	17	Brake piston	31	Time delay valve
4	Snap ring	18	O-ring	32	Wrench bolt
5	Shaft	19	Spring	33	Plug
6	Pin	20	Valve plate	34	Reactionless valve assy
7	Stop ring	21	Pin	35	Plug
8	Shoe plate	22	Needle bearing	36	O-ring
9	Cylinder block	23	Rear cover	37	Back up ring
10	Spring	24	Wrench bolt	38	O-ring
11	Ball guide seat	25	Wrench bolt	39	O-ring
12	Ball guide	26	Poppet	40	Bushing
13	Set plate	27	Spring		
14	Piston assy	28	Plug		

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
Allen wrench	5	
	6	
	12	
	17	
Socket for socket wrench, spanner	36	
Torque wrench	Capable of tightening with the specified torques	
Snap ring plier (for holes, axis)	Snap ring (4)	
Solder hammer	Needle bearing (22), pin (6, 21)	
Oil seal inserting jig	Oil seal (2)	
Induction heating apparatus for bearing	Roller bearing (3)	

### (2) Tightening torque

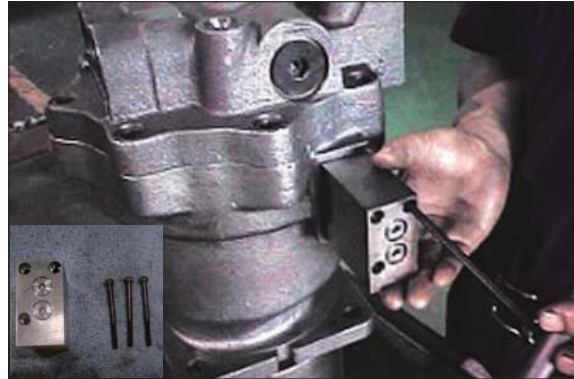
Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	in	mm
Wrench bolt	24	M14	20.9	151.2	0.47	12
Wrench bolt	25	M14	20.9	151.2	0.47	12
Relief valve	30	M33	18.0	130.2	1.42	36
Wrench bolt	32	PF 1/4	6.9	49.9	0.20	5
Plug	33	PF 1/4	20.9	151.2	0.24	6



### 3) DISASSEMBLING

#### (1) Disassemble the sub of a Turning axis

- ① Unloosing wrench bolt (32) and disassemble time delay valve assy (31) from rear cover (23).



3607A8SM01/01A

- ② Hang rear cover (23) on hoist, unloose wrench bolt (24, 25) and disassemble from body (1).



3607A8SM02

- ③ Using a jig, disassemble break piston (17) from body (1).



3607A8SM03

- ④ Disassemble respectively cylinder block assy, friction plate (15), plate (16) from body (1).



3607A8SM04

- ⑤ Disassemble shoe plate (8) from body (1).



3607A8SM05

- ⑥ Using a plier jig, disassemble snap ring (4) and shaft assy (5).



3607A8SM06/06A

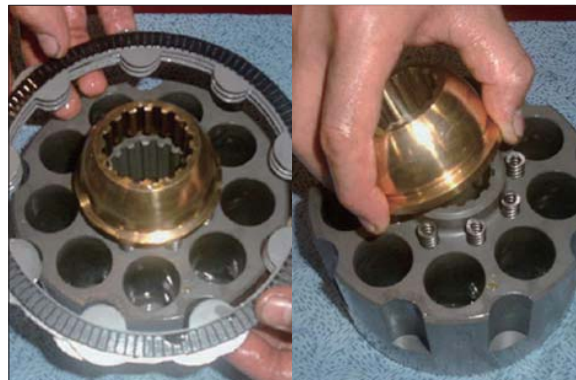
**(2) Disassemble cylinder block assy sub**

- ① Disassemble piston assy (14), set plate (13) from cylinder block assy.



3607A8SM07

- ② Disassemble ball guide (12), friction plate (15), plate (16) and ball guide seat (11) from cylinder block (9).



3607A8SM08A/08B

- ③ Disassemble spring(10) from cylinder block(9).



3607A8SM09

**(3) Disassemble rear cover assy sub**

- ① Disassemble pin(6, 21) and valve plate (20) from rear cover(23).



3607A8SM10/10A

- ② Using a torque wrench, disassemble relief valve assy(30) 2 set from rear cover(23).



3607A8SM11/11A

- ③ Disassemble make up check valve assy with a torque wrench from rear cover(23).



3607A8SM12/12A



#### 4) ASSEMBLING

##### (1) Assemble the sub of a turning axles

- ① Put roller bearing (3) on preheater and provide heat to inner wheel (compressing temp : 290°C for 2 minutes)
  - Roller bearing × 1EA



3607A8SM21

- ② After assembling and compressing preheated roller bearing (3), stop ring (7) into shaft (5).
  - Stop ring × 1EA
  - Shaft × 1EA



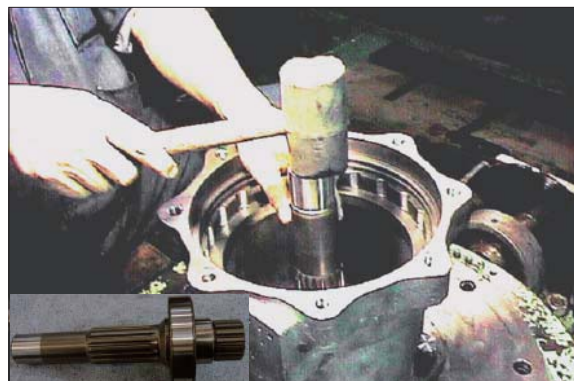
3607A8SM22/22A

- ③ Using a compressing tool and steel stick, assemble oil seal (2) into body (1).
  - Oil seal × 1EA



3607A8SM23/23A

- ④ Insert above shaft sub into body (1) and assemble it with a hammer.



3607A8SM24

- ⑤ Fix snap ring (4) to shaft with a plier jig.  
· Snap ring × 1EA



3607A8SM06

- ⑥ Spread grease on shoe plate (8) and assemble on the body.  
· Shoe plate × 1EA



3607A8SM05

**(2) Assemble the sub of cylinder block assy**

- ① Assemble spring (10) 9 set into cylinder block (9).  
· Spring × 9EA



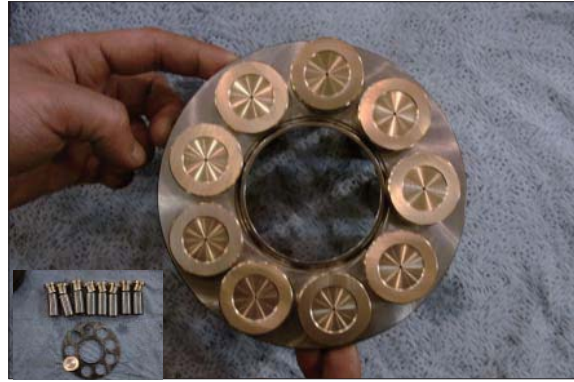
3607A8SM25

- ② Assemble ball guide (12) and ball guide seat (11) into cylinder block (9).  
· Ball guide × 1EA



3607A8SM26

- ③ Assemble piston assy (14) 9 set into set plate (13).
- Piston assy × 9EA
  - Set plate × 1EA



3607A8SM27

- ④ Assemble above item ② and ③.



3607A8SM28

- ⑤ Assemble cylinder block assy into body (1).



3607A8SM04

- ⑥ Assemble 4 set of lining plate (16), friction plate (15) respectively into body.
- Lining plate × 4EA
  - Friction plate × 4EA



3607A8SM29

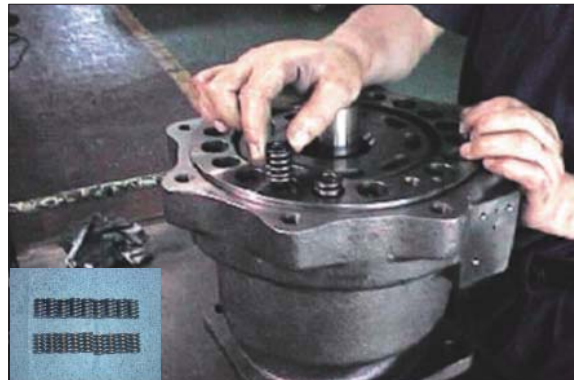


- ⑦ Assemble O-ring (18) into break piston (17).  
 · O-ring × 2EA



3607A8SM30

- ⑧ Insert break piston assy into body (1) and assemble spring (19) into break piston (17).  
 · Spring × 19EA



3607A8SM31/31A

**(3) Assemble the sub of rear cover assy sub**

- ① After assembling needle bearing (22) into rear cover (23), with a hammer assemble pin (6, 21).



3607A8SM32/32A

- ② Assemble respectively make up check valve assy spring (27), poppet (26), plug (28) into rear cover (23) after then screw it torque wrench.  
 · Make up check sub × 2set  
 · Spring × 2EA  
 · Check × 3EA



3607A8SM33/12A

- ③ Assemble relief valve assy (30) 2set into rear cover (23) with a torque wrench.



3607A8SM34/11A

- ④ Spreading grease on valve plate (20), assemble into rear cover (23).  
· Valve plate × 1EA



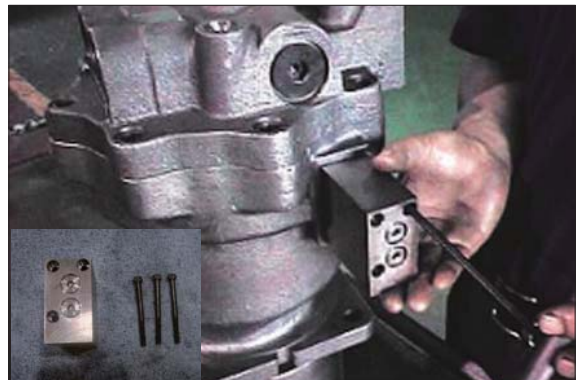
3607A8SM10/10A

- ⑤ Lift up rear cover assy on body (1) by a crane and assemble it with a wrench bolt (24, 25).



3607A8SM02

- ⑥ Assemble time delay valve assy (31) into rear cover (23) with a wrench bolt (32).

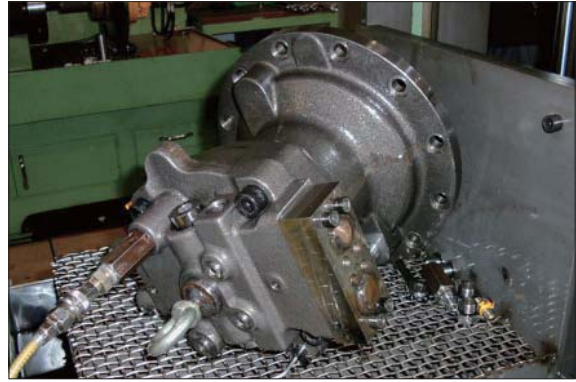


3607A8SM01/01A



**(4) Air pressing test**

Be sure of leakage, after press air into assembled motor.



14078SM232

**(5) Leakage check**

After cleaning motor by color check No.1, paint No.3 and be sure of leakage.



14078SM233/233A

**(6) Mount test bench**

Mounting motor test bench, test the availability of each part.



220078SM14

### 3. REMOVAL AND INSTALL OF REDUCTION GEAR

#### 1) REMOVAL

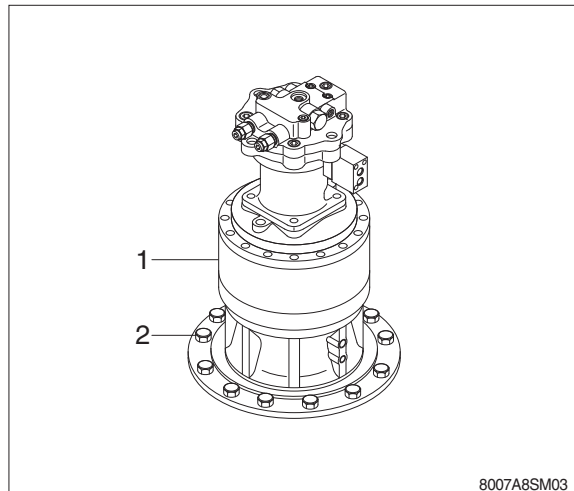
- (1) Remove the swing motor assembly.  
For details, see removal of swing motor assembly.
- (2) Sling reduction gear assembly (1) and remove mounting bolts (2).
- (3) Remove the reduction gear assembly.
  - Reduction gear device weight : 270 kg  
(600 lb)



13031GE18

#### 2) INSTALL

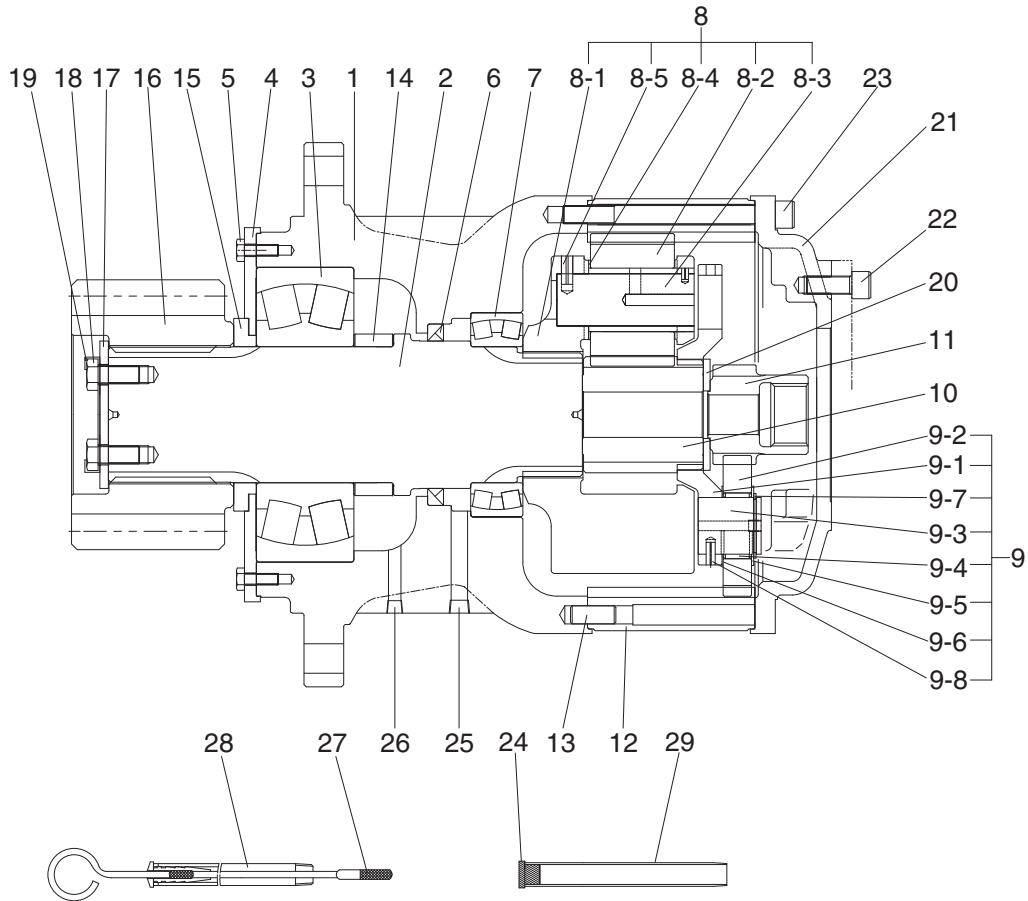
- (1) Carry out installation in the reverse order to removal.
  - Tightening torque :  $100 \pm 15 \text{ kgf} \cdot \text{m}$   
( $723 \pm 109 \text{ lbf} \cdot \text{ft}$ )



8007A8SM03

## 4. REDUCTION GEAR

### 1) STRUCTURE



120092SM03

1	Casing	9-1	Carrier 1	16	Pinion gear
2	Drive shaft	9-2	Planetary gear 1	17	Lock plate
3	Roller bearing	9-3	Pin 1	18	Hex bolt
4	Cover plate	9-4	Needle cage	19	Lock washer
5	Hex bolt	9-5	Side plate 2	20	Thrust ring
6	Oil seal	9-6	Side plate 1	21	Cover
7	Roller bearing	9-7	Stop ring	22	Socket bolt
8	Carrier assy 2	9-8	Spring pin	23	Socket bolt
8-1	Carrier 2	10	Sun gear 2	24	Socket plug
8-2	Planet gear 2	11	Sun gear 1	25	Plug
8-3	Pin 2	12	Ring gear	26	Plug
8-4	Washer	13	Knock pin	27	Gauge bar
8-5	Spring pin	14	Spacer ring	28	Gauge pipe
9	Carrier assy 1	15	Spacer	29	Air breather assy

## 2) DISASSEMBLY

### (1) Removal of cover

- ※ Loosen the socket bolt (23) with 16mm hexagonal socket and remove the cover (21).

### (2) Removal of sun gear 1 and thrust ring assembly

Remove carrier 1 (9), install eye bolt to tap hole (M10) and remove carrier 1 assembly itself.



3607A8SR03

### (3) Removal of sun gear 2

Remove sun gear 2 (10), install eye bolt to tap (M10) of carrier 2 (8) and remove carrier 2 assembly itself.



3607A8SR04

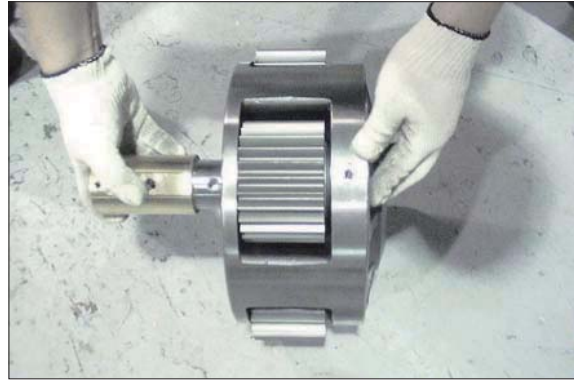
### (4) Disassembly of 2nd carrier assembly

- ① Insert spring pin (8-5) into pin assy 2 (8-3) by hammering.
- ※ Do not reuse spring pin after removal.



3607A8SR05

- ② Remove pin assy 2 (8-3) from carrier 2 (8-1), planetary gear 2 (8-2) and thrust washer (8-4) with hands.



3607A8SR06

**(5) Removal of ring gear**

Remove ring gear (12) from casing (1).

- ※ Fluid packing is applied on contacting face of ring gear and gear casing.  
Therefore, remove ring gear from casing by minus screw driver.



3607A8SR07

**(6) Removal of drive shaft (2) assembly**

- ① Spread off the corners of spacer (15), cover plate (4) and hex bolt (5) with a tool.



3607A8SR08

- ② Install hydraulic press at the end face of shaft, and remove drive shaft (2), spacer ring (14), and roller bearing (3) as assembly.

- ※ Do not reuse oil seal after removal.



3607A8SR09



- ③ Remove roller bearing (7) from gear casing (1).



3607A8SR10

- ④ Remove oil seal (6) from gear casing (1).



3607A8SR11

**(7) Disassembly of shaft assembly**

Insert motor side of shaft (2) into steel tube (inner dia :  $\varnothing$  145 mm) and push the end of output shaft side with hydraulic press and then remove roller bearing (3), and spacer ring (14) as assembly from drive shaft (2).



3607A8SR12

### 3) ASSEMBLY

#### (1) Assembly of drive shaft assembly

① After assembly drive shaft (2), heat roller bearing (3) up to 50°C plus surrounding temperature and assemble it to shaft with hydraulic press and then assemble spacer ring (14) in this order.

※ Pay attention to the assembling direction of cover plate (4).



3607A8SR13

#### (2) Installation of oil seal

Remove oil from assembled face of oil seal of gear casing (1) and oil seal (6).

Apply fluid packing (three bond of white color) on outer face of oil seal and assemble at pressing jig of gear casing.

After inserting with press, lubricate oil seal with grease.



3607A8SR14

#### (3) Assembly of drive shaft assembly

① Be careful lest oil seal lip damage by spline of drive shaft (2).

Assemble drive shaft assembly by using seal guide.

② Put drive shaft of gear casing (1) upward. Assemble drive shaft assembly to gear casing by tightening eye bolt into tap hole (M16) of output side of drive shaft (2).

※ Place support (approx 150 mm) below of gear case (1) for seal protector contact with work table.



3607A8SR15

#### (4) Install of roller bearing

Put gear casing under output shaft and heat roller bearing (7) up to 50°C plus surrounding temperature and then assemble it to the shaft.



3607A8SR16

#### (5) Assembly of ring gear

- ① Remove oil from mating faces between gear casing (1) and ring gear (12), and knock pin (13). Assemble collar of gear casing and apply fluid packing (three bond of grey color).



3607A8SR17

- ② Assemble ring gear (12).



36078SR18

#### (6) Assembly of carrier 2 assembly

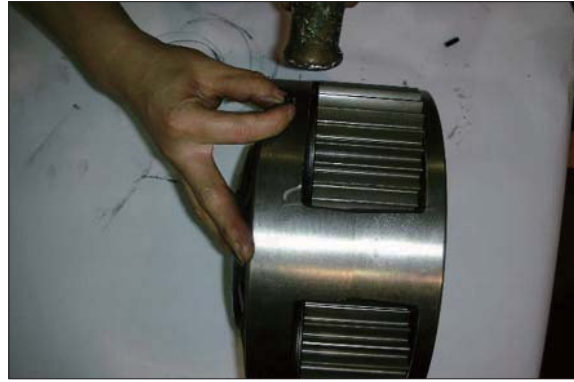
- ① Assemble planetary gear 2 (8-2) to carrier 2 (8-1) with thrust washer (8-4) and insert pin assy 2 (8-3).
- ※ Lubricate gear oil to inside of gear and outside of shaft.



3607A8SR19



- ② Insert spring pin (8-5) by hammering.
- ※ Insert as the clearance between spring pins toward planetary gear 2 (8-2).



3607A8SR20

**(7) Assembly of carrier 2 assembly and sun gear 2**

- ① Mount eye bolt into tap hole (M10) of carrier 2 (8) and lift carrier assembly and then insert carrier assembly being engaged with internal teeth of ring gear (12). Rotate carrier assembly lightly so that splines of drive shaft (2) are engaged.



3607A8SR21

- ② Insert sun gear 2 (10) to planetary gear 2 (8-2).



3607A8SR22

**(8) Assembly of sun gear 1, carrier 1 assembly**

- ① Mount eye bolt into tap hole (M10) of lift carrier assembly and then insert carrier assembly being engaged with internal teeth of ring gear (12). Rotate holder assembly lightly so that sun gear 2 (10) is engaged with teeth of carrier 1 (9-1).



3607A8SR23

- ② Insert sun gear 1 (11) to planetary gear 1 (9-2).



- (9) Check rotation of sun gear by turning plunge part of gear casing with hands.

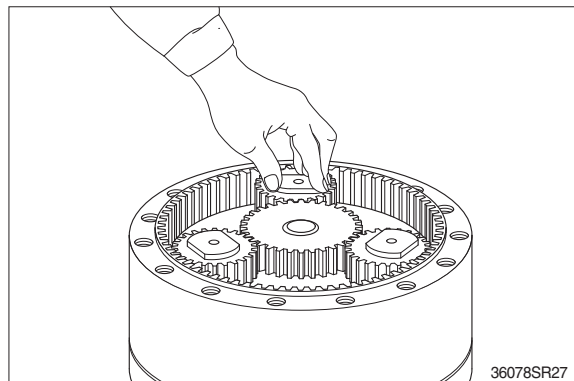
**(10) Assembly of cover**

Remove oil from mating faces between ring gear (12) and cover (21) and apply fluid packing.

Assemble cover (21) and tighten socket bolt (23) with 16mm hexagonal socket.

Tightening torque :  $25 \pm 2.5 \text{ kgf} \cdot \text{m}$   
( $180 \pm 18 \text{ lbf} \cdot \text{ft}$ )

This completes assembly

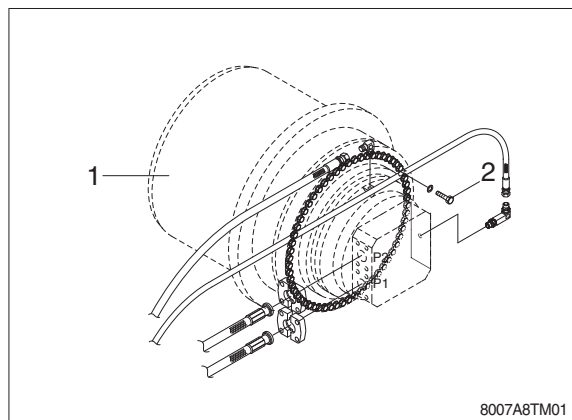


## GROUP 6 TRAVEL DEVICE

### 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 hose.
  - ※ **Fit blind plugs to the disconnected hoses.**
- (7) Remove the bolts and the sprocket.
- (8) Sling travel device assembly (1).
- (9) Remove the mounting bolts (2), then remove the travel device assembly.
  - Weight : 935 kg( 2060 lb)

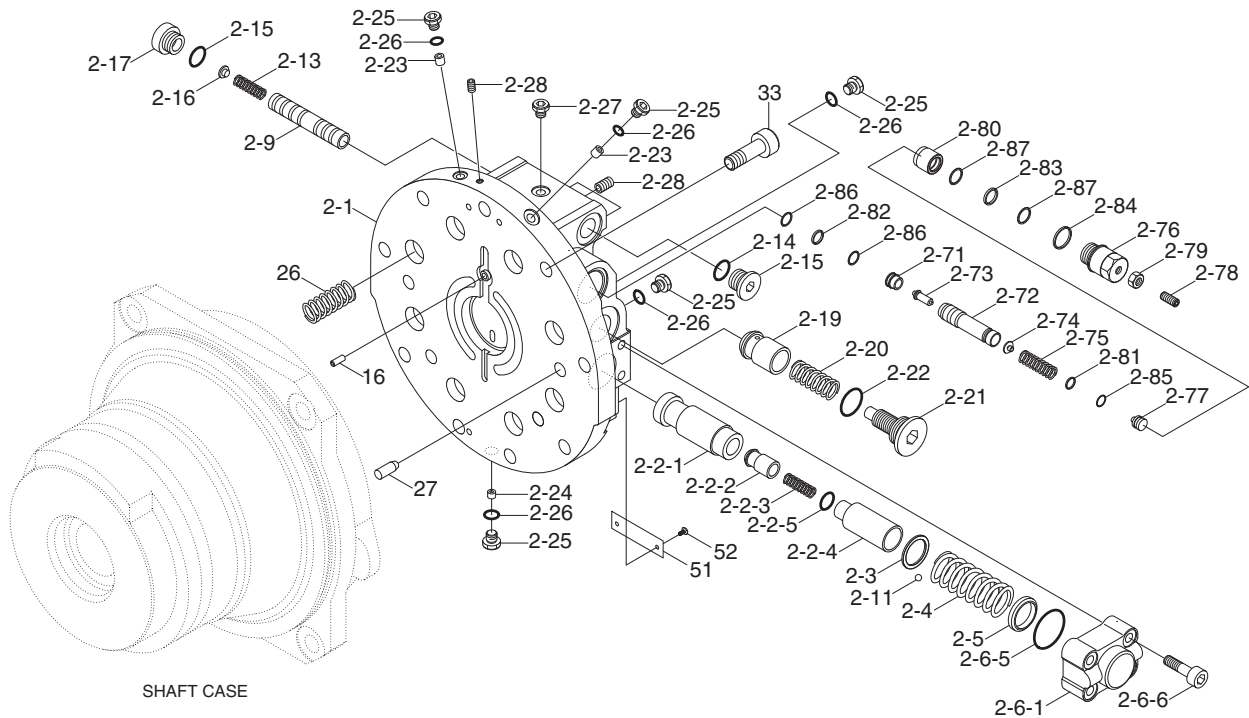


#### 2) INSTALL

- (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

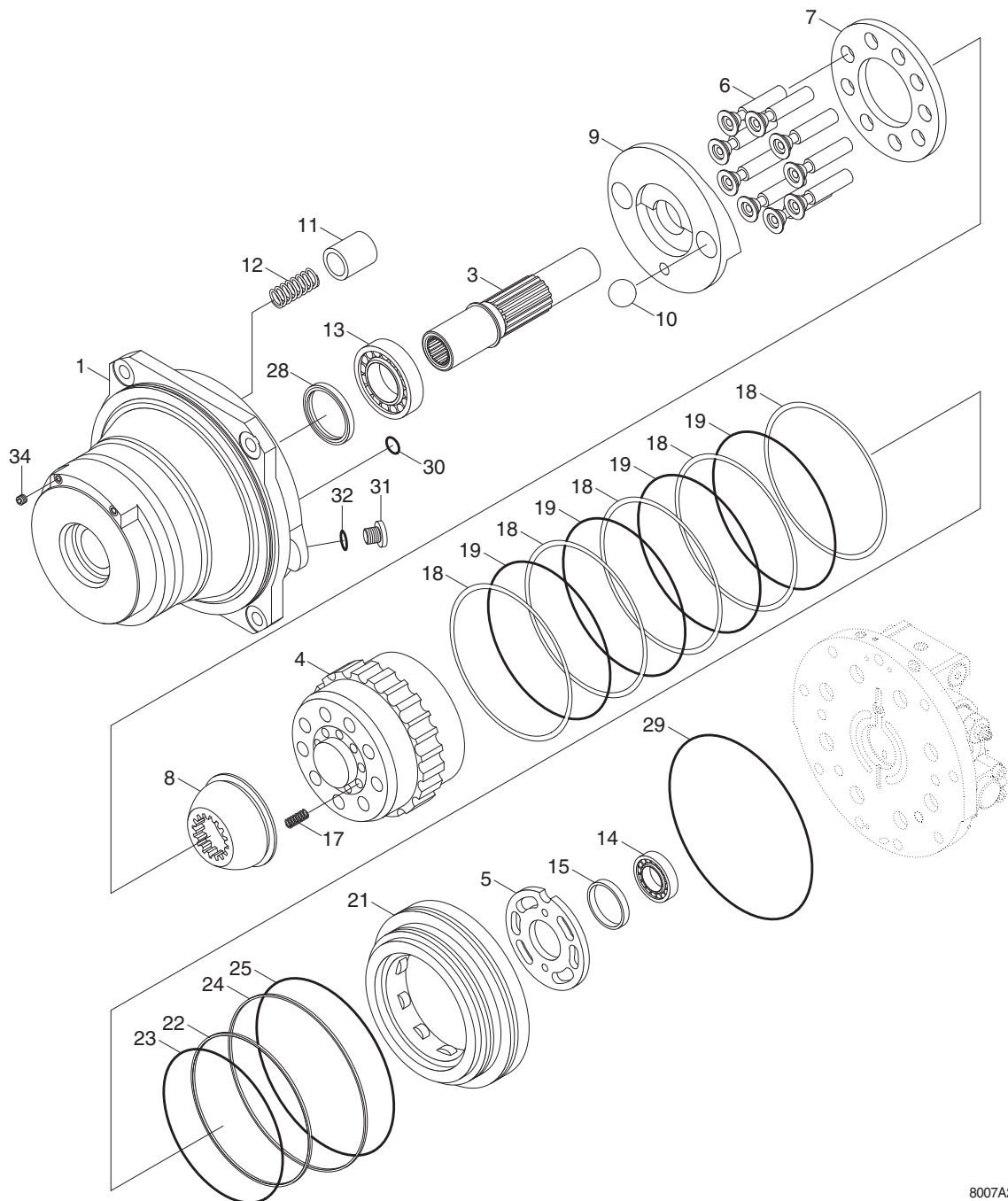


8007A2TM02

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**

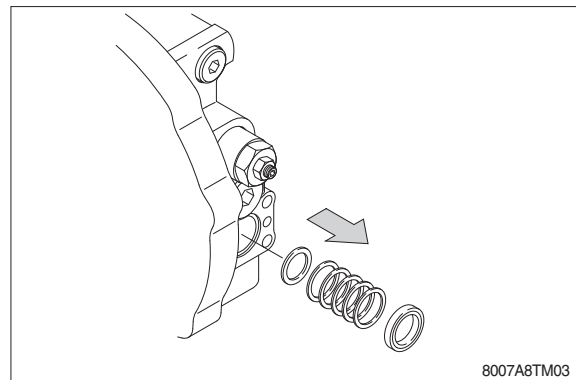
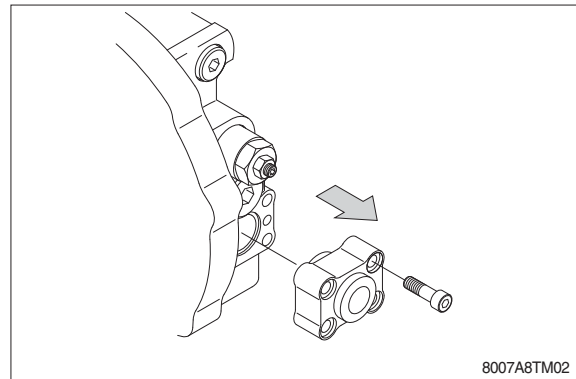
#### **(1) General precautions**

- 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.

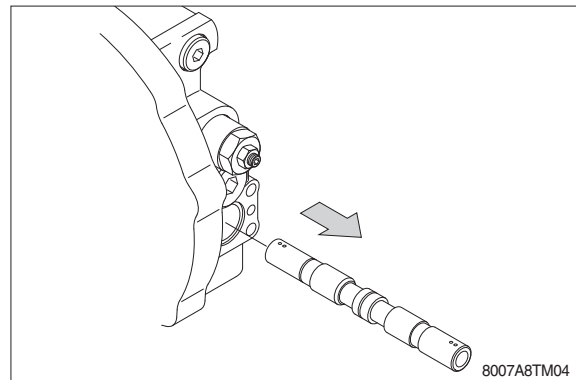


## (2) DISASSEMBLY TRAVEL MOTOR

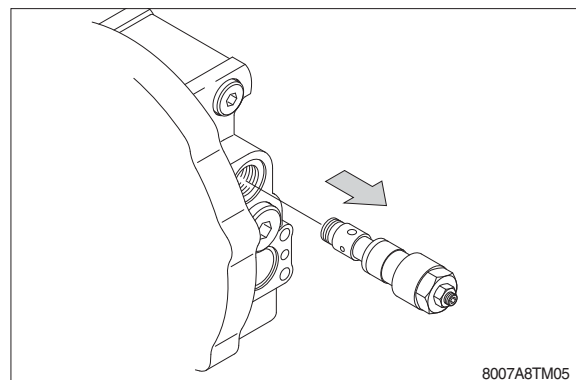
- ① Remove cap (2-6) and take out spring (37), spring seat (36).



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

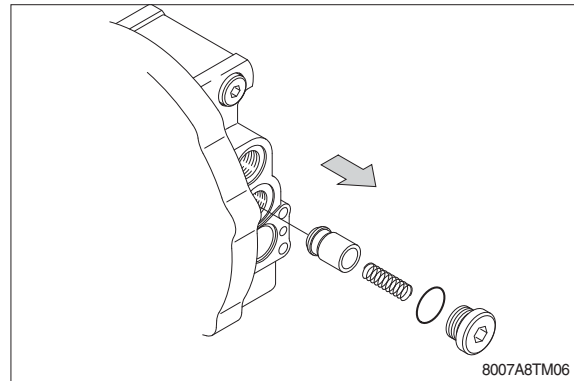


- ③ Loosen the plug (2-7-6) to remove the relief valve assembly (2-7).
  - ※ Do not move the setscrew, nut. Otherwise, the set pressure will change.
  - ※ Do not disassemble the relief valve assembly because it is a functional component.

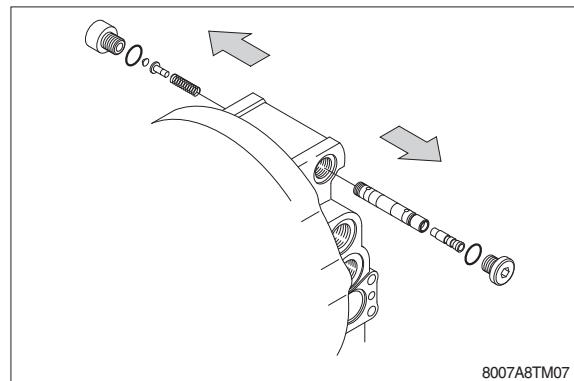




- ④ Remove plug (2-21), spring (2-20) and check valve (2-19).



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



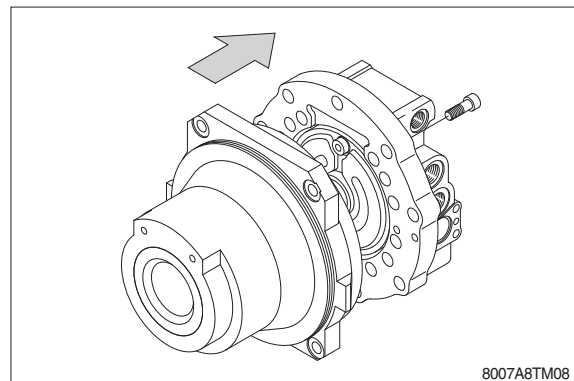
- ⑥ Remove socket head bolt (33).

- Points

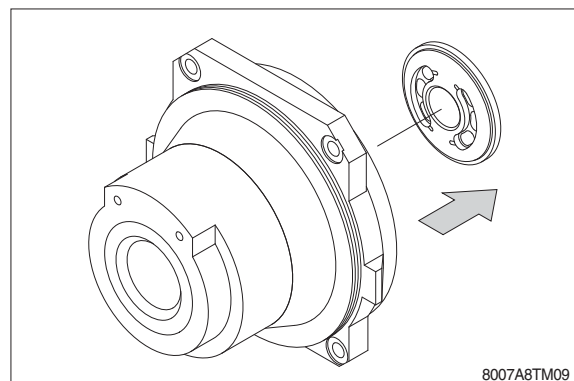
To disassemble the motor easily, socket head bolt (33) should be loosened evenly because base plate (1-2-1) lift up by the reactive force of springs (26).

- Remove base plate (1-2-1).

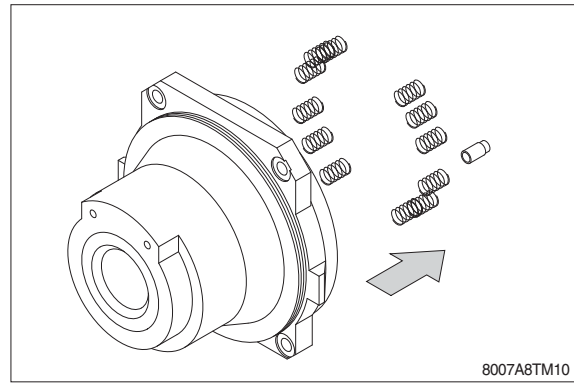
Then, pay attention so that cylinder block does not come out. When it is difficult to remove, strike it by use of plastic hammer. If it is more difficult to remove, remove it by lightly prying with screwdriver.



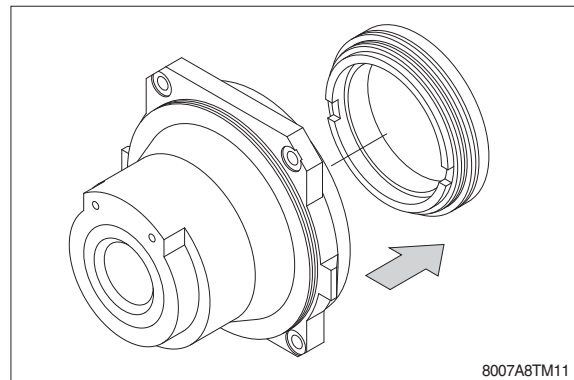
- ⑦ Remove valve plate (5) from base plate (1-2-1).



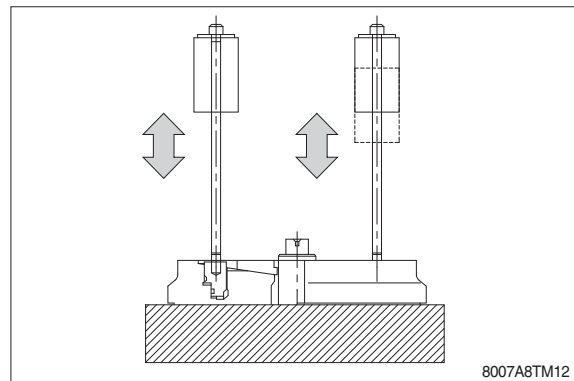
- ⑧ Remove O-rings (29)(30), pins (27) and springs (26).



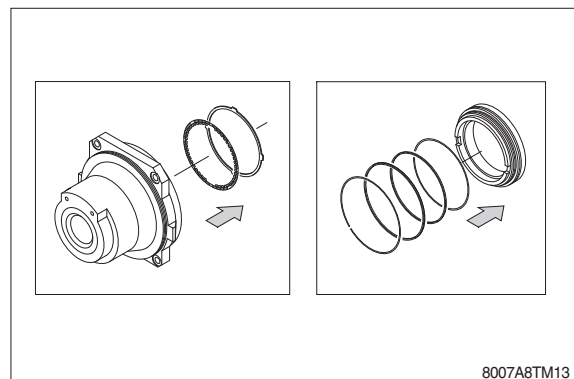
- ⑨ Remove brake piston (21).  
Blow compressed air into parking brake-releasing port on case (1).



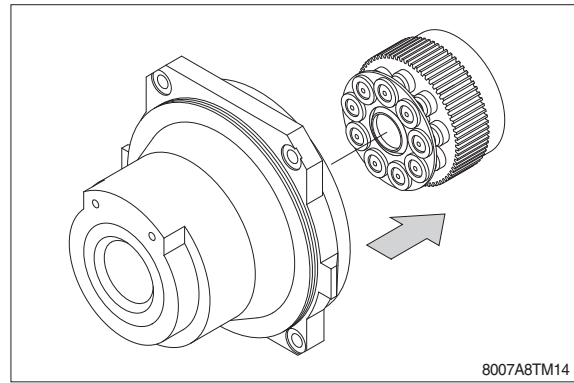
- ※ Before work, put rag on all surface of brake piston because brake piston fly out and oil flies off while at work.



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

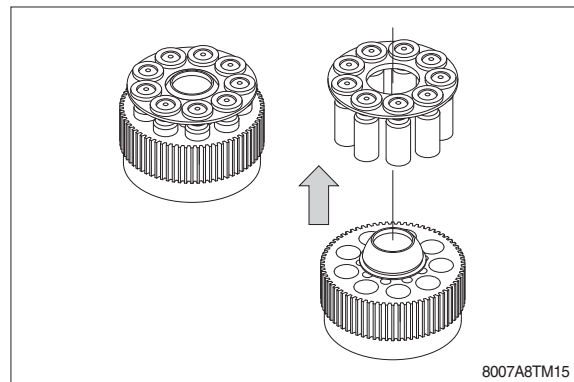


⑩ Remove cylinder block assy.

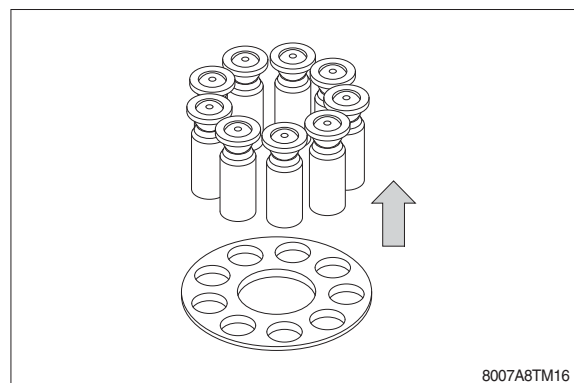


⑪ Disassemble cylinder block assy.

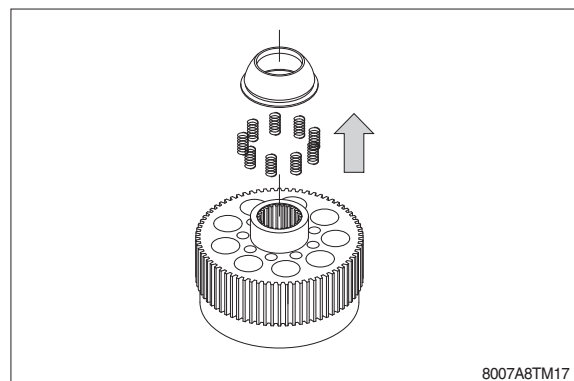
a: Remove piston assy (6) and retainer plate (7) from cylinder block (4).



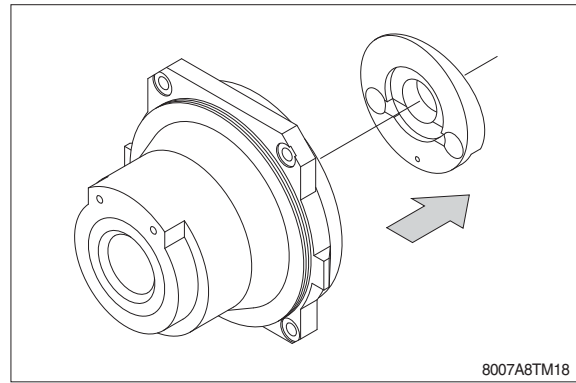
b: Remove piston assy (6) from retainer plate (7).



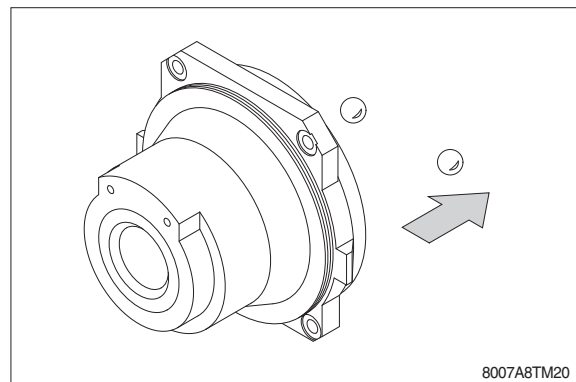
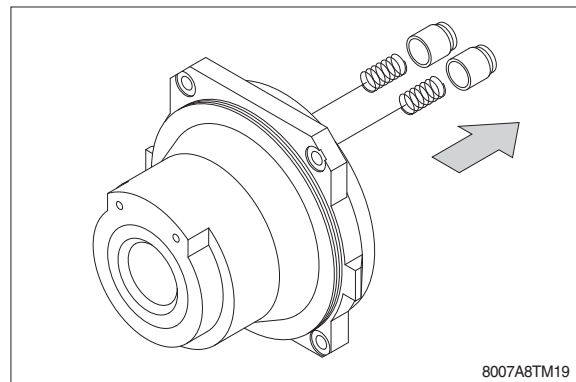
c: Remove retainer holder (8) from cylinder block (4).  
And then, remove springs (17) from cylinder block (4).



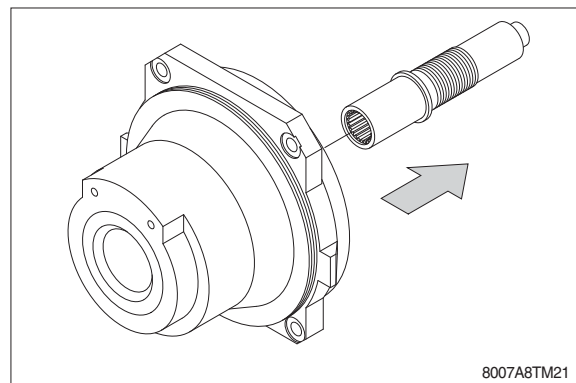
⑫ Remove swash plate (9).



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



⑭ Remove shaft (3).

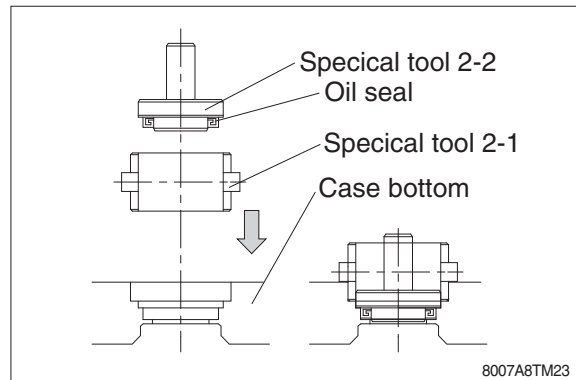
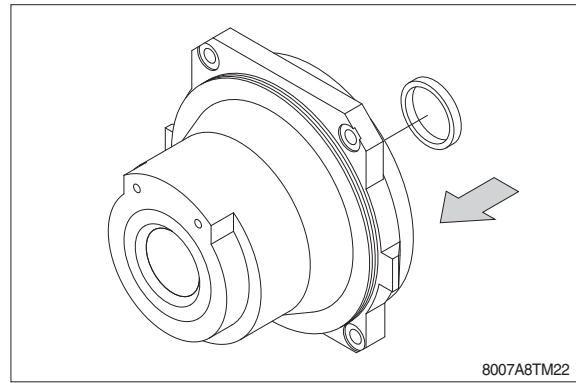


#### 4) REASSEMBLY

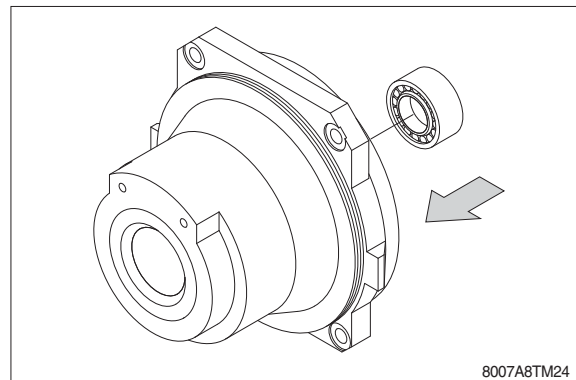
##### (1) General precautions

- 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).

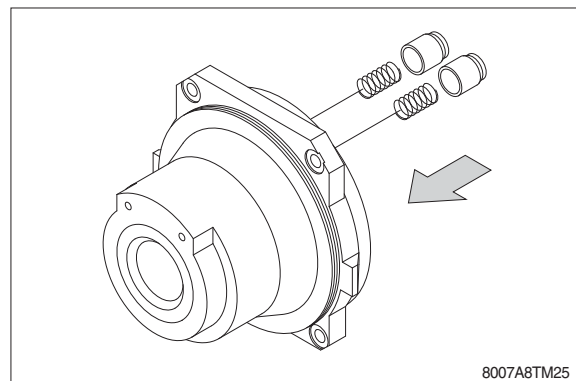


- ② Press fit the outer race of roller bearing (13) in case (1).



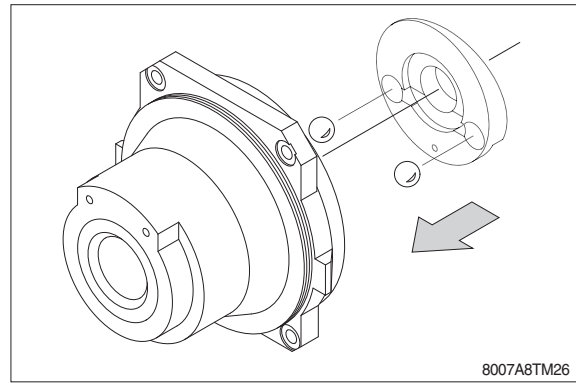
- ③ Install springs (12) and piston assy (11) on case (1).

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



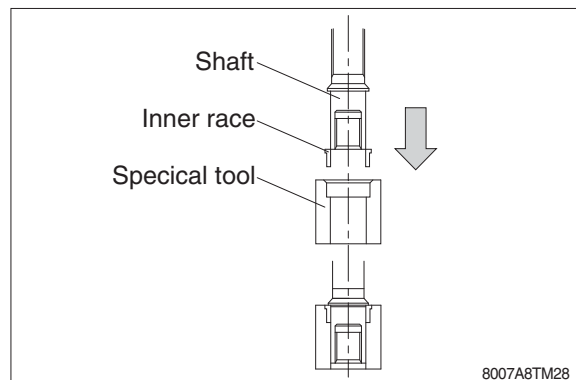
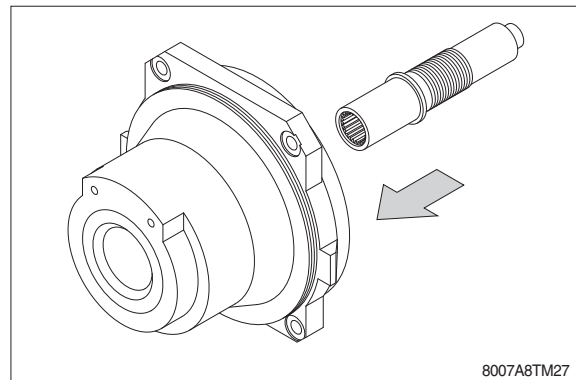
④ Install steel ball (10).

※ Apply hydraulic oil to the surface of the steel ball.



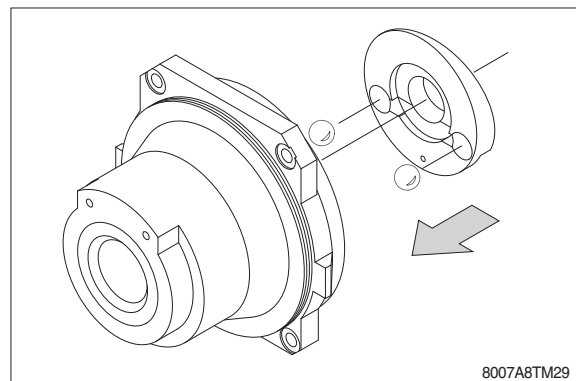
⑤ Press fit Inner race of roller bearing (13) on shaft (3).

And then, install shaft sub assy on case (1).

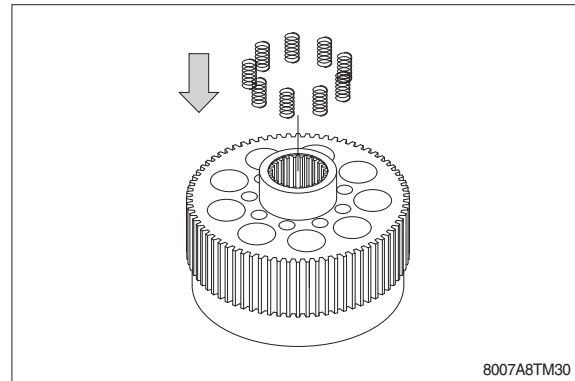


⑥ Install Swash plate (9).

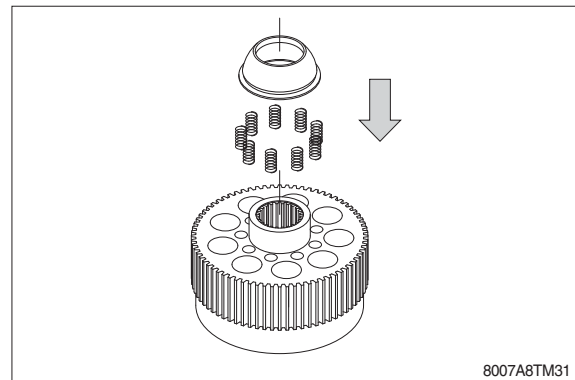
※ Apply hydraulic oil to the surface of the steel ball.



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

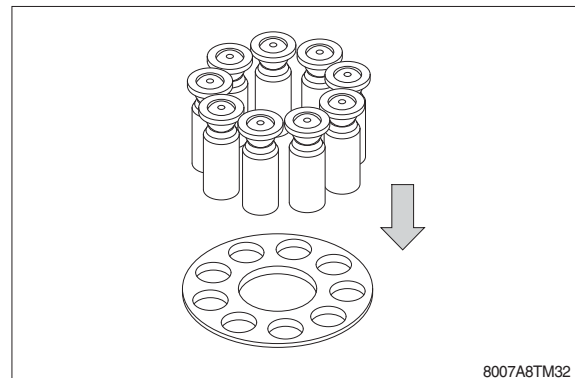


⑧ Install retainer holder (8) on cylinder block (4).



⑨ Install 9 piston assy (6) in each holes of retainer plate (7).

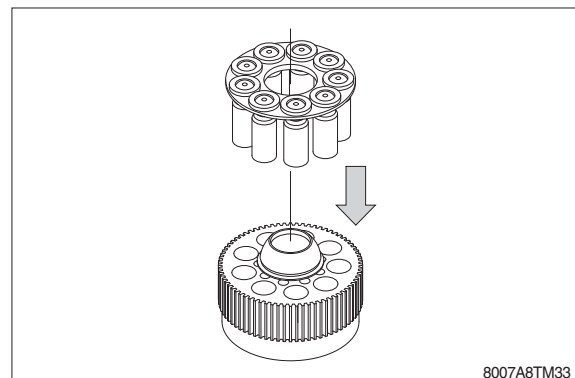
※ **Be care for the direction of the retainer plate.**



⑩ Install piston assy (6) and retainer plate (7) in cylinder block (4).

※ **Apply hydraulic oil in 9 holes of cylinder block.**

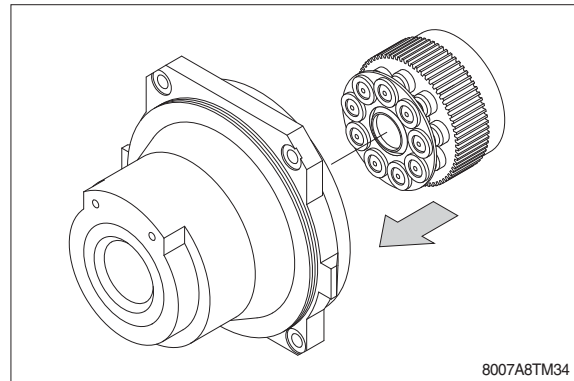
Apply hydraulic oil on the surface of retainer holder (8) and retainer plate (7).





⑪ Install cylinder block assy.

※ Apply hydraulic oil on the surface of piston assemblies (6) and swash plate (9).



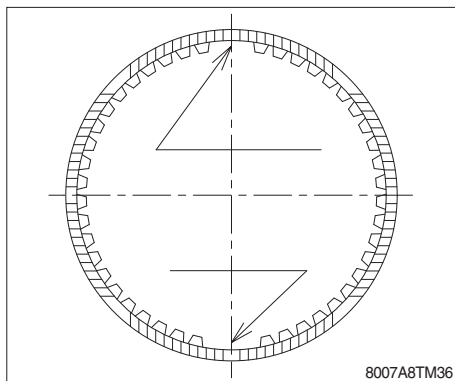
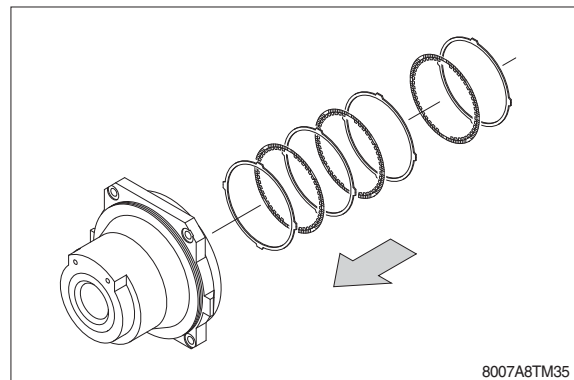
⑫ Install friction plates (18) and disk plates (19).

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 the case.

c: 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).

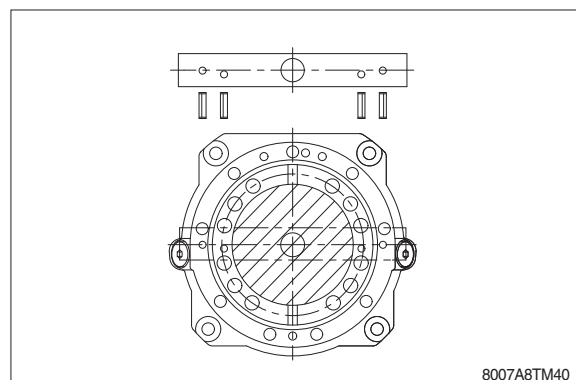
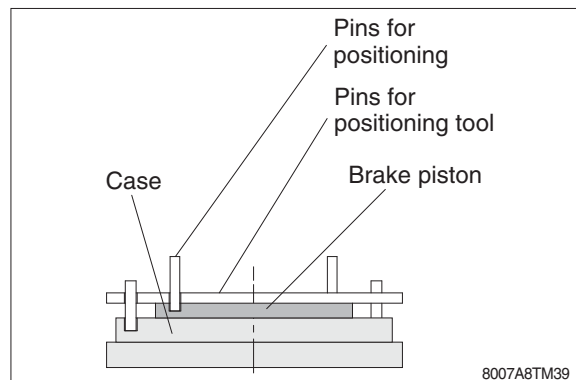
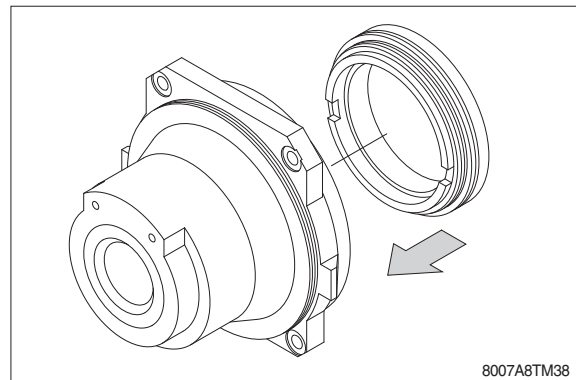
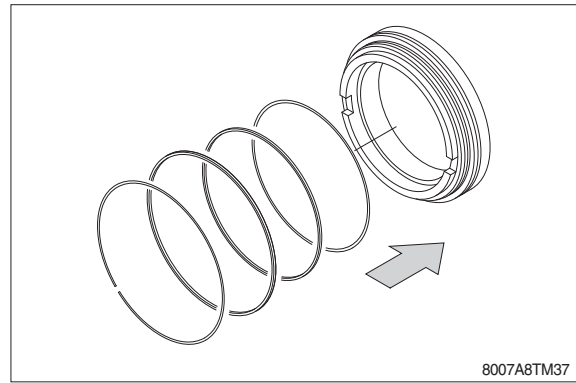
And install brake piston (21) to case (1) to align pins (27) installed on base plate in No.\*\* with holes on brake piston (21).

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

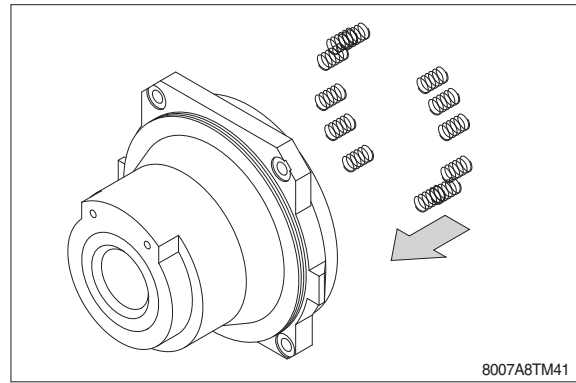
a: Each backup rings should be set out side position.

b: Be careful of installing direction of brake piston.

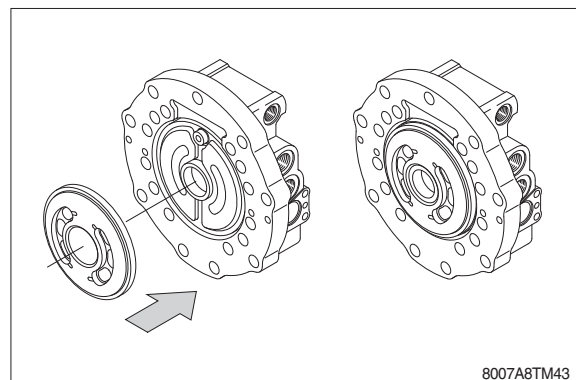
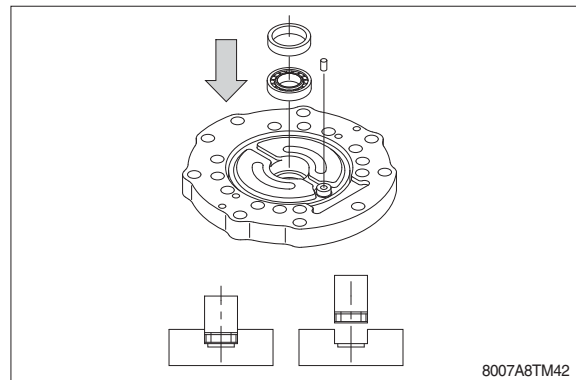
c: Apply grease to outside of brake piston and inside of case (1).



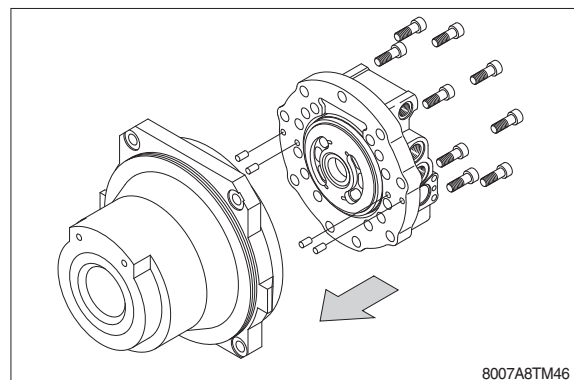
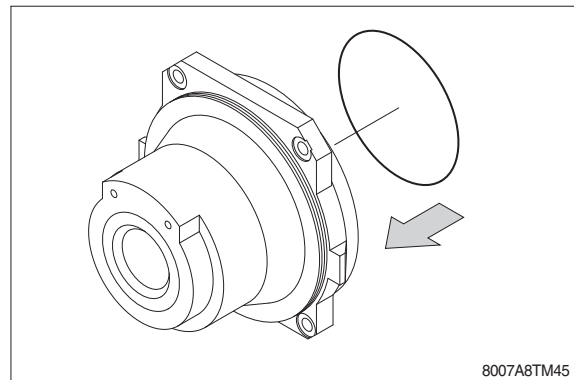
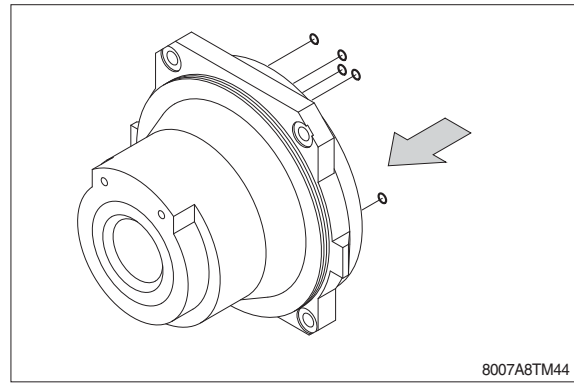
- ⑭ Install springs (26) in the holes of brake piston (21).



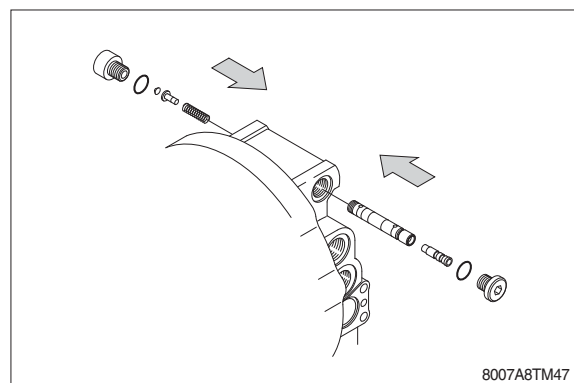
- ⑮ Press fit roller bearing (14) on base plate (2-1).  
Install pins (16) and color (15) on base plate (2-1).  
※ **Apply grease to the surface of valve plate (25) and base plate (2-1).**



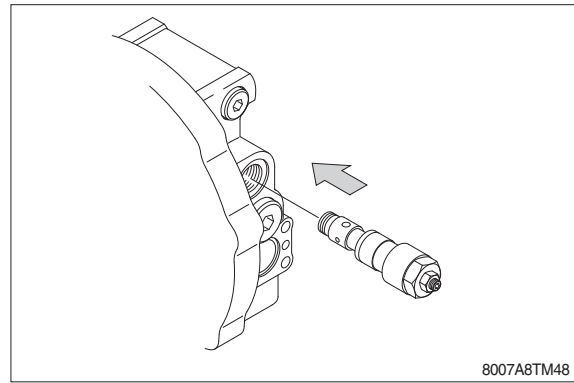
- ⑩ Install O-rings (29)(30) on case (1).  
 Install pins (27) on base plate (2-1).  
 Install base plate (2-1) and socket head bolt (9).
- a: Apply grease to O-ring (25).
  - b: Do not apply grease to O-ring (30).
  - c: Be care for direction of pin (27).
  - d: Apply hydraulic oil to the surface between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



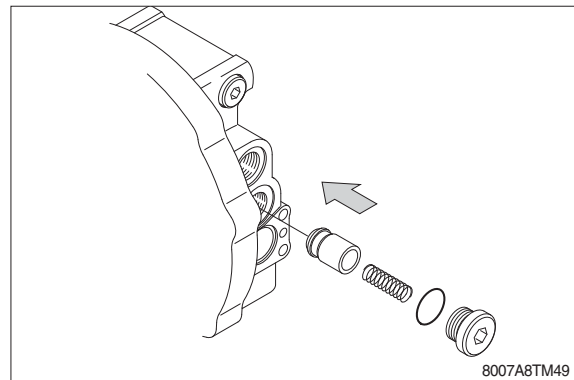
- ⑪ Place spring (2-13) on valve assy (2-9), and then install valve assy on base plate (2-1).  
 Tighten plug (2-14) with O-ring (2-15).  
 Place spring guide (2-16) and washer (2-18), and then tighten plug (2-17) with O-ring (2-15).
- ※ **Apply hydraulic oil to valve assy before installation.**  
 Apply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



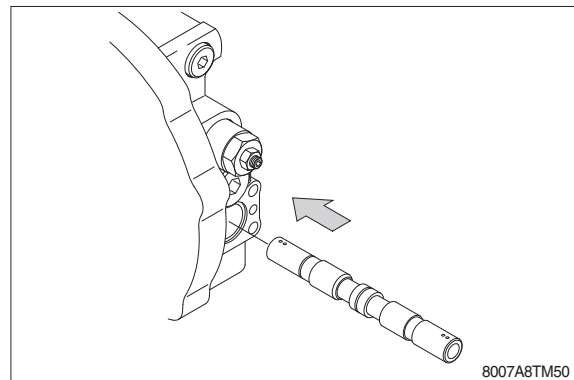
- ⑱ Tighten relief valve assemblies (2-7).  
※ Apply slight grease to O-rings (2-7-12)  
and backup rings (2-7-16).



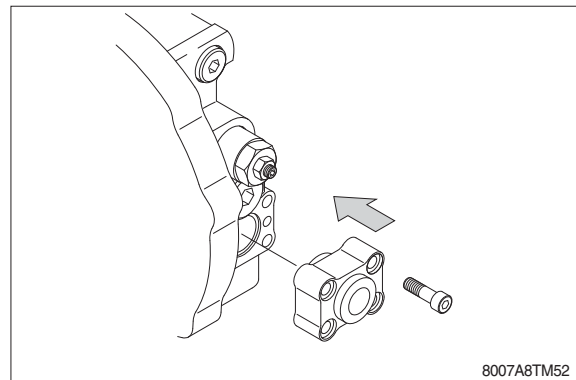
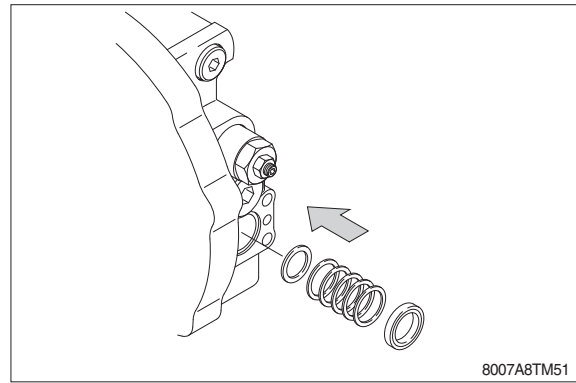
- ⑲ Place check valve (2-19) and springs (2-20).  
Tighten plug (2-21) with O-ring (2-22).  
※ Apply slight grease to the O-rings.



- 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.

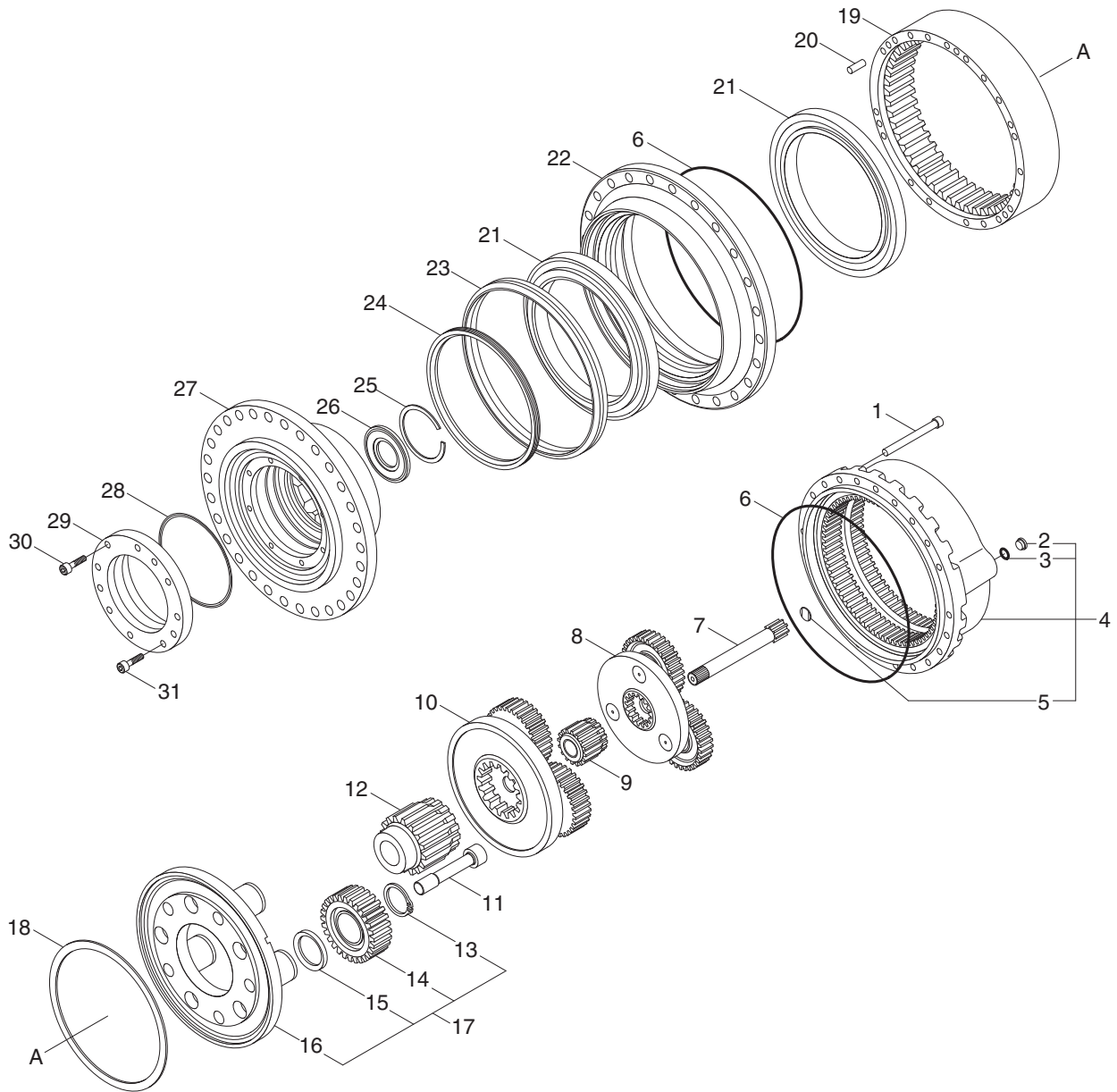


- ② Place spring seats (2-3) and springs (2-4).  
Install O-rings (2-10) on base plate (2-1).  
Install O-rings (2-6-5) on cap assy (2-6).  
Place spring seats (2-5) on cap assy (2-6), and then install them on base plate (2-1).  
\* Tighten socket head bolts (2-6-6).  
Apply grease to O-rings (2-6-5).



### 3. REDUCTION GEAR

#### 1) STRUCTURE



120092TM01

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



## 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 adapter flange (29).



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



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



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



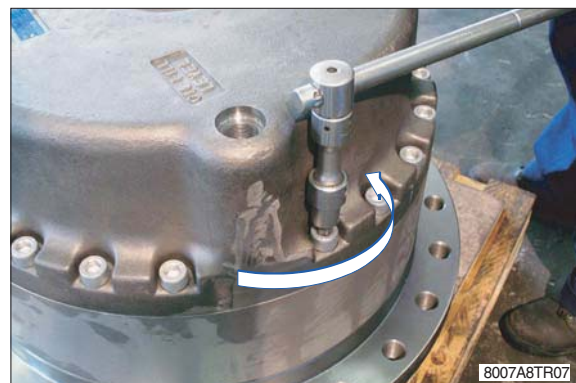
(5) By using a tackle and the equipment turn the gearbox upside down.



(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 (7) in order to remove it from the end cover (4).

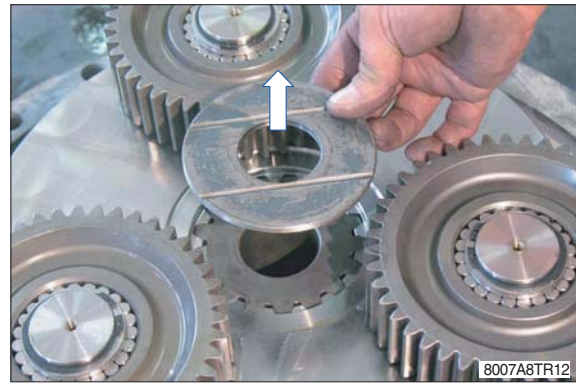


(11) Remove the 1st stage sun gear (7).





(12) Remove the centering ring.



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



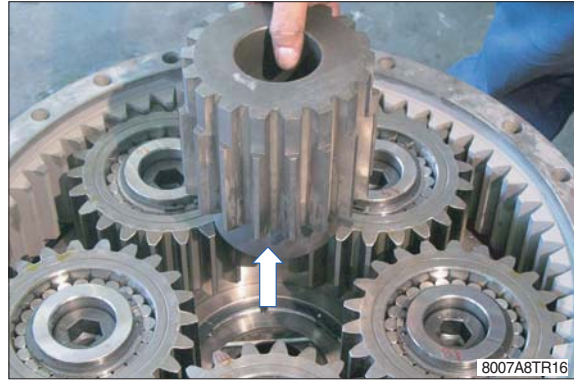
(14) Remove the 2nd stage sun gear (9).



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



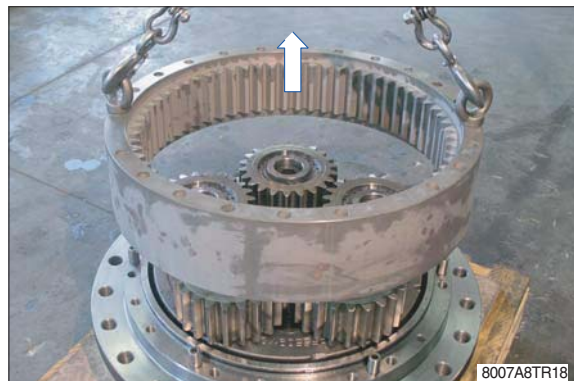
(16) Remove the 3rd stage sun gear (12).



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



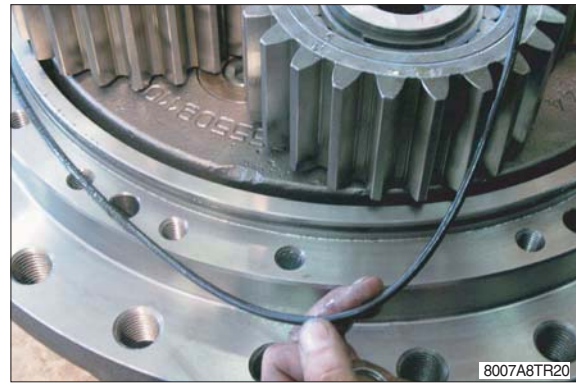
(18) Tighten 2 eyebolts on the toothed ring (19) and by using a tackle remove it from the gearbox housing (22).



(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).





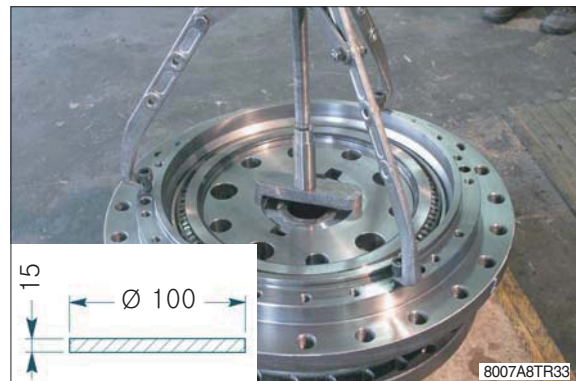
(28) By using a tackle remove the planetary carrier (16) from the gearbox housing (22).



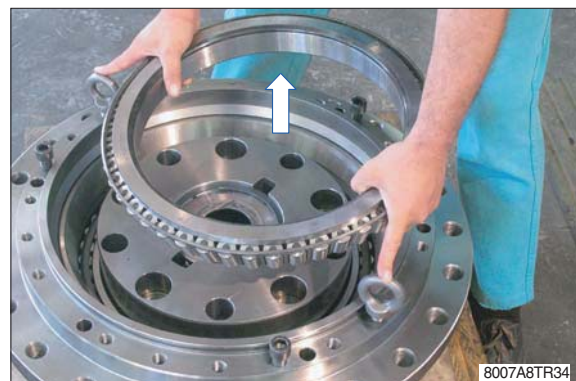
(29) By using a screwdriver, remove the spacer (18) from the planetary carrier (16).



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

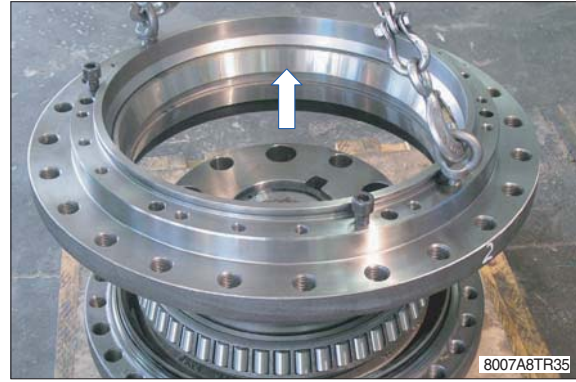


(31) Remove the bearing inner ring (21) from its seat in the gearbox housing (22).



(32) Tighten 2 eyebolts 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.



## 1) REASSEMBLY

※ The pieces that are subject to general wear and tear are the following :

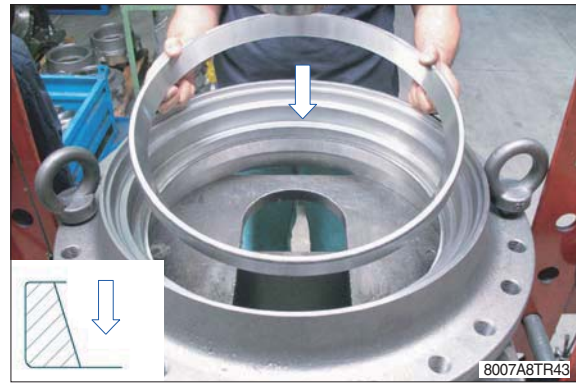
- Gears
- Bearings
- All the seals

※ Replace the used or irregular parts respecting the following steps:

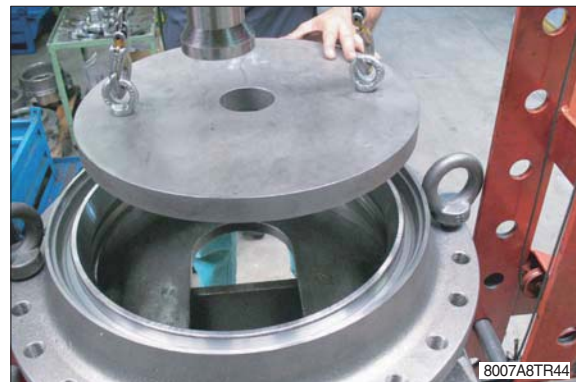
- Accurately remove dirt, and in particular properly clean the seals, bearings and locking rings seating.
- Lubricate the parts before connecting them.
- In the case of damaged gears, for example a planetary, do not proceed to replace the individual gear but the entire reduction assembly.
- When reconnecting 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).

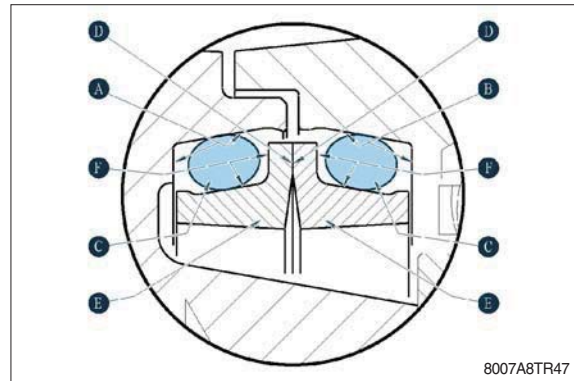


- (4) Insert the spacer (24) on the flanged hub (27).



※ **Make ready of the lifetime seal :**

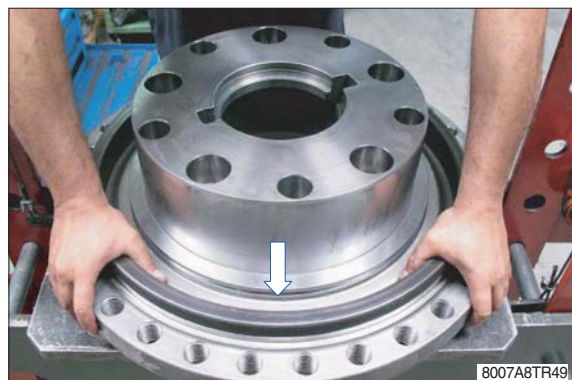
- ① Carefully clean the **seats (A and B)** using, if necessary, metallic brushes or solvent (surfaces in contact with or (c) must be perfectly clean and dry).
- ② Make sure that **sealing surfaces (D)** of **metal rings (E)** are free from scratches, dinges or foreign substances; metallic ring surfaces 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.



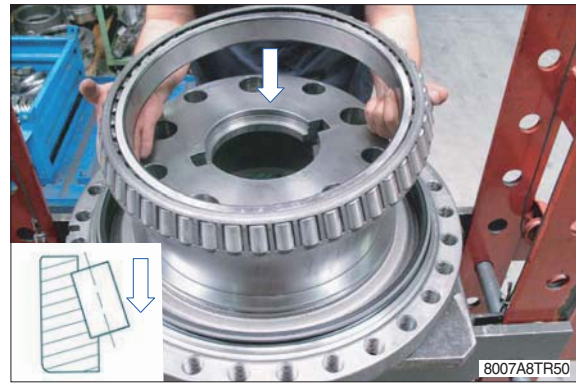
- (5) Assemble the half seal (23) on the tool.



- (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).

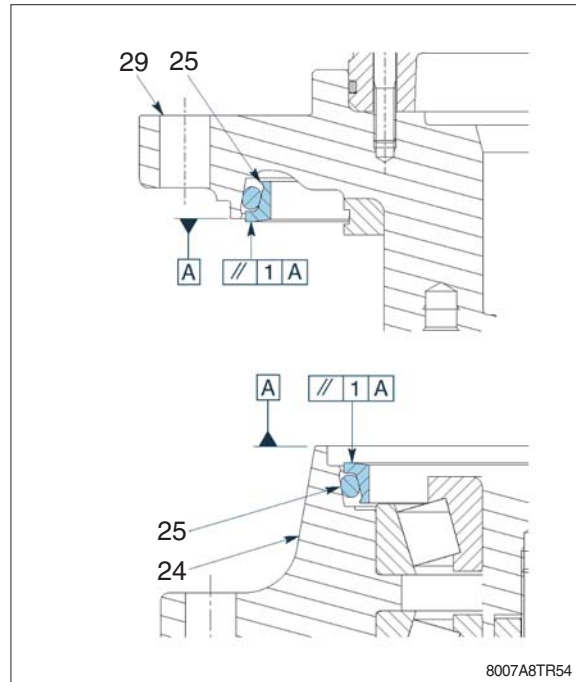


(10) Insert the 1st reduction assembly(8).





※ Correct lifetime seal assembly check (23).

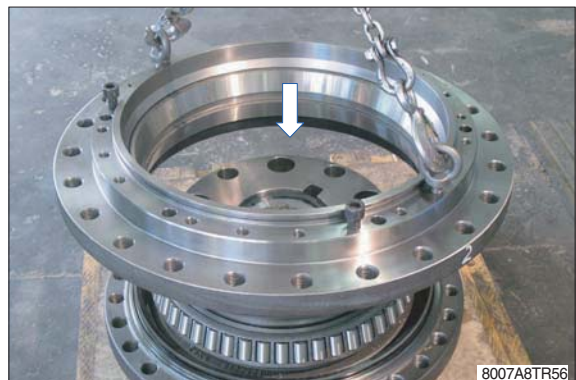


(11) Clean carefully the seal faces (23).

※ 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).



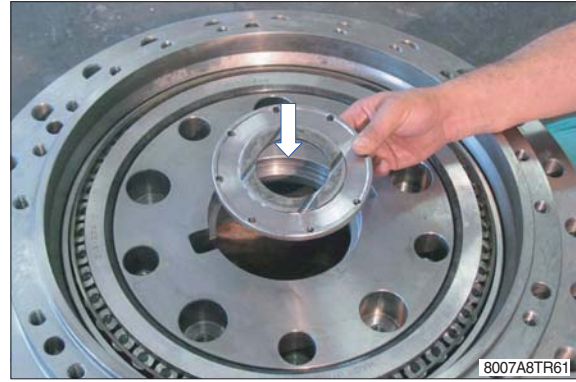
(15) By using a press and the stopper push the bearing inner ring (21) against the shoulder of the flanged hub (27) until assembling of the unit is complete.



(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.

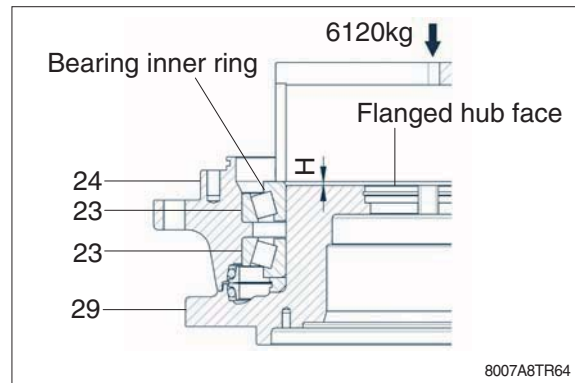


(19) By using pliers assemble the circlip (13) into its seat on the flanged hub (27).



※ 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 complete.





(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 screw 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  $342 \text{ kgf} \cdot \text{m}$  ( $2474 \text{ lbf} \cdot \text{ft}$ )



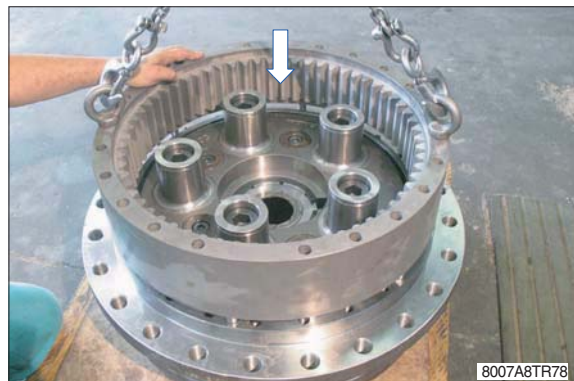
(26) Assemble the O-ring (6) into its seat in the gearbox housing (22).



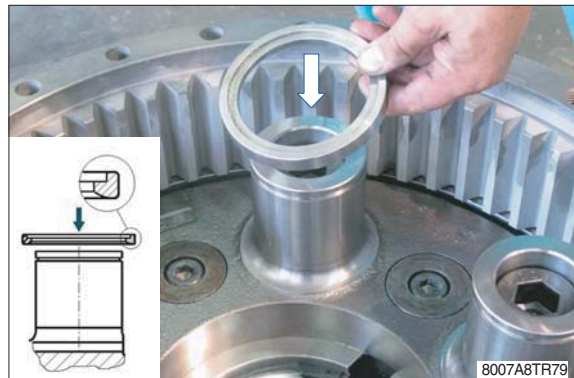
(27) By using a rubber hammer push the 6 pins (20) against the shoulder until assembly is complete.



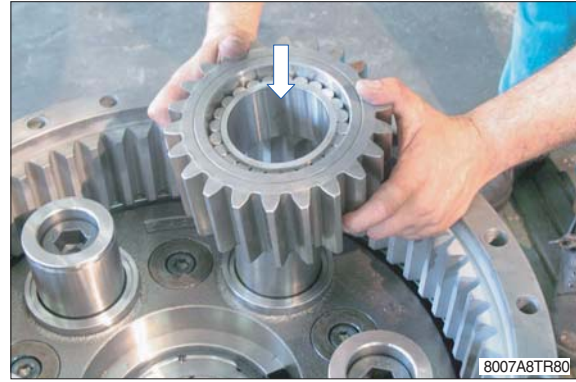
(28) By using a tackle assemble the toothed ring and, by using a rubber hammer, push it against the shoulder until assembly is complete.



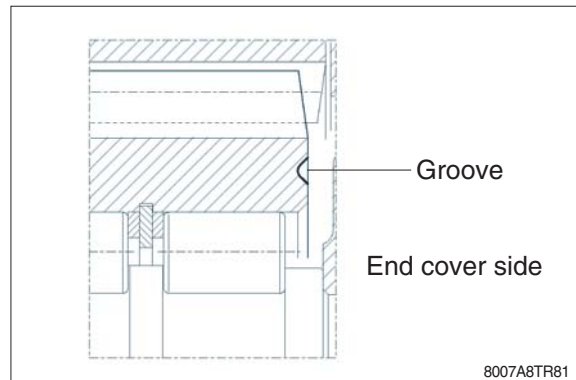
(29) Assemble correctly the spacers (15) on the pins of the planetary carrier (16).



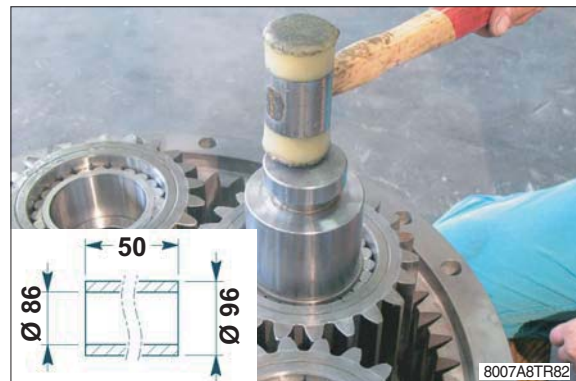
(30) Place the reduction planet assemblies of the 3rd reduction (14) on the pins of the planetary carrier (16).



※ 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 (14) against the shoulder until assembly is complete.



(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).



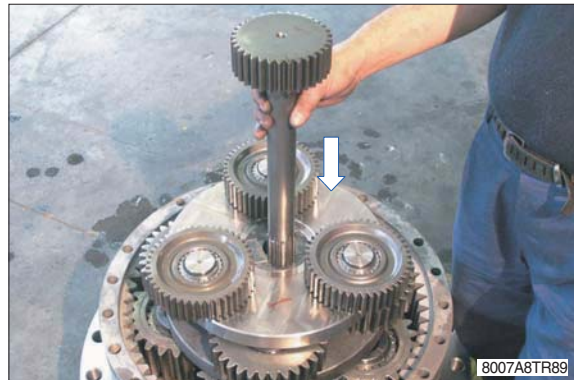
(36) By using a tackle and the equipment assemble the 1st reduction assembly (8).



(37) Assemble the centering ring.



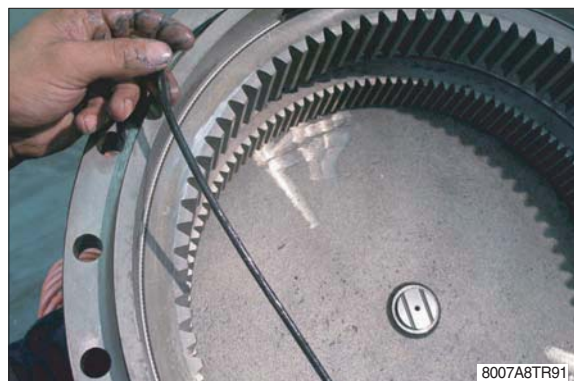
(38) Insert the 1st stage sun gear (7).



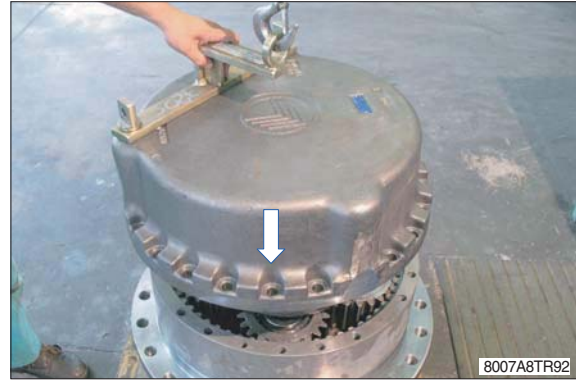
(39) By using a punch and a rubber hammer press the pad (5) against the shoulder of the end cover (4).



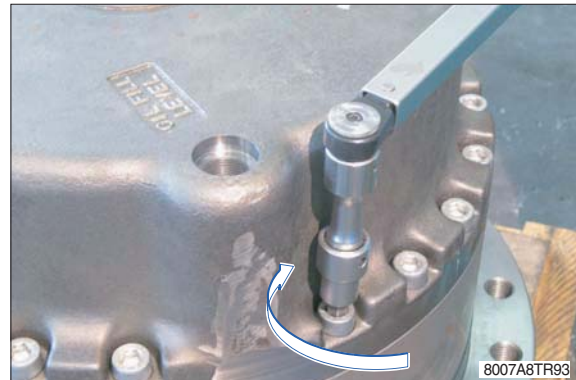
(40) Assemble the O-ring (6) into its seat in the end cover (4).



(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).



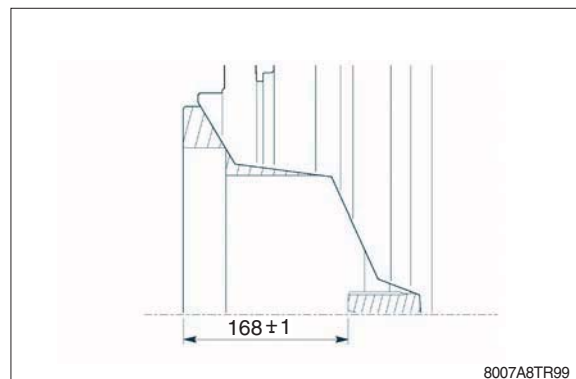
(46) Position the motor adapter flange (29) on the gearbox.



(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 scheme.



## GROUP 7 RCV LEVER

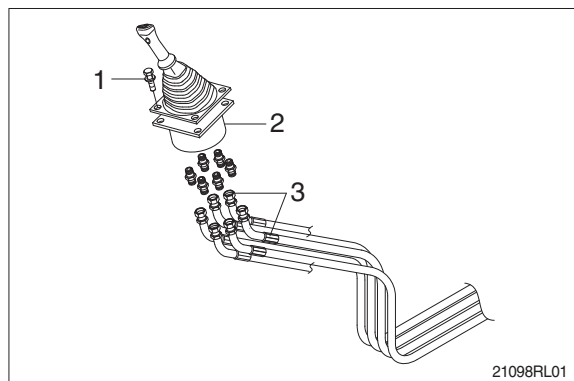
### 1. REMOVAL AND INSTALL

#### 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.**

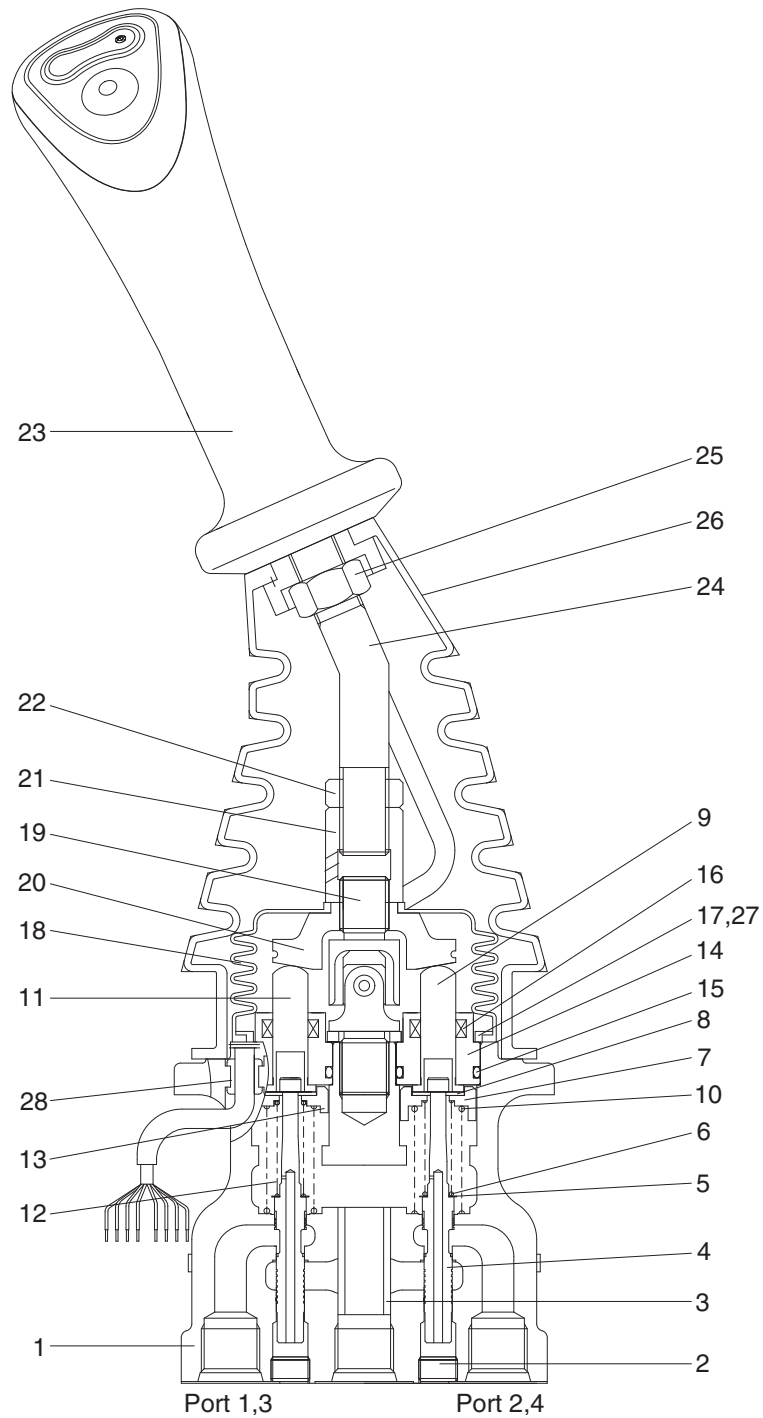


#### 2) INSTALL

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

## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE



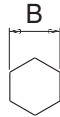
32092RL01

1	Case	8	Stopper	15	O-ring	22	Lock nut
2	Plug	9	Push rod	16	Rod seal	23	Handle assembly
3	Bushing	10	Spring	17	Plate	24	Handle bar
4	Spool	11	Push rod	18	Boot	25	Nut
5	Shim	12	Spring	19	Joint assembly	26	Boot
6	Spring	13	Spring seat	20	Swash plate	27	Spring pin
7	Spring seat	14	Plug	21	Adjusting nut	28	Bushing



## 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
Plug	2	PT 1/8	3.0	21.7
Joint	19	M14	3.5	25.3
Swash plate	20	M14	5.0±0.35	36.2±2.5
Adjusting nut	21	M14	5.0±0.35	36.2±2.5
Lock nut	22	M14	5.0±0.35	36.2±2.5

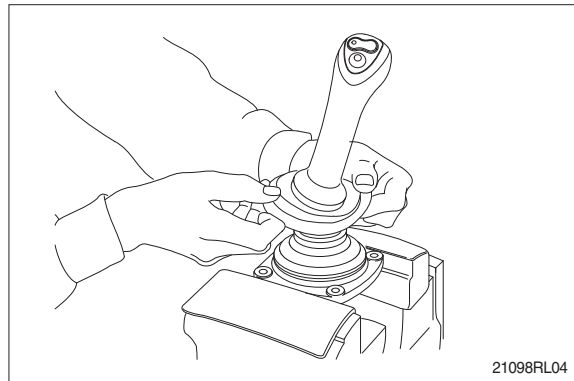
### 3) DISASSEMBLY

(1) Clean pilot valve with kerosene.

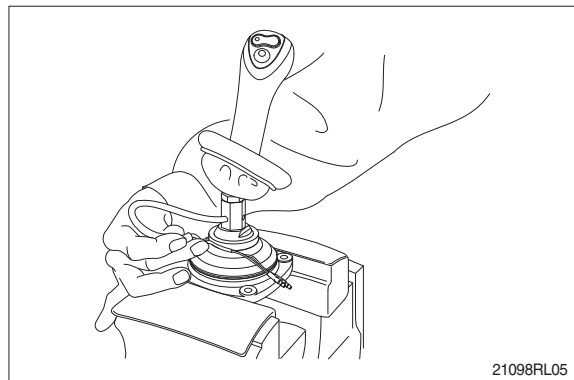
※ **Put blind plugs into all ports**

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

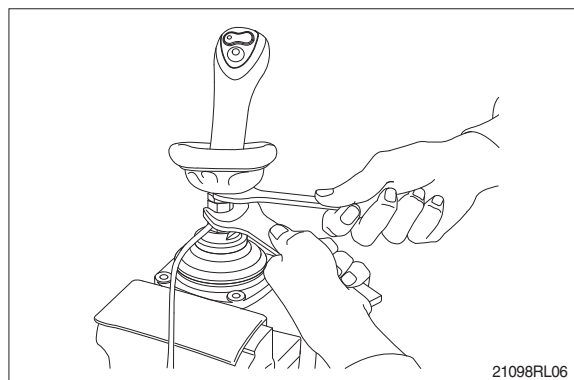
(3) Remove end of boot (26) from case (1) and take it out upwards.



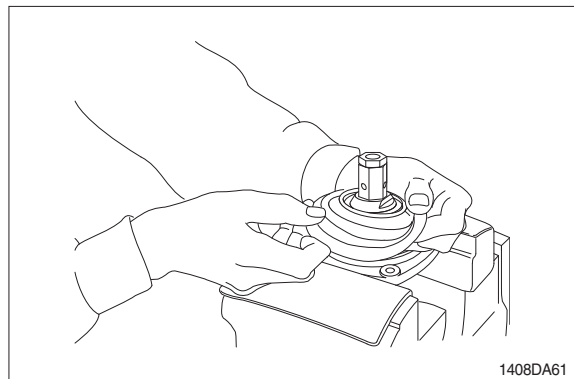
※ For valve with switch, remove cord also through hole of casing.



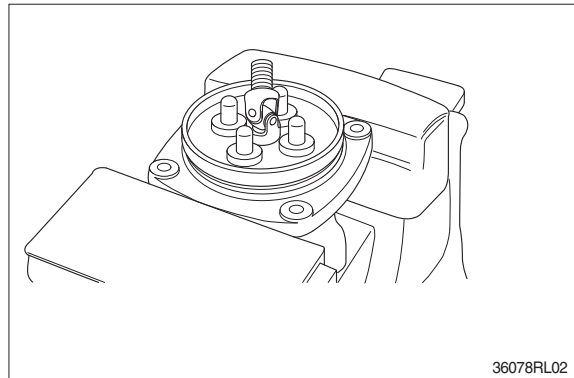
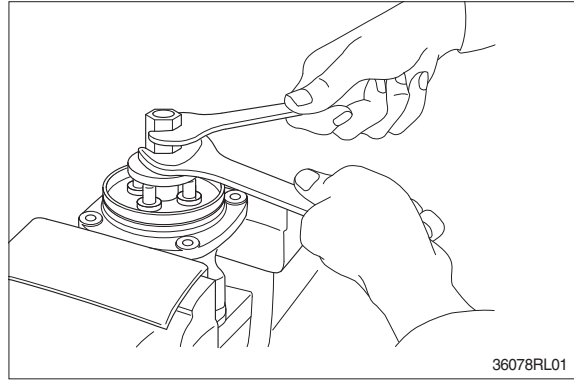
(4) Loosen lock nut (22) and adjusting nut (21) with spanners on them respectively, and take out handle section as one body.



(5) Remove the boot (18).

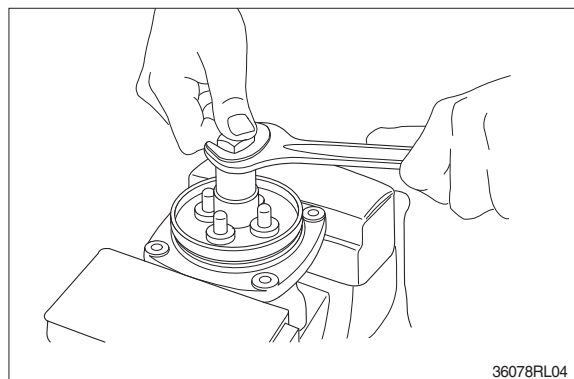
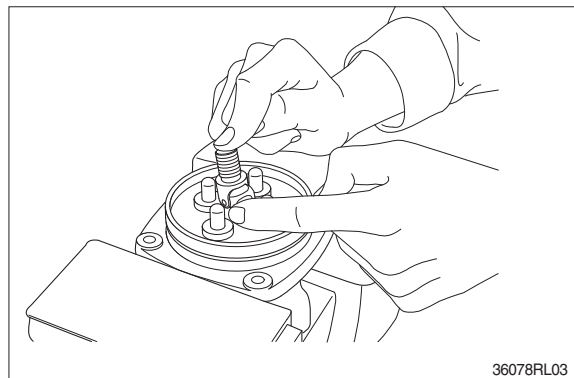


- (6) Loosen adjusting nut (21) and swash plate (20) with spanners on them respectively, and remove them.

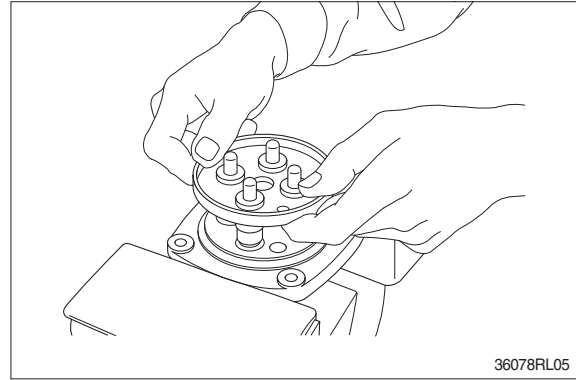


- (7) Turn joint anticlockwise to loosen it, utilizing jig (Special tool).

- ※ When return spring (10) is strong in force, plate (17), plug (14) and push rod (11) will come up on loosening joint. Pay attention to this.



(8) Remove plate (17).



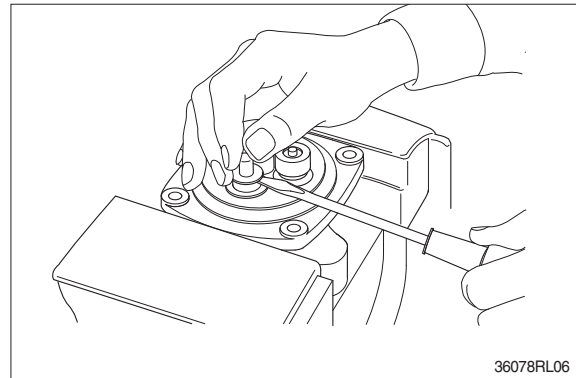
(9) When return spring (10) is weak in force, plug (14) stays in casing because of sliding resistance of O-ring.

※ **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.

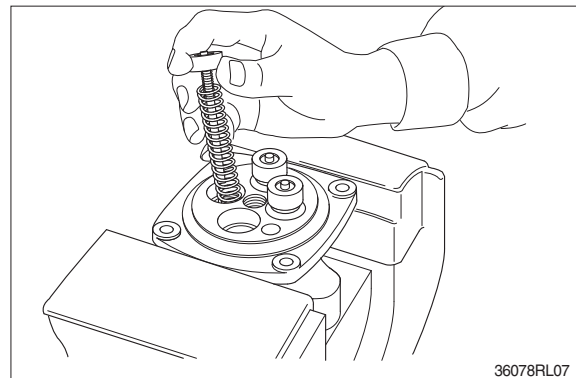
※ **During taking out, plug may jump up due to return spring (10) force.**

Pay attention to this.

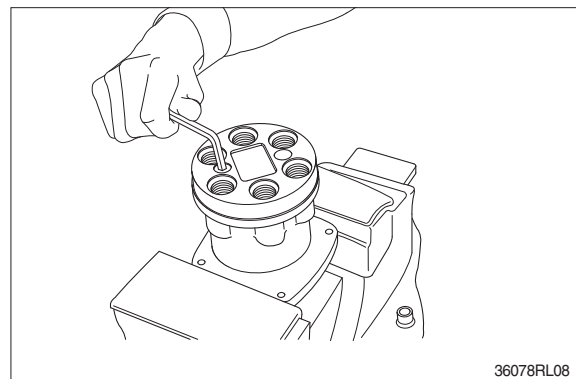


(10) Remove reducing valve subassembly and return spring (10) out of casing.

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

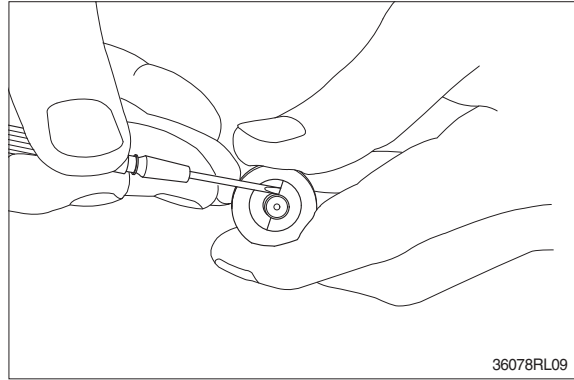


(11) Loosen hexagon socket head plug(2) with hexagon socket screw key.



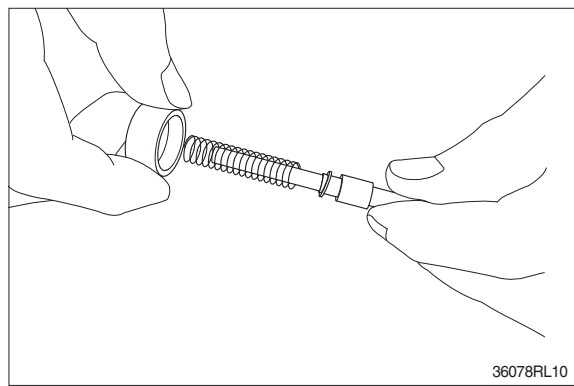
(12) For disassembling reducing valve section, stand it vertically with spool (4) bottom placed on flat workbench. Push down spring seat (7) and remove two pieces of semicircular stopper (8) with tip of small minus screwdriver.

- ※ Pay attention not to damage spool surface.
- ※ Record original position of spring seat (7).
- ※ Do not push down spring seat more than 6mm.

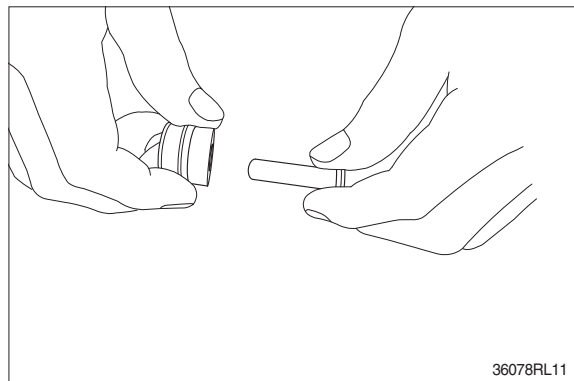


(13) Separate spool (4), spring seat (7), spring (6) and shim (5) individually.

- ※ **Until being assembled, they should be handled as one subassembly group.**

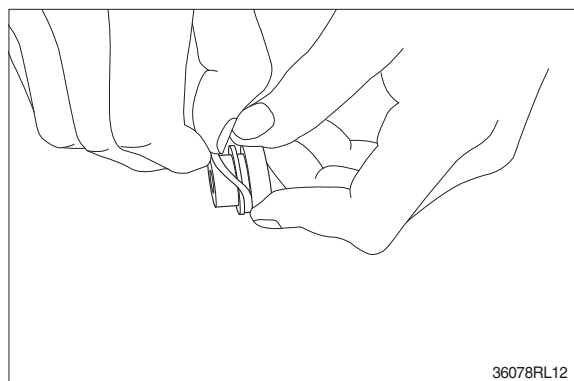


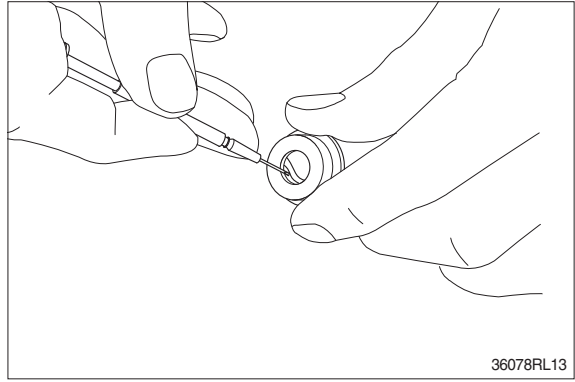
(14) Take push rod (11) out of plug (14).



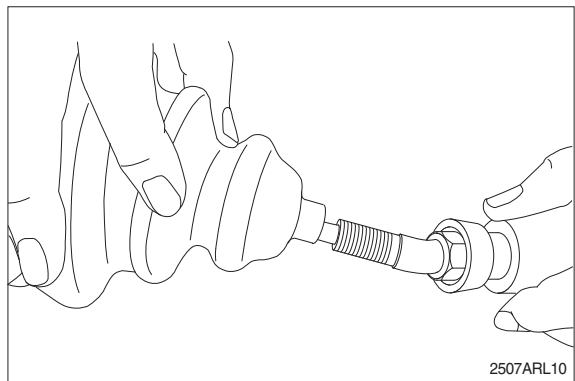
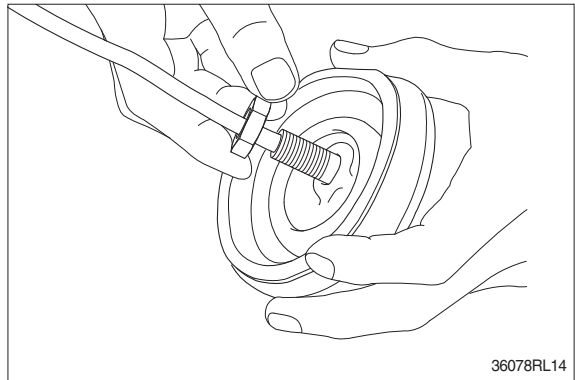
(15) Remove O-ring (15) and seal (16) from plug (14).

Use small minus screwdriver or so on to remove this seal.





(16) Remove lock nut (22) and then boot (26).





#### (16) 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.**

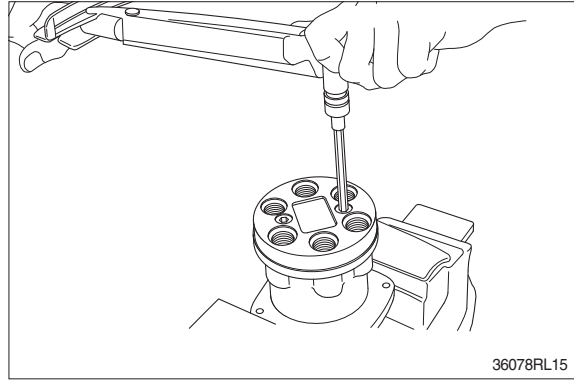
#### (17) Rust prevention of parts

- 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.**

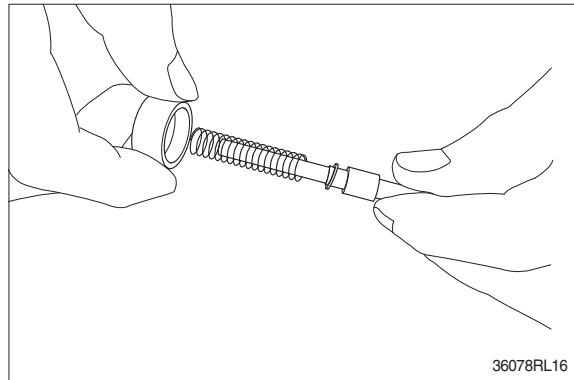
#### 4) ASSEMBLY

(1) Tighten hexagon socket head plug (2) to the specified torque.

※ **Tighten two bolts alternately and slowly.**

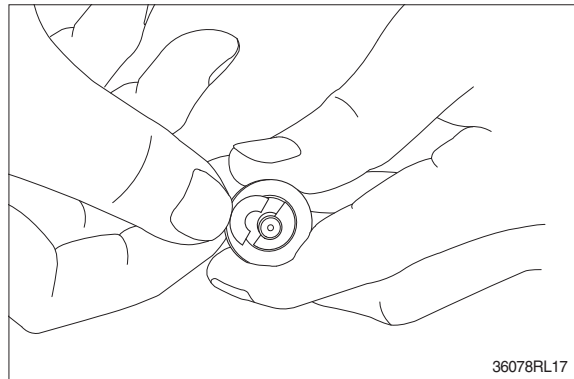


(2) Put shim (5), springs (6) and spring seat (7) onto spool (4) in this order.



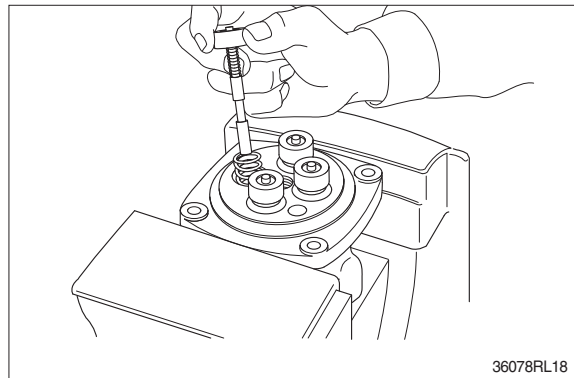
(3) Stand spool vertically with its bottom placed on flat workbench, and with spring seat pushed down, put two pieces of semicircular stopper (8) on spring seat without piling them on.

※ **Assemble stopper (8) so that its sharp edge side will be caught by head of spool. Do not push down spring seat more than 6mm.**

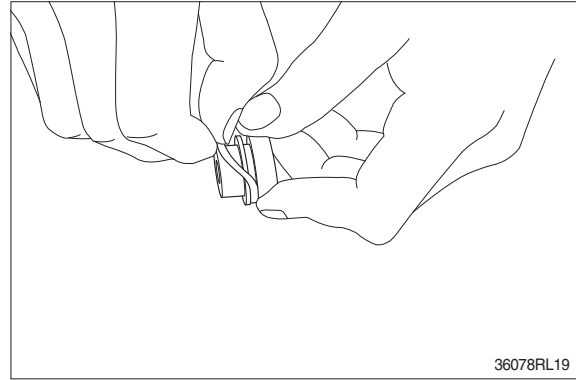


(4) Assemble spring (10) into casing (1).  
Assemble reducing valve subassembly into casing.

※ **Assemble them to their original positions.**

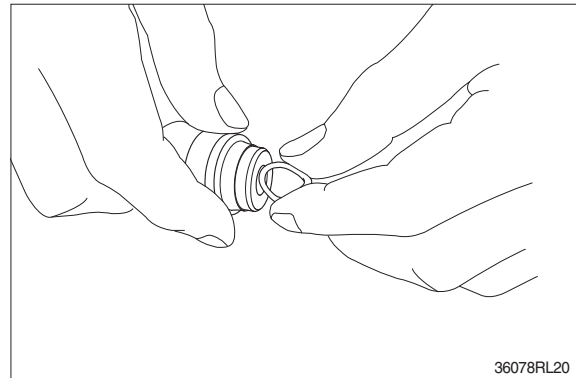


(5) Assemble O-ring (15) onto plug (14).



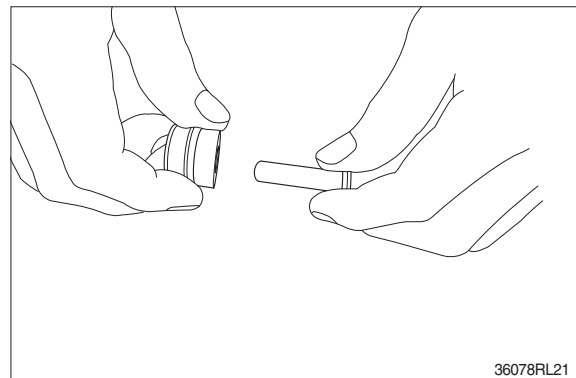
(6) Assemble seal (16) to plug (14).

※ Assemble seal in such lip direction as shown below.



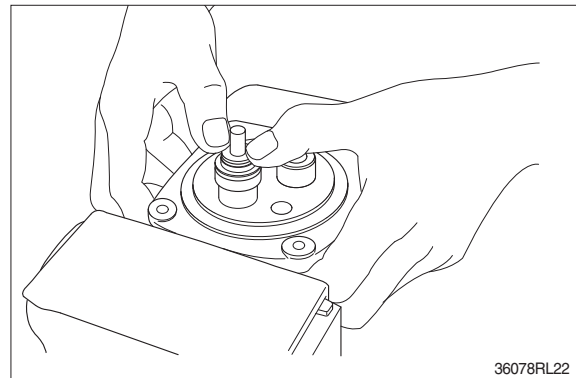
(7) Assemble push rod (11) to plug (14).

※ Apply working oil on push-rod surface.

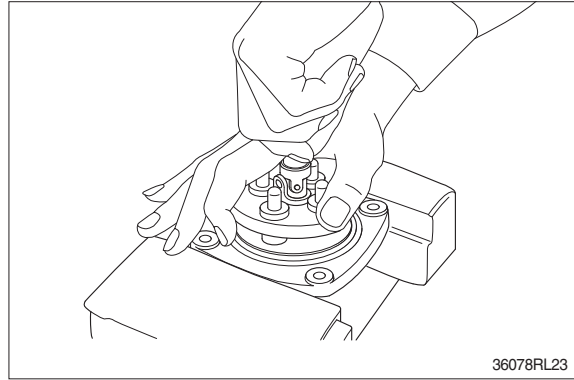


(8) Assemble plug subassembly to casing.

※ When return spring is weak in force, sub-assembly stops due to resistance of O-ring.

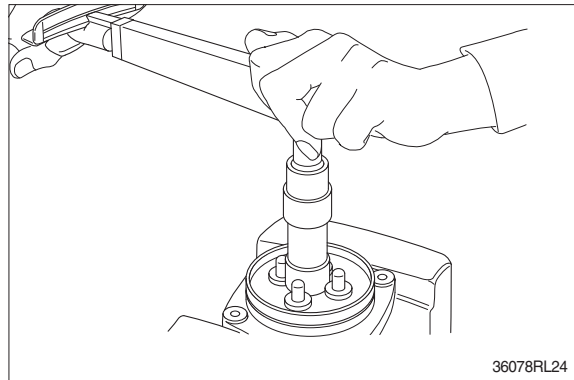


- (9) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (17), and tighten joint (19) temporarily.

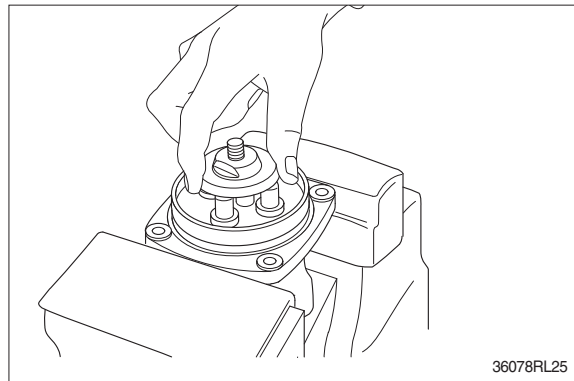


- (10) Fit plate (17).

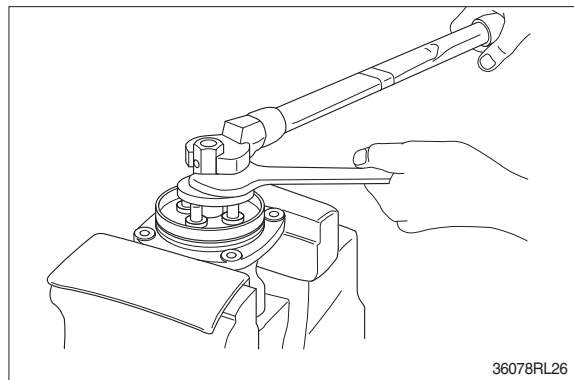
- (11) Tighten joint (19) with the specified torque to casing, utilizing jig.



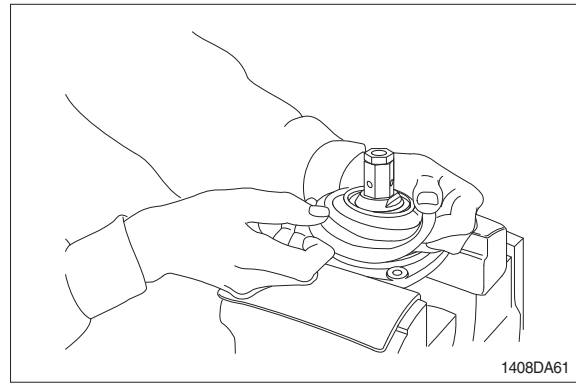
- (12) Assemble swash plate (20) to joint (19).  
※ **Screw it to position that it contacts with 4 push rods evenly.**  
※ **Do not screw it over.**



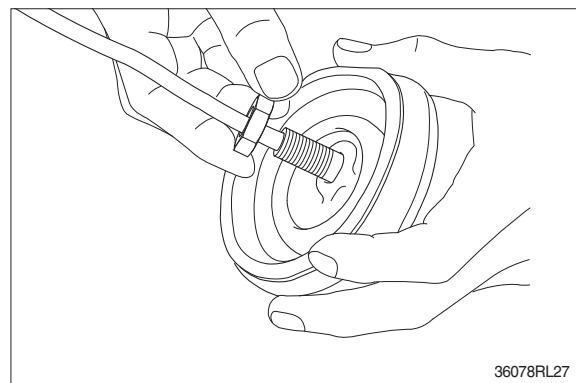
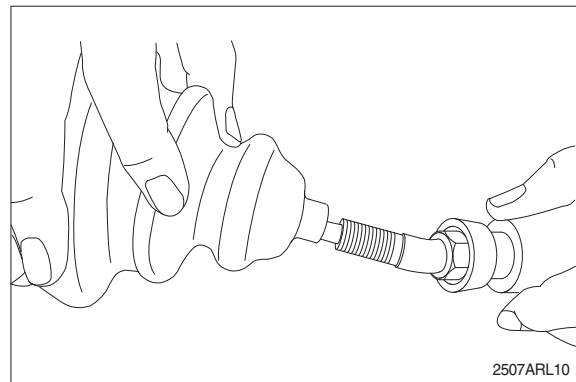
- (13) Assemble adjusting nut (21), apply spanner to width across flat of plate (20) to fix it, and tighten adjusting nut to the specified torque.  
※ **During tightening, do not change position of disk.**



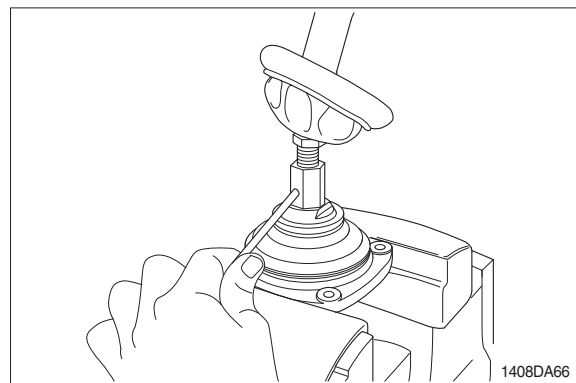
(14) Fit boot (18) to plate.



(15) Fit boot (26) and lock nut (22), and handle subassembly is assembled completely.

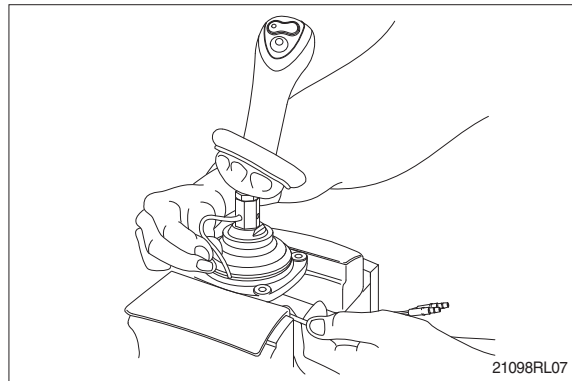


(16) Pull out cord and tube through adjusting nut hole provided in direction 60° to 120° from casing hole.

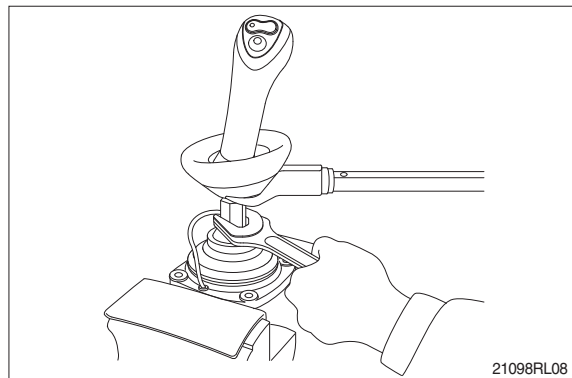


(17) Assemble bushing (27) to plate and pass cord and tube through it.

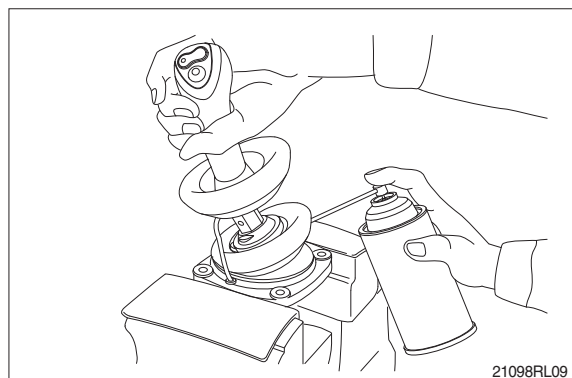
※ Provide margin necessary to operation.



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

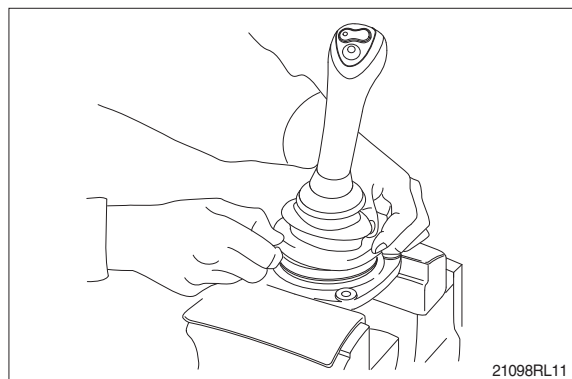


(19) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(20) Assemble lower end of bellows to casing.

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





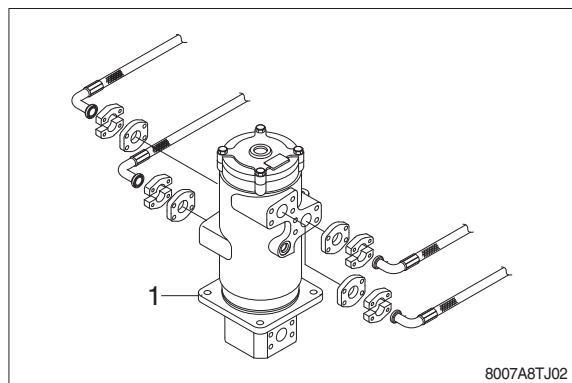
## GROUP 8 TURNING JOINT

### 1. REMOVAL AND INSTALL

#### 1) REMOVAL

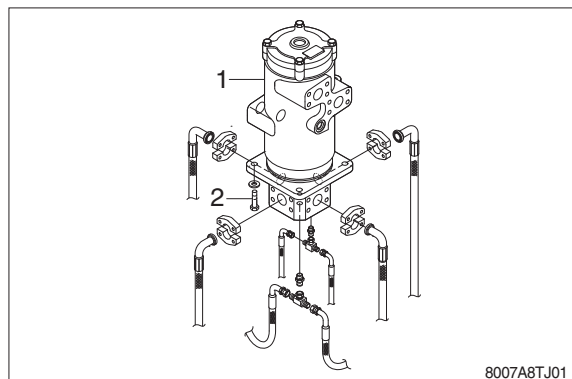
- (1) Lower the work equipment to the ground and stop the engine.
- (2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- (3) Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure 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) Sling the turning joint assembly (1) and remove the mounting bolt (2).
  - Weight : 75 kg (165 lb)
  - Tightening torque :  $29.7 \pm 45 \text{ kgf} \cdot \text{m}$   
( $215 \pm 32.5 \text{ lbf} \cdot \text{ft}$ )
- (6) Remove the turning joint assembly.
- ※ When removing the turning joint, check that all the hoses have been disconnected.



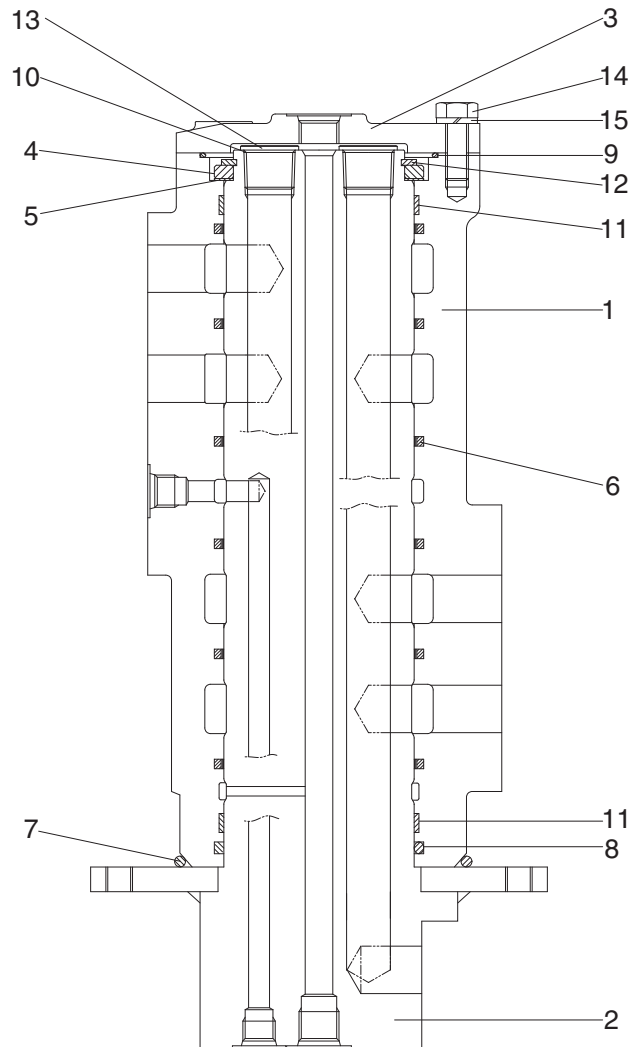
#### 2) INSTALL

- (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



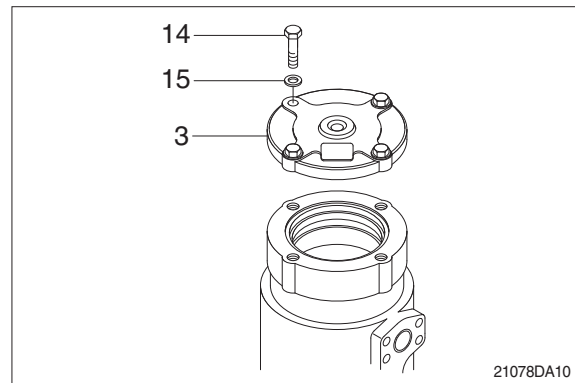
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- |   |                |    |              |    |                |
|---|----------------|----|--------------|----|----------------|
| 1 | Hub            | 6  | Slipper seal | 11 | Wear ring      |
| 2 | Shaft assembly | 7  | O-ring       | 12 | Retaining 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  |

## 2) DISASSEMBLY

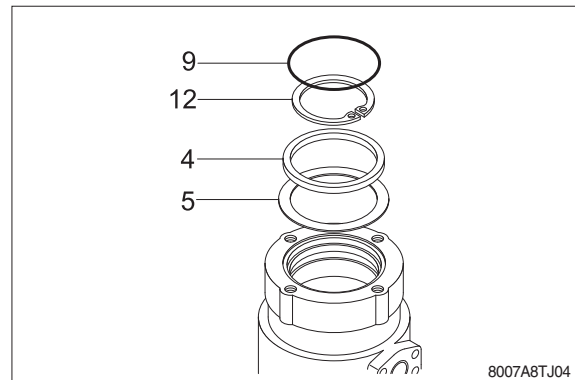
※ Before the disassembly, clean the turning joint.

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



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

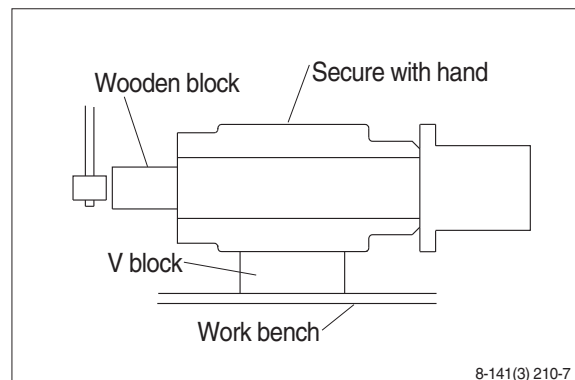
- (3) Remove retainer ring (12), spacer (4) and shim (5).



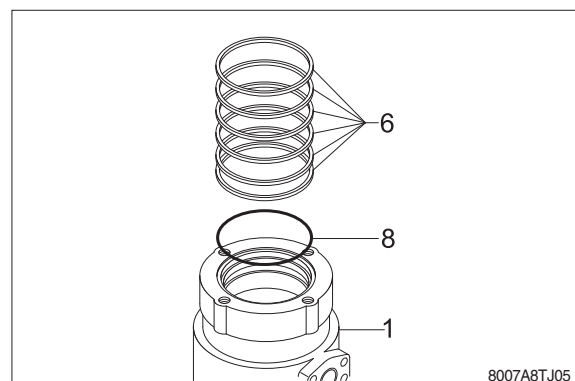
- (4) Place body (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

※ 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).



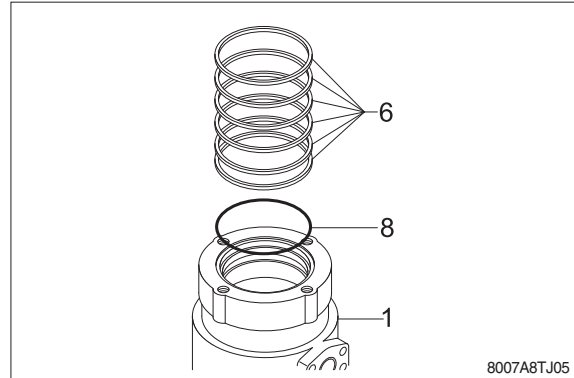
- (5) Remove six slipper seals (6) and O-ring (8), from body (1).



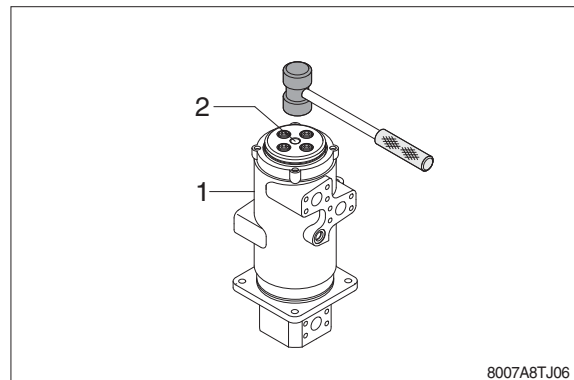
### 3) ASSEMBLY

- ※ 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.

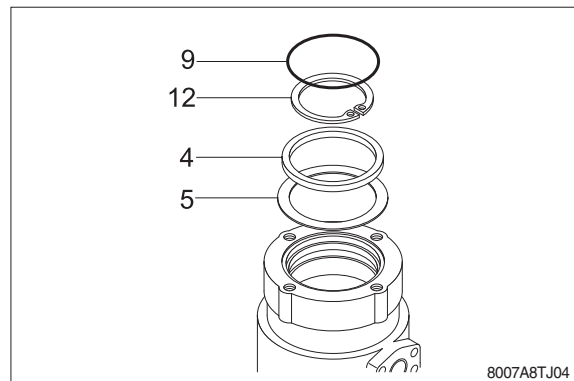
- (1) Fix six slipper seal (6) and O-ring (8), to body (1).
- (2) Fit O-ring (7) to shaft(2).



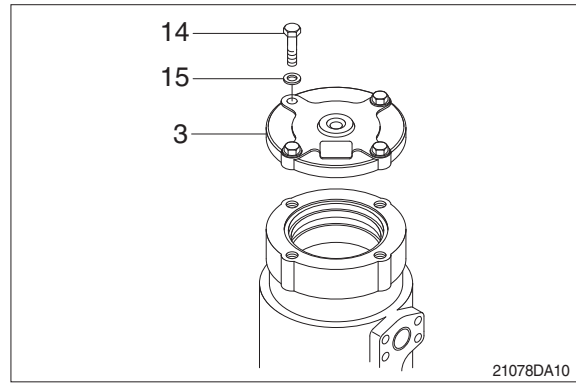
- (3) Set shaft (2) on block, tap body (1) with a plastic hammer to install.



- (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

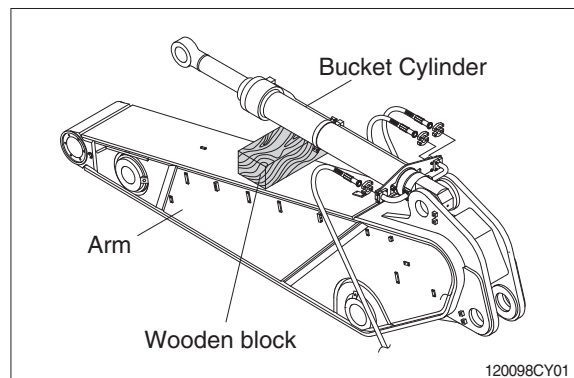
### 1. REMOVAL AND INSTALL

#### 1) BUCKET CYLINDER

##### (1) Removal

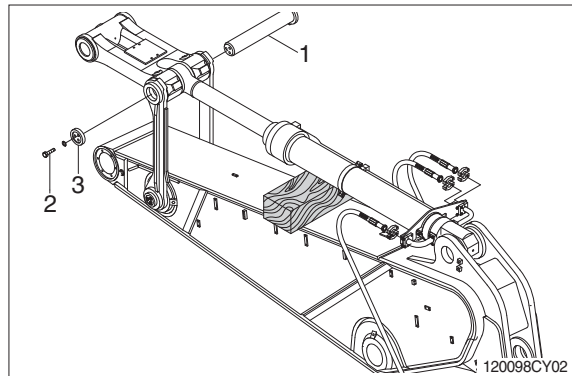
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ※ Escaping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

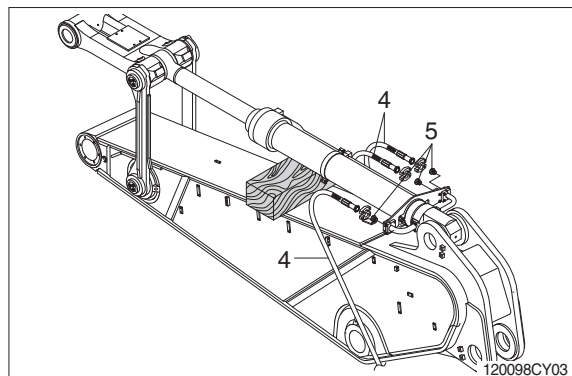


② Remove bolt (2), stopper (3) and pull out pin (1).

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

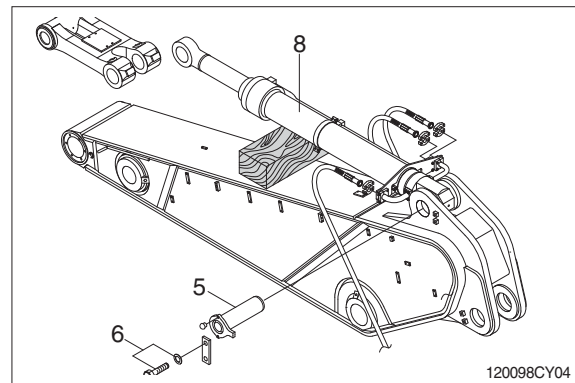


③ Disconnect bucket cylinder hoses (4) and put plugs (5) on cylinder pipe.





- ④ Sling bucket cylinder assembly (8) and remove bolt (6) then pull out pin (5).
- ⑤ Remove bucket cylinder assembly (8).
  - Weight : 1050 kg (2310 lb)



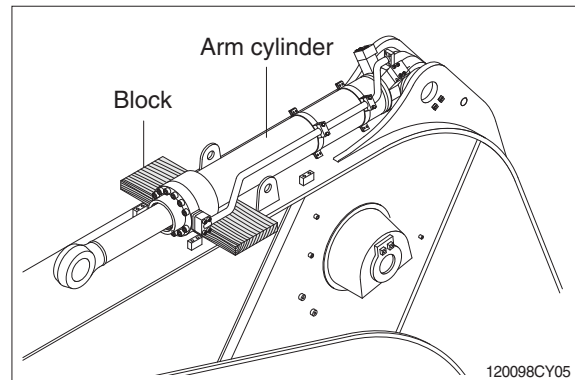
## (2) Install

- 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.

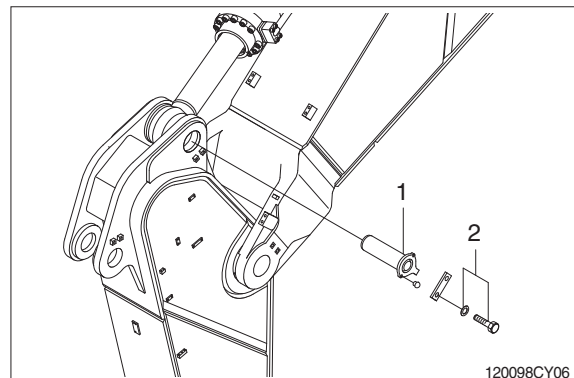
## 2) ARM CYLINDER

### (1) Removal

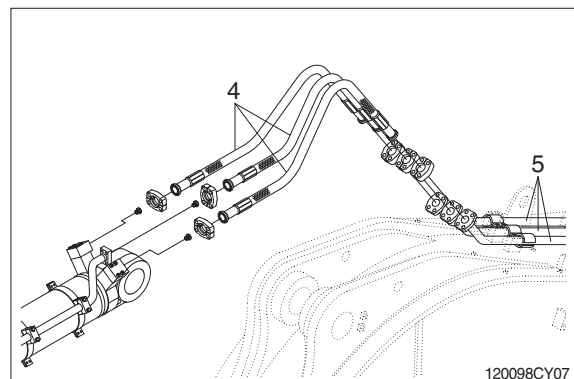
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
  - ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
  - ▲ Loosen the breather slowly to release the pressure inside the hydraulic tank.
  -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



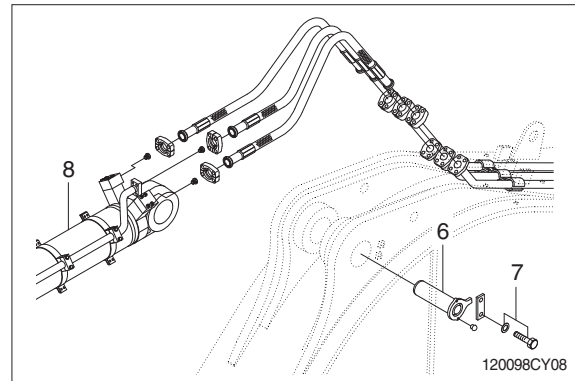
- ② Remove bolt (2) and pull out pin (1).
- ※ Tie the rod with wire to prevent it from coming out.



- 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 : 1510 kg (3330 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

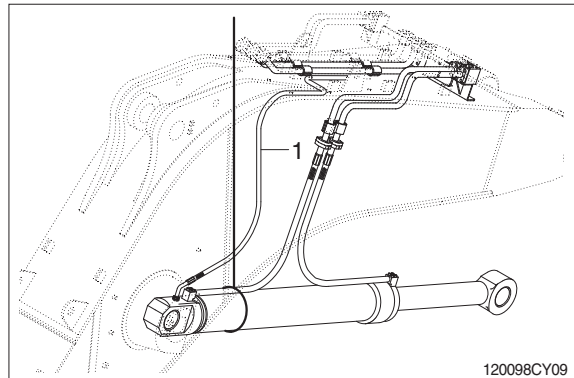
#### (1) Removal

- ※ 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.

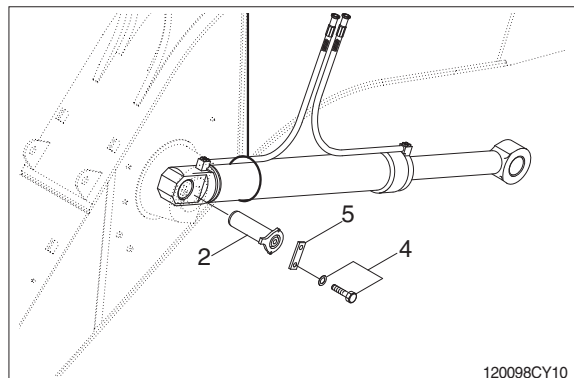
- ※ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

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

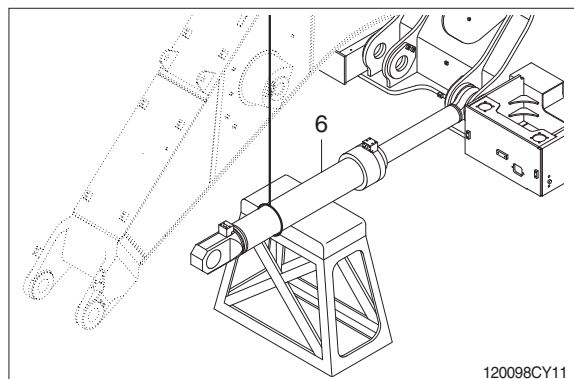


- ③ Remove bolt (4), pin plate (5) and pull out pin (2).

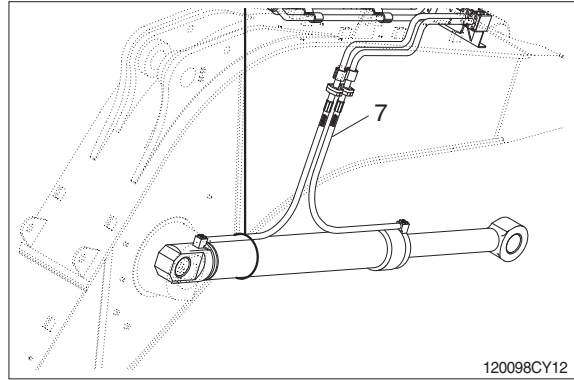
- ※ Tie the rod with wire to prevent it from coming out.



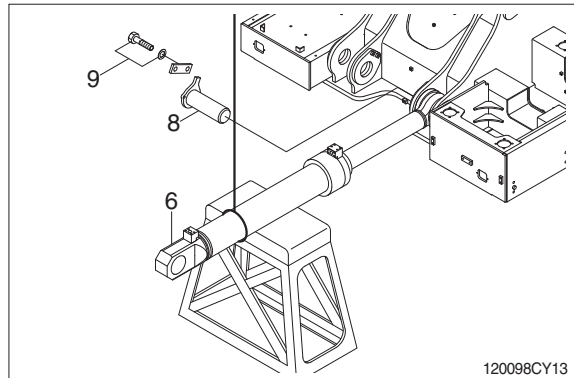
- ④ Lower the boom cylinder assembly (6) on a stand.



- 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 : 1190 kg (2620 lb)



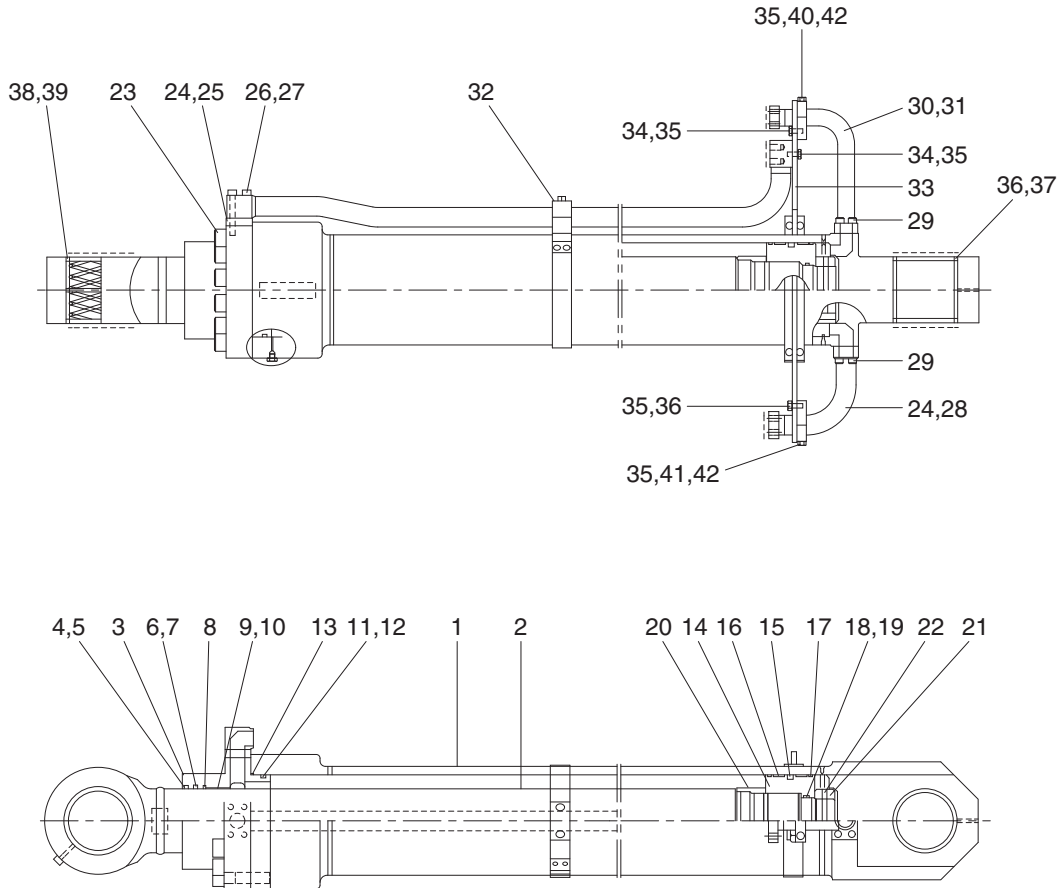
## (2) Install

- 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.
  - ※ Confirmed the hydraulic oil level and check the hydraulic oil leak or not.

## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE

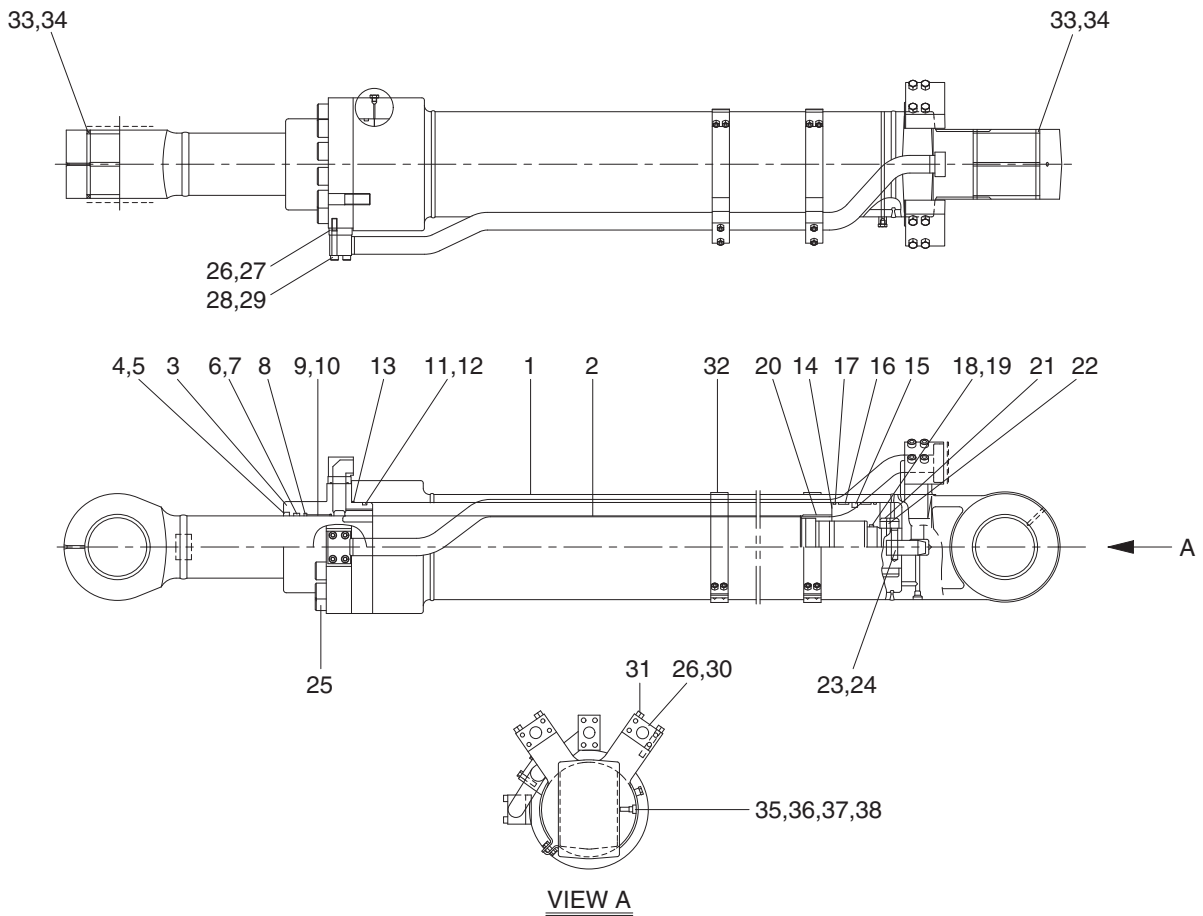
#### (1) Bucket cylinder



120098CY14

1	Tube assembly	15	Piston seal	29	Hexagon socket head bolt
2	Rod assembly	16	Wear ring	30	O-ring
3	Gland	17	Dust ring	31	Pipe assembly
4	Dust wiper	18	O-ring	32	Band assembly
5	Retain ring	19	Back up ring	33	Band assembly
6	Rod seal	20	Cushion ring	34	Hexagon socket head bolt
7	Back up ring	21	Piston nut	35	Plain washer
8	Buffer ring	22	Set screw	36	Oilless bearing
9	Dry bearing	23	Hexagon socket head bolt	37	Dust seal
10	Retain ring	24	O-ring	38	Pin bushing
11	O-ring	25	Flange	39	Dust seal
12	Back up ring	26	Pipe assembly	40	Clamp assembly
13	O-ring	27	Hexagon socket head bolt	41	Clamp assembly
14	Piston	28	Pipe assembly	42	Hexagon socket head bolt

## (2) Arm cylinder

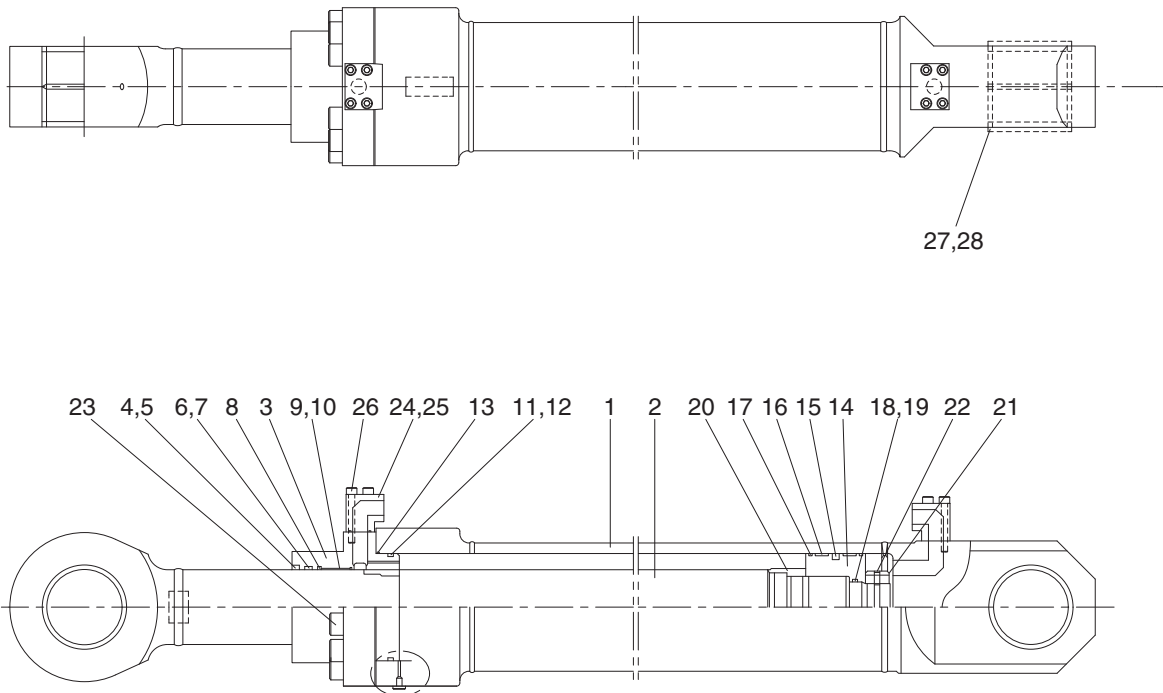


120098CY15

1	Tube assembly	14	Piston	27	Flange
2	Rod assembly	15	Piston seal	28	Pipe assembly
3	Gland	16	Wear ring	29	Hexagon socket head bolt
4	Dust wiper	17	Dust ring	30	Block
5	Retain ring	18	O-ring	31	Hexagon socket head bolt
6	Rod seal	19	Back up ring	32	Band assembly
7	Back up ring	20	Cushion ring	33	Oilless bushing
8	Buffer ring	21	Piston pin	34	Dust seal
9	Dry bearing	22	Set screw	35	Check valve
10	Retain ring	23	Cushion spear	36	Spring
11	O-ring	24	Parallel pin	37	O-ring
12	Back up ring	25	Hexagon socket head bolt	38	Socket plug
13	O-ring	26	O-ring		



### (3) Boom cylinder



27,28

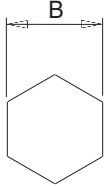
23 4,5 6,7 8 3 9,10 26 24,25 13 11,12 1 2 20 17 16 15 14 18,19 22 21

- |    |               |    |              |    |                          |
|----|---------------|----|--------------|----|--------------------------|
| 1  | Tube assembly | 11 | O-ring       | 21 | Piston nut               |
| 2  | Rod assembly  | 12 | Back up ring | 22 | Set screw                |
| 3  | Gland         | 13 | O-ring       | 23 | Hexagon socket head bolt |
| 4  | Dust wiper    | 14 | Piston       | 24 | O-ring                   |
| 5  | Retain ring   | 15 | Piston seat  | 25 | Flange                   |
| 6  | Rod seal      | 16 | Wear ring    | 26 | Hexagon socket head bolt |
| 7  | Back up ring  | 17 | Dust ring    | 27 | Oilless bushing          |
| 8  | Buffer ring   | 18 | O-ring       | 28 | Dust seal                |
| 9  | Dry bearing   | 19 | Back up ring |    |                          |
| 10 | Retain ring   | 20 | Cushion ring |    |                          |

120098CY16

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Allen wrench	10	
	14	
	16	
	30	
	33	
(-) 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	14	-	210 ± 21	1520 ± 152
	Boom cylinder	14	-	250 ± 25	1810 ± 181
	Arm cylinder	14	-	200 ± 20	1447 ± 145
Piston lock nut	Bucket cylinder	20	-	280 ± 28	2025 ± 203
	Boom cylinder	20	-	290 ± 29	2100 ± 210
	Arm cylinder	20	-	260 ± 26	1881 ± 188
Socket head bolt	Bucket cylinder	23	M30	157 ± 16	1136 ± 116
		27	M14	15 ± 1.5	108 ± 10.8
	Boom cylinder	25	M33	215 ± 21.5	1555 ± 156
		31	M16	23 ± 2.3	166 ± 16.6
	Arm cylinder	23	M30	157 ± 16	1136 ± 116
		26	M14	15 ± 1.5	108 ± 10.8

### 3) DISASSEMBLY

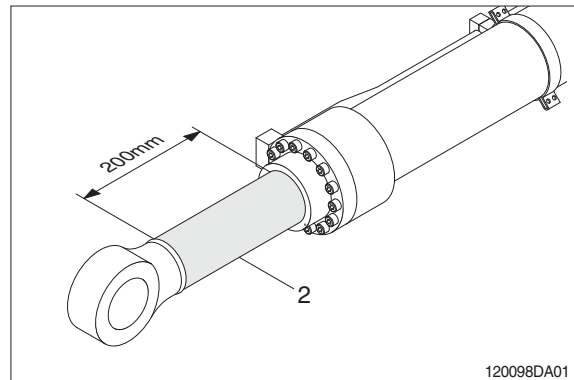
#### (1) Remove cylinder head and piston rod

※ Procedures are based on the bucket cylinder.

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

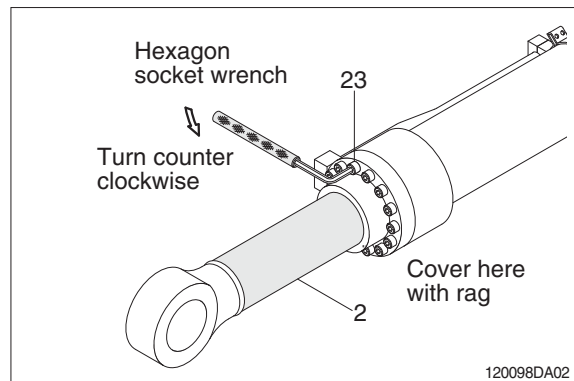
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

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



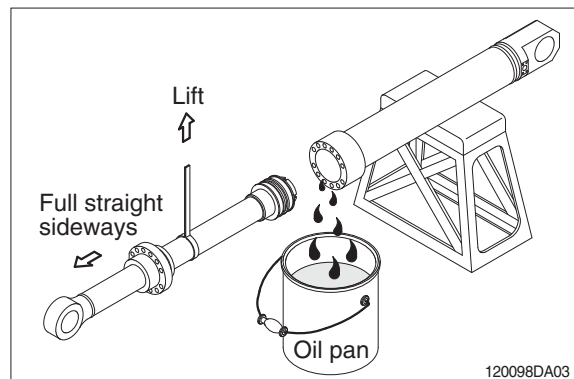
③ Loosen and remove socket bolts (23) of the gland in sequence.

※ Cover the extracted rod assembly (2) with rag to prevent it from being accidentally damaged during operation.



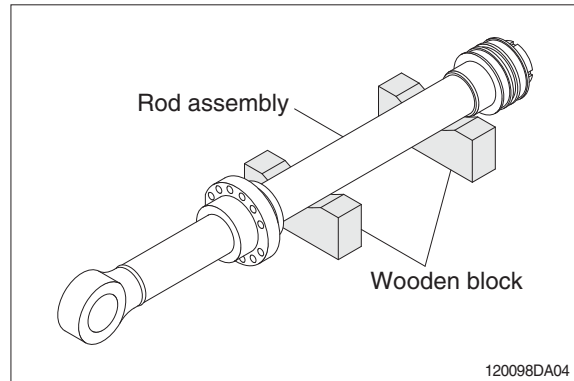
④ Draw out cylinder head and rod assembly together from tube assembly (1).

※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



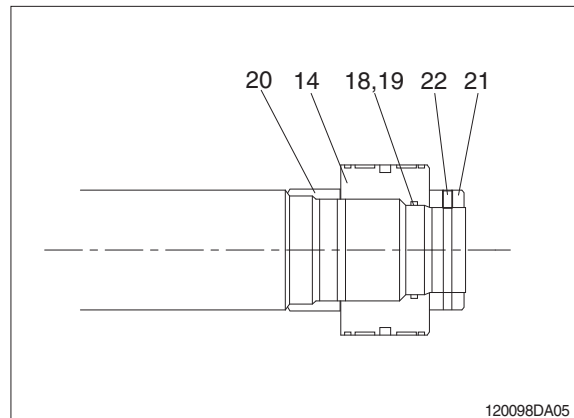
Note that the plated surface of rod assembly (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.

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

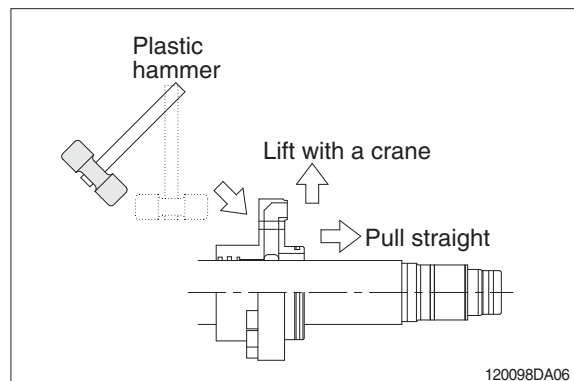


### (3) Remove piston and cylinder head

- ① Loosen socket set screw (22) and remove piston nut (21).
- ※ **Since piston nut (21) is tightened to a high torque use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove piston nut (21).**
- ② Remove piston assembly (14), back up ring (19), and O-ring (18).

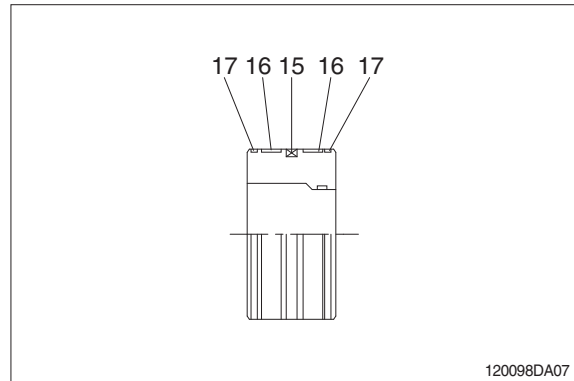


- ③ Remove the cylinder head assembly from rod assembly (2).
  - ※ **If it is too heavy to move, move it by striking the flanged part of cylinder head with a plastic hammer.**
  - ※ **Pull it straight with cylinder head assembly lifted with a crane.**
- Exercise care so as not to damage the lip of rod dry bearing (9) and packing (4, 5, 6, 7, 8, 10) by the threads of rod assembly (2).



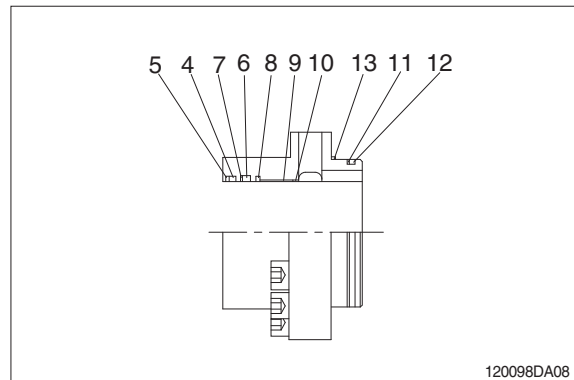
**(3) Disassemble the piston assembly**

- ① Remove wear ring (16).
  - ② Remove dust ring (17) and piston seal (15).
- ※ Exercise care in this operation not to damage the grooves.



**(4) Disassemble cylinder head assembly**

- ① Remove back up ring (12) and O-ring (11).
  - ② Remove snap ring (5), dust wiper (4).
  - ③ Remove back up ring (7), rod seal (6) and buffer ring (8) and snap ring (10).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.
- ※ Do not remove dry bearing (9).

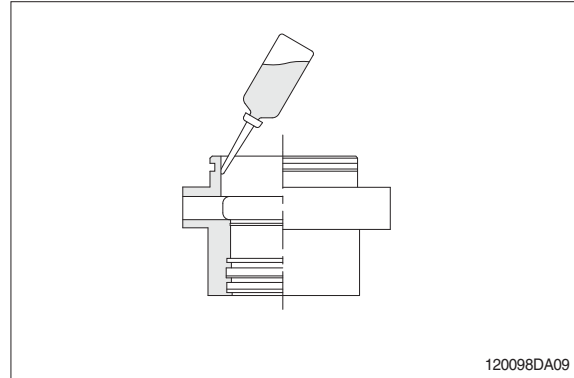


### 3) ASSEMBLY

#### (1) Assemble cylinder head assembly

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

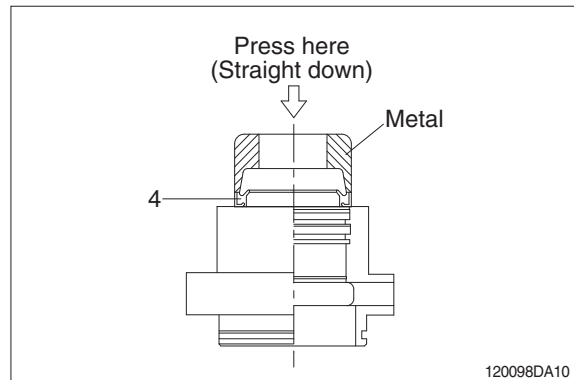
- ① Coat the inner face of gland (3) with hydraulic oil.



- ② Coat dust wiper (4) with grease and fit dust wiper (4) to the bottom of the hole of dust seal.

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

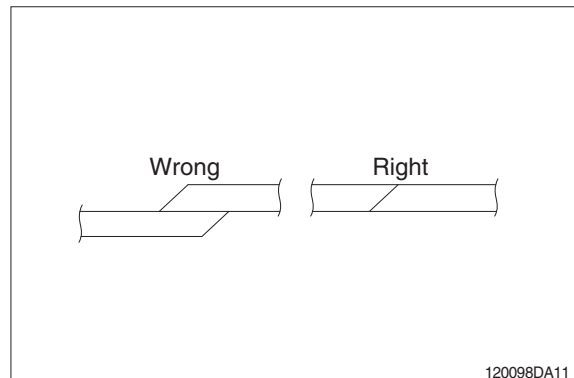
- ③ Fit snap ring (5) to the stop face.



- ④ Fit back up ring (7), rod seal (6), buffer ring (8) and snap ring (5) to corresponding grooves, in that order.

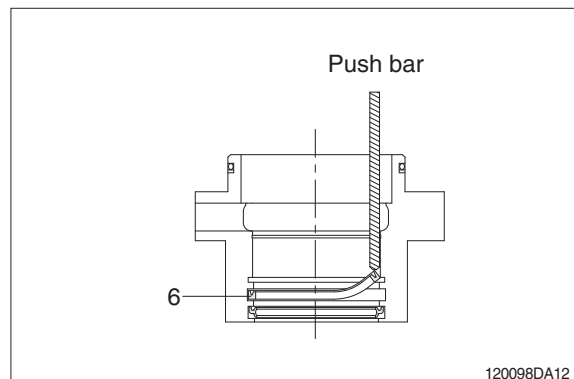
※ Coat each packing with hydraulic oil before fitting it.

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

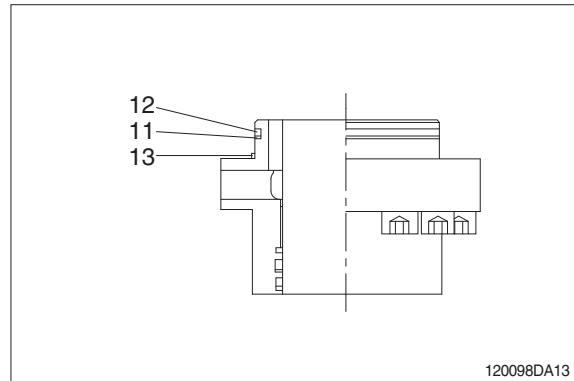


※ Rod seal (6) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.

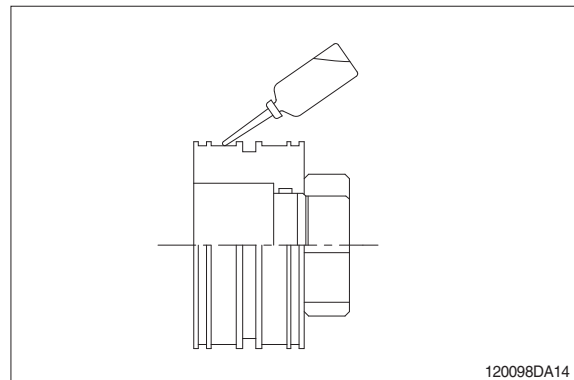


- ⑤ Fit back up ring (12) to gland (3).
- ※ Put the backup ring in the warm water of 30~50°C.
- ⑥ Fit O-ring (11, 13) to gland (3).

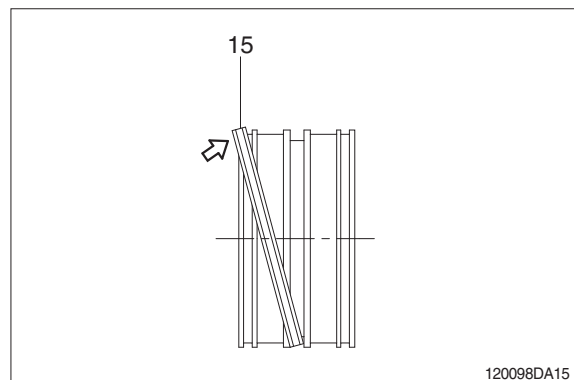


**(2) Assemble piston assembly**

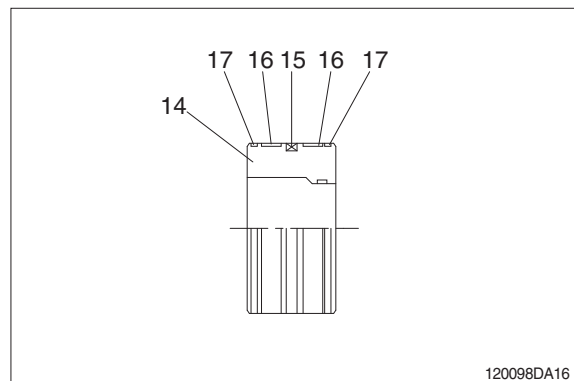
- ※ Check for scratches or rough surfaces. If found smooth with an oil stone.
- ① Coat the outer face of piston (14) with hydraulic oil.



- ② Fit piston seal (15) 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.



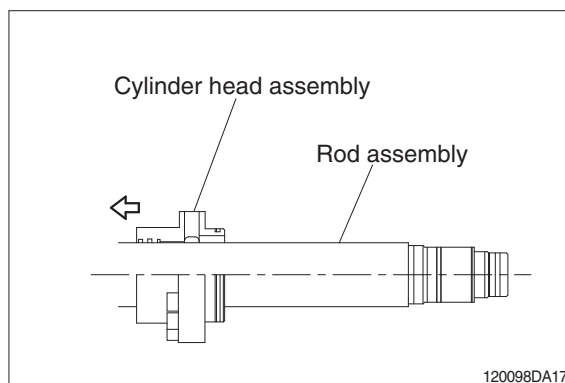
- ③ Fit wear ring (16) and dust ring (17) to piston (14).



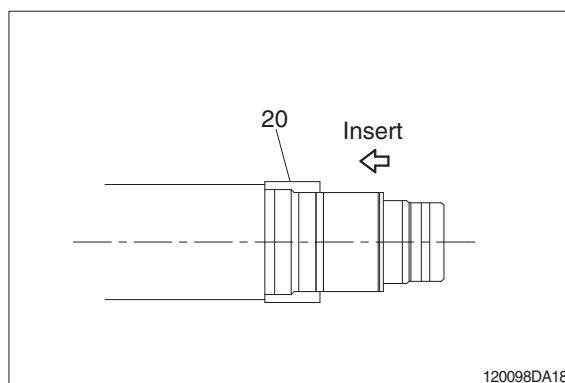


**(3) Install piston and cylinder head**

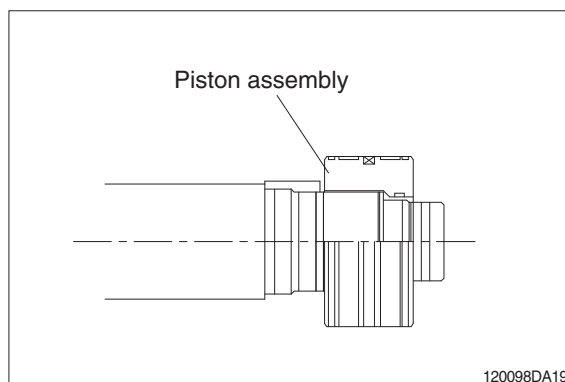
- ① Fix the rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to rod assembly.



- ④ Insert cushion ring (20) to rod assembly.
- ※ **Note that cushion ring (20) has a direction in which it should be fitted.**

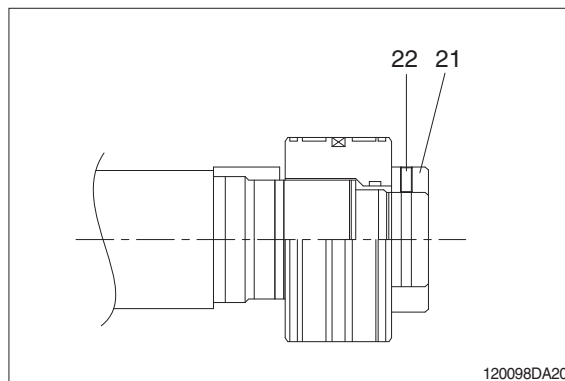


- ⑤ Fit piston assembly to rod assembly.
- Tightening torque :  $210 \pm 21$  kgf · m  
( $1520 \pm 152$  lbf · ft)



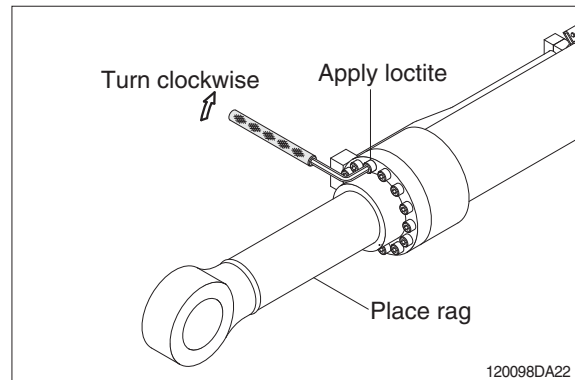
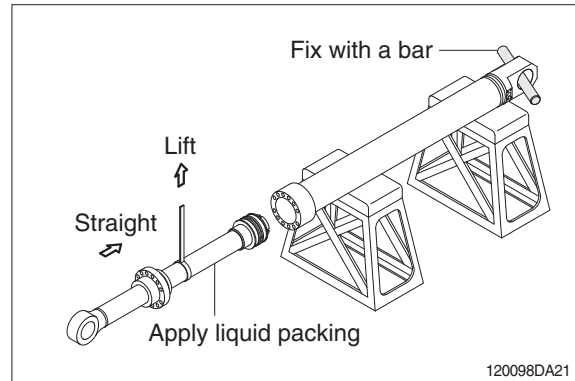
- ⑥ Fit piston nut (21) and tighten the set screw (22).
- Tightening torque :

Item		kgf · m	lbf · ft
Bucket	21	$280 \pm 28$	$2025 \pm 203$
	22	$3.2 \pm 0.3$	$23.1 \pm 2.2$
Boom	21	$260 \pm 26$	$1881 \pm 188$
	22	$3.0 \pm 0.3$	$21.7 \pm 3.6$
Arm	21	$290 \pm 29$	$2100 \pm 210$
	22	$3.0 \pm 0.3$	$21.7 \pm 3.6$



### (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.**

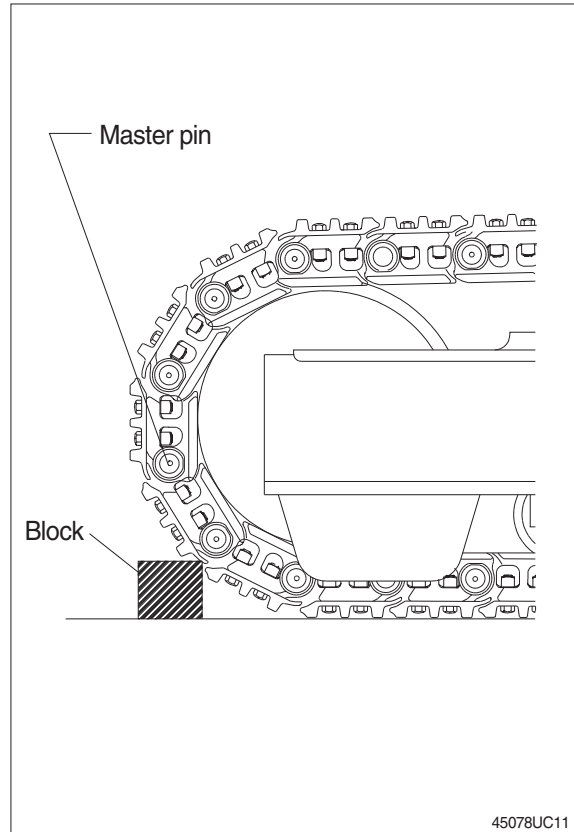


## GROUP 10 UNDERCARRIAGE

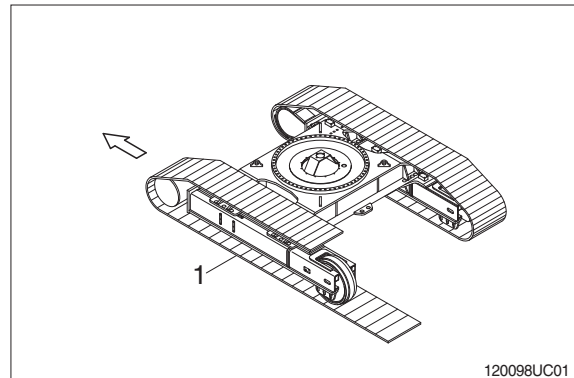
### 1. TRACK LINK

#### 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.

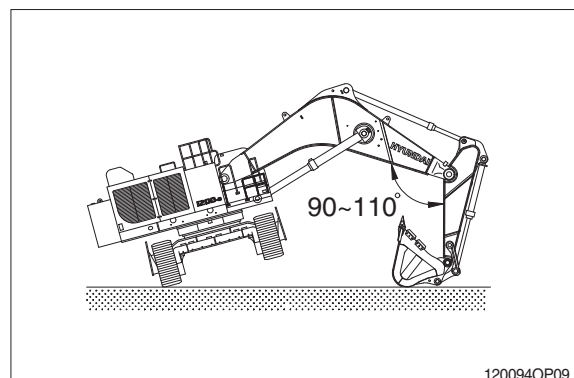


- (4) Move the machine slowly in reverse, and lay out track link assembly (1).
  - ※ Jack up the machine and put wooden block under the machine.
  - ※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.



#### 2) INSTALL

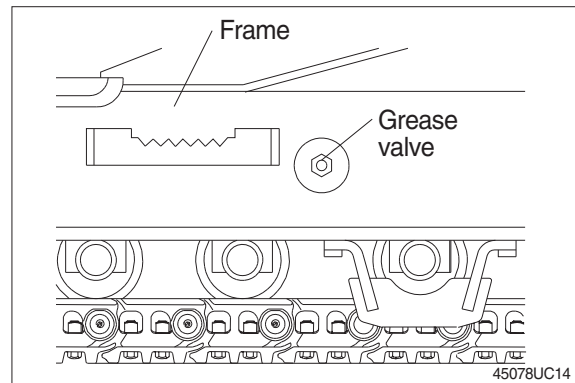
- (1) Carry out installation in the reverse order to removal.
  - ※ Adjust the tension of the track link.



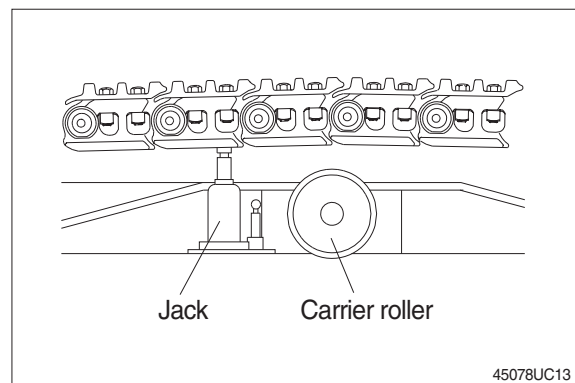
## 2. CARRIER ROLLER

### 1) REMOVAL

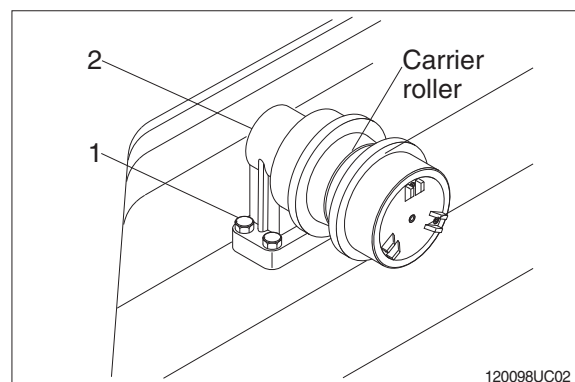
- (1) Loosen tension of the track link.



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



- (3) Loosen the lock nut (1).
- (4) Remove carrier roller assembly (2).
  - Weight : 70 kg (150 lb)



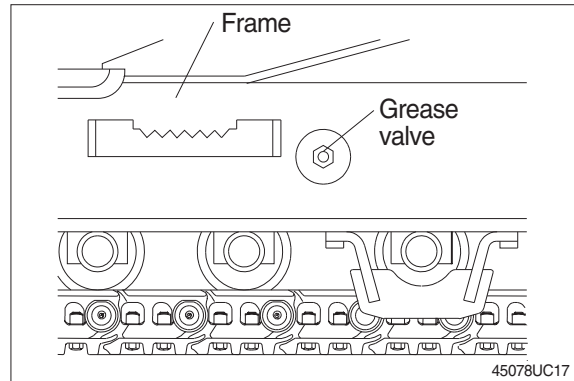
### 2) INSTALL

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

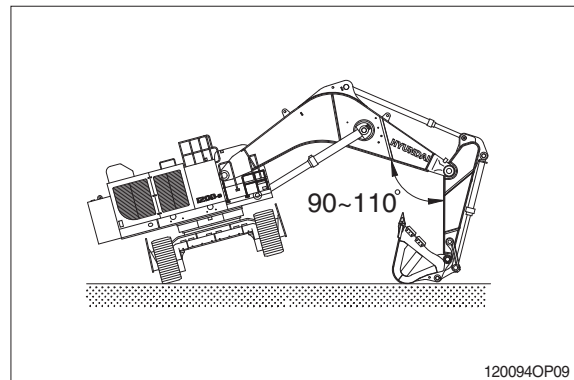
### 3. TRACK ROLLER

#### 1) REMOVAL

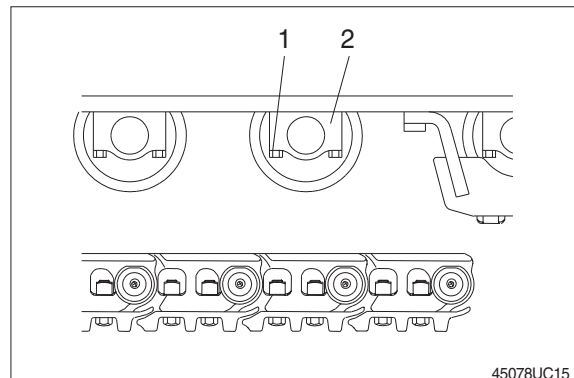
- (1) Loosen tension of the track link.



- (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 : 210 kg (460 lb)



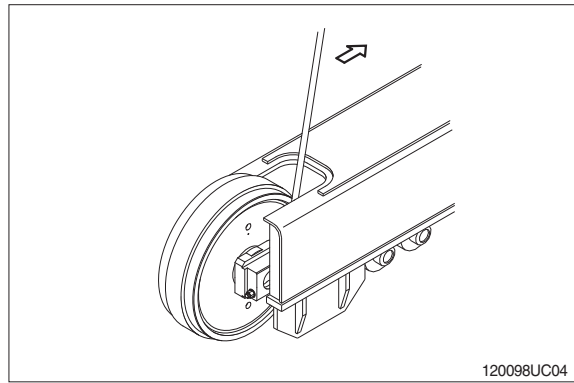
#### 2) INSTALL

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

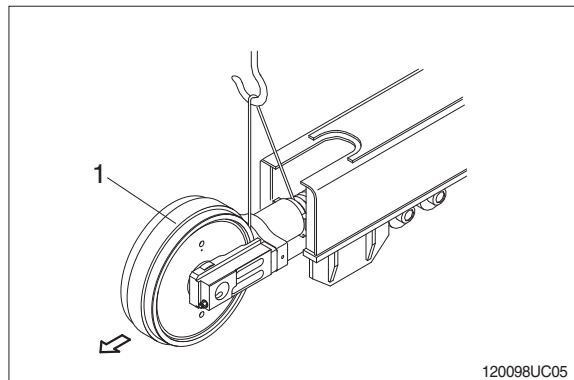
## 4. IDLER AND RECOIL SPRING

### 1) REMOVAL

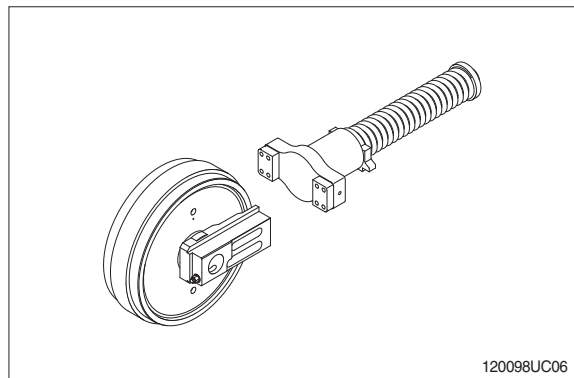
- (1) Remove the track link.  
For detail, see removal of track link.



- (2) Sling the recoil spring (1) and pull out idler and recoil spring assembly from track frame, using a pry.  
· Weight : 1880 kg (4140 lb)

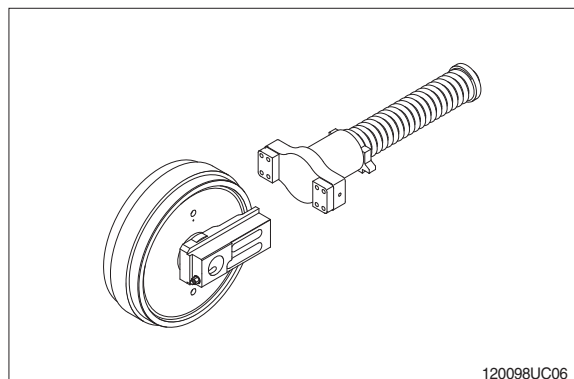


- (3) Remove the bolts (2), washers (3) and separate idler from recoil spring.



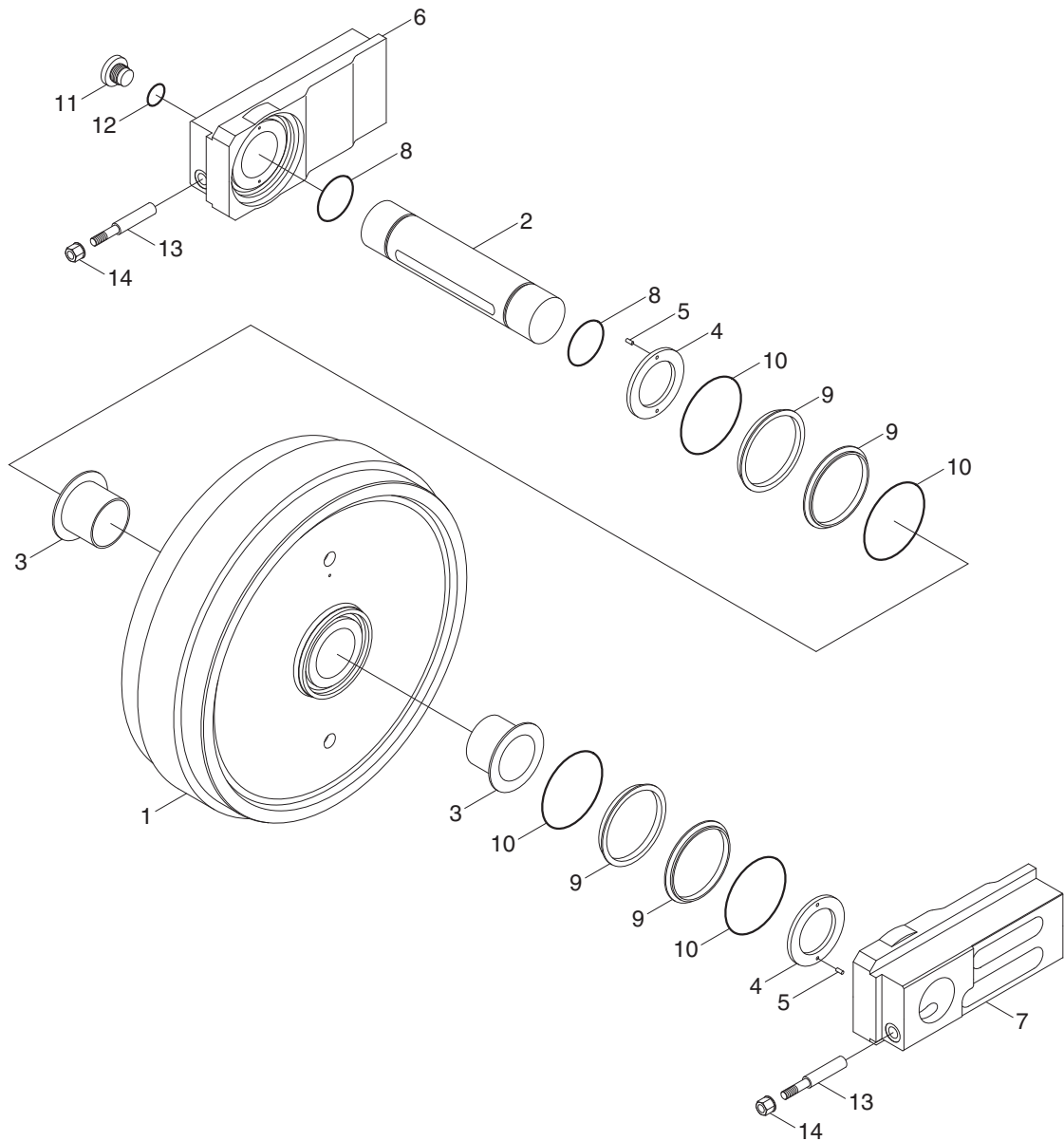
### 2) INSTALL

- (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



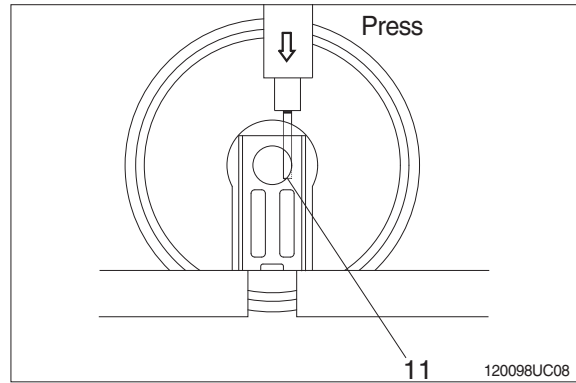
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- |   |         |    |         |    |           |
|---|---------|----|---------|----|-----------|
| 1 | Idler   | 6  | Bracket | 11 | Plug      |
| 2 | Shaft   | 7  | Bracket | 12 | O-ring    |
| 3 | Bushing | 8  | O-ring  | 13 | Taper pin |
| 4 | Spacer  | 9  | Seal    | 14 | Nut       |
| 5 | Pin     | 10 | O-ring  |    |           |

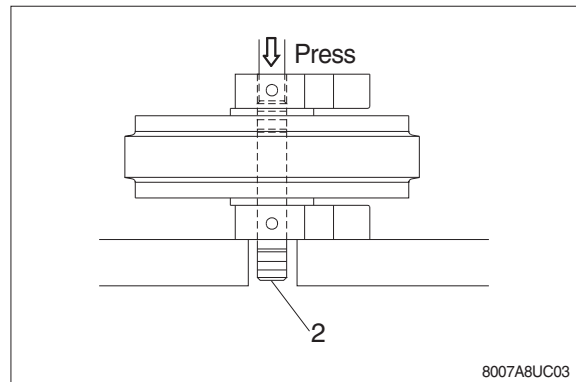


**(2) Disassembly**

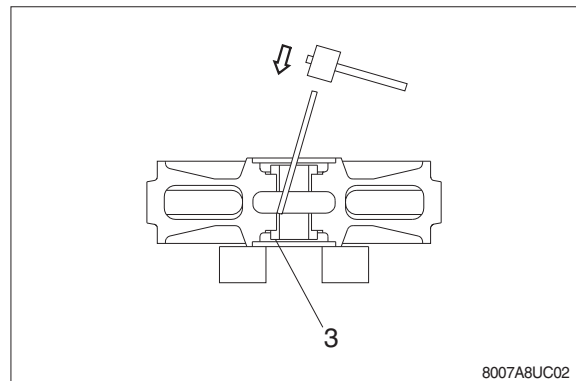
- ① Remove plug and drain oil.
- ② Remove nut (14).
- ③ Draw out the spring pin (13), using a press.



- ④ Pull out the shaft (2) with a press.
- ⑤ Remove seal (9) from idle (1) and bracket (6, 7).
- ⑥ Remove O-ring (10) from shaft.



- ⑦ Remove the bushing (3) from idler, using a special tool.
- ※ **Only remove bushing if replacement is necessary.**



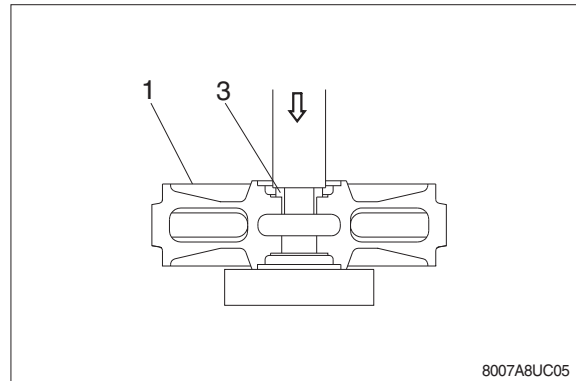
### (3) Assembly

※ Before assembly, clean the parts.

※ Coat the sliding surfaces of all parts with oil.

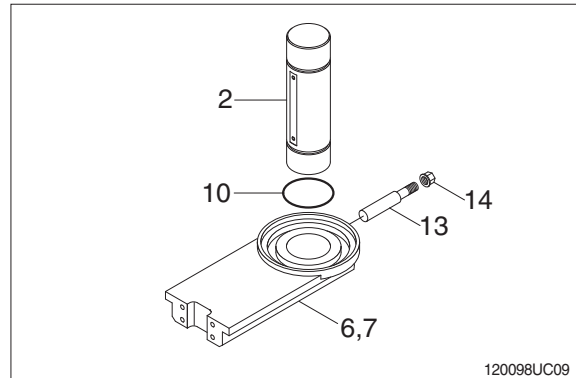
- ① Cool up bushing (3) fully by some dry ice and press it into idler (1).

Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.

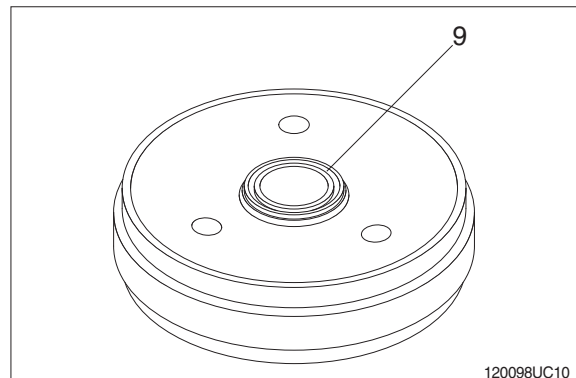


- ② Coat O-ring (10) with grease thinly, and install it to shaft (2).

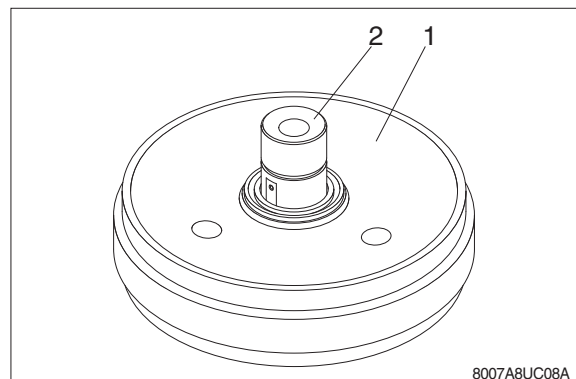
- ③ Insert shaft (2) into bracket (6, 7) and drive in the taper pin (13) and nut (14).



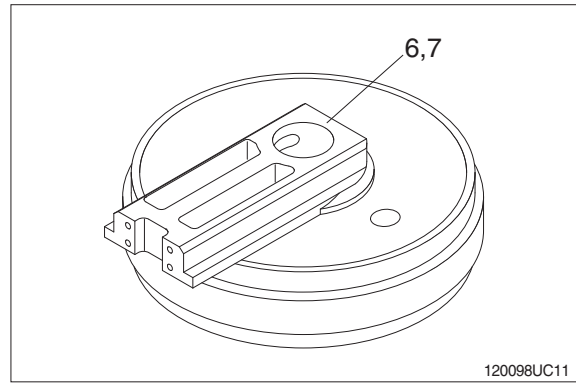
- ④ Install seal (9) to idler (1) and bracket (6, 7).



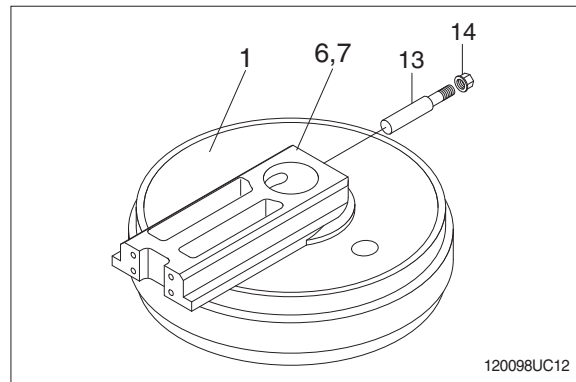
- ⑤ Install shaft (2) to idler (1).



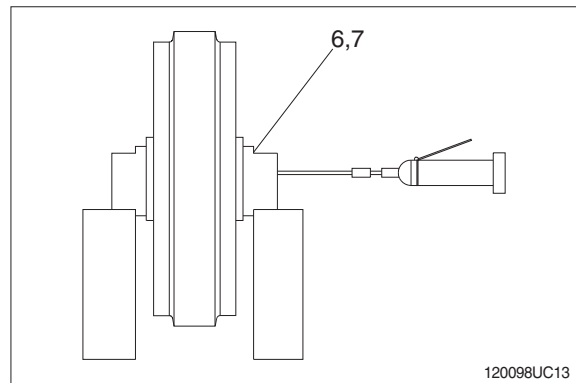
- ⑥ Install bracket (6, 7) attached with seal (9).



- ⑦ Knock in the taper pin (13) with a hammer and tighten nut (14).

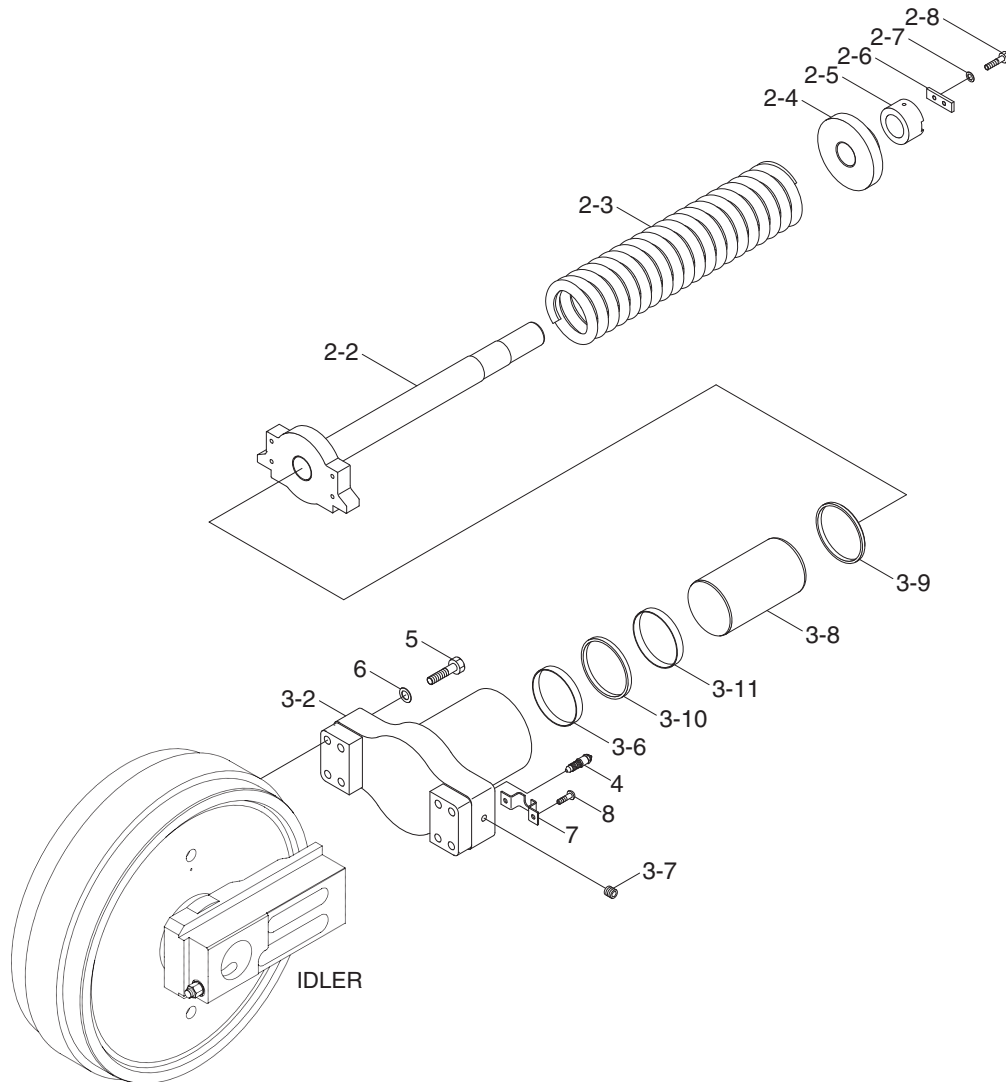


- ⑧ Lay bracket (6, 7) on its side.  
Supply engine oil to the specified level,  
and tighten plug.



#### 4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

##### (1) Structure

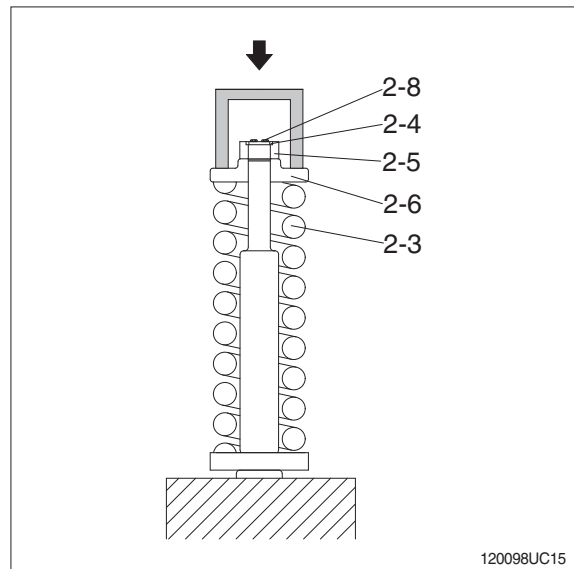


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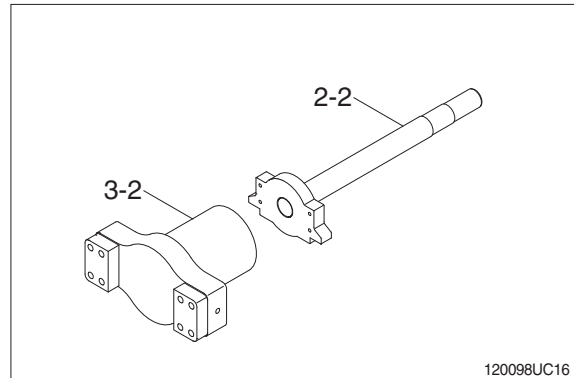
2	Tension cylinder assy	2-8	Bolt	3-10	U/Packing seal
2-2	Main rod	3	Tension body assy	3-11	Guide ring
2-3	Spring	3-2	Cylinder wa	4	Grease valve
2-4	Rear flange	3-6	Guide ring	5	Hex bolt
2-5	Locking ring	3-7	Plug	6	Hardened washer
2-6	Plate	3-8	Piston	7	Plate
2-7	Washer	3-9	Wiper ring	8	Socket bolt

## (2) Disassembly

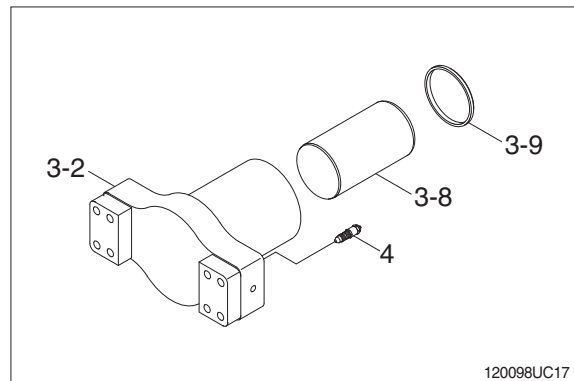
- ① Apply pressure on spring (2-3) with a press.
  - ※ **The spring is under a large installed load. This is dangerous, so be sure to set properly.**
    - Spring set load : 58957 kg (129980 lb)
- ② Remove bolt (2-8), safety plate (2-6) and locking ring (2-5).
- ③ Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.
- ④ Lighten the press load slowly and remove bracket (2-4) and spring (2-3).



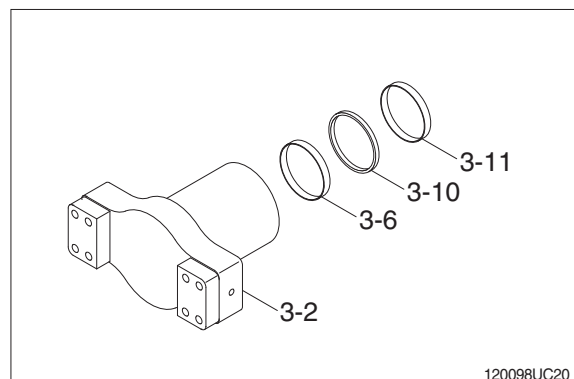
- ⑤ Remove rod (2-2) cylinder (3-2).



- ⑥ Remove grease valve (4) from cylinder (3-2).
- ⑦ Remove wiper ring (3-9) and piston (3-8) from cylinder (3-2).



- ⑧ Remove guide ring (3-11) packing seal (3-10) and guide ring (3-6).

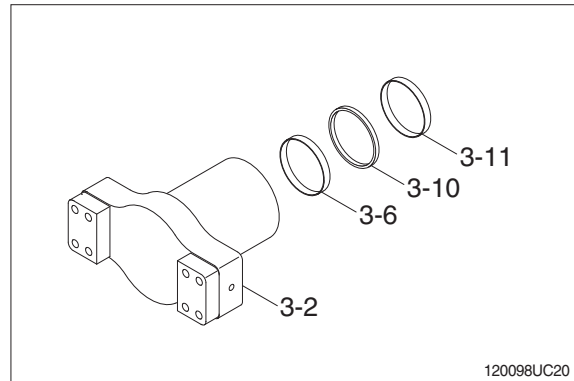


### (3) Assembly

- ① Install guide ring (3-6), packing seal (3-10), guide ring (3-11).

※ **When installing packing seal (3-10) take full care so as not to damage the lip.**

- ② Install piston (3-8) and wiper ring (3-9).

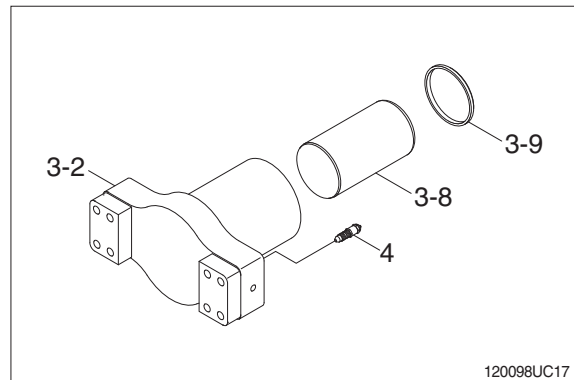


- ③ Pour grease into cylinder (3-2), then push in piston (3-8) by hand.

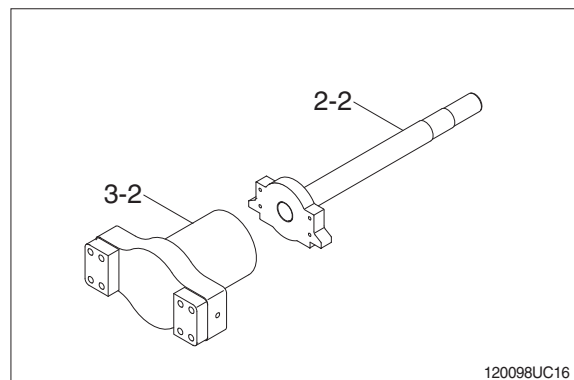
After take grease out of grease valve mounting hole, let air out.

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

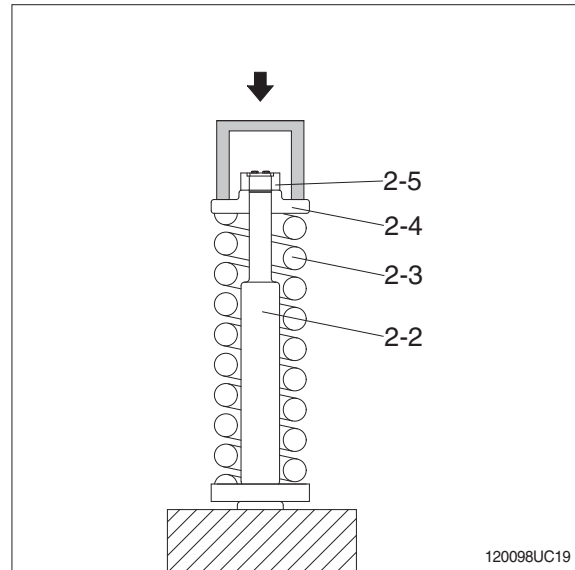
- ④ Fit grease valve (4) to cylinder (3-2).  
· Tightening torque :  $6.0 \pm 1.0$  kgf · m  
( $43.4 \pm 7.2$  lbf · ft)



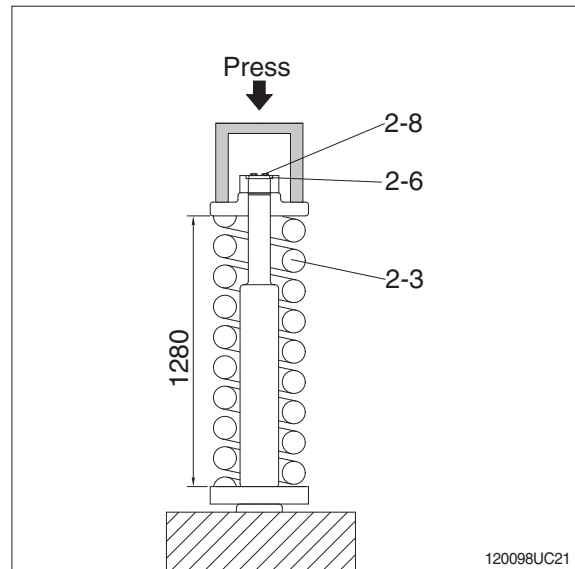
- ⑤ Install rod (2-2) and cylinder (3-2).



- ⑥ Install spring (2-3) and rear flange (2-4) to rod (2-2).
- ⑦ Apply pressure to spring (2-3) with a press and tighten locking ring (2-5).
- ※ **Apply sealant before assembling.**
- ※ **During the operation, pay attention specially to prevent the press from slipping out.**



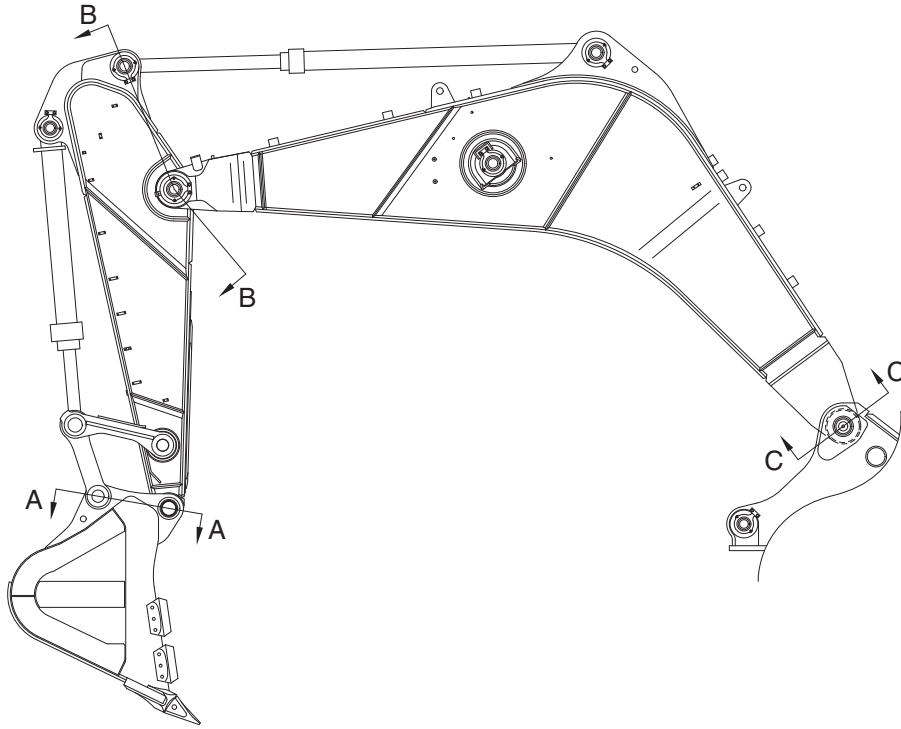
- ⑧ Lighten the press load and confirm the set length of spring (2-3).
- ⑨ After the setting of spring (2-3), install safety plate (2-6) and bolt (2-8).



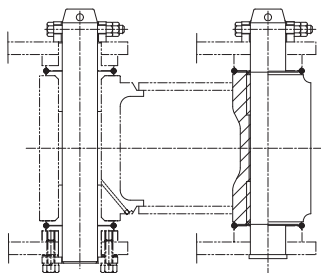


# GROUP 11 WORK EQUIPMENT

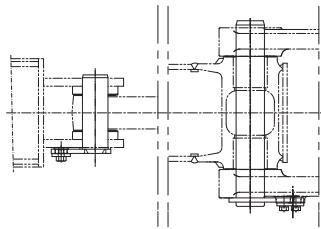
## 1. STRUCTURE



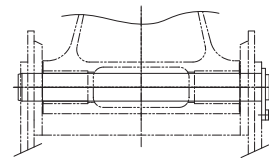
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SECTION A



SECTION B



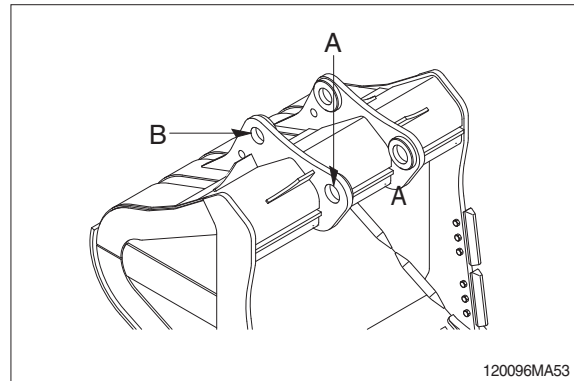
SECTION C

## 2. REMOVAL AND INSTALL

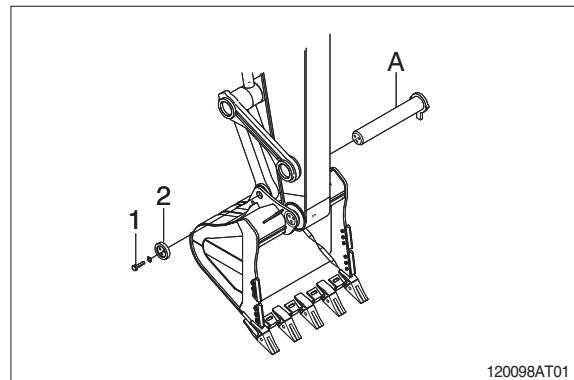
### 1) BUCKET ASSEMBLY

#### (1) Removal

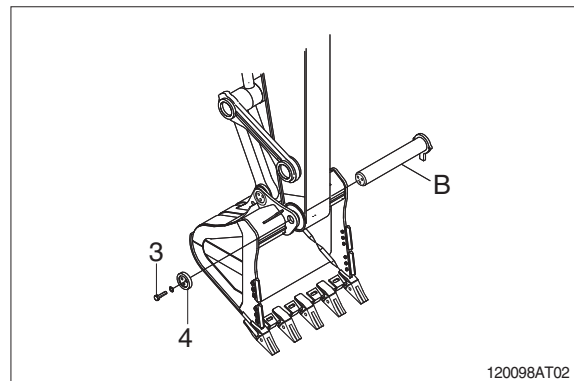
- ① Lower the work equipment completely to ground with back of bucket facing down.



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



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

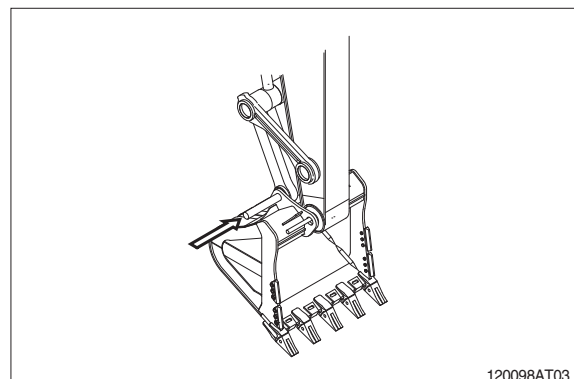


#### (2) Install

- 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 hose (1).

▲ 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.

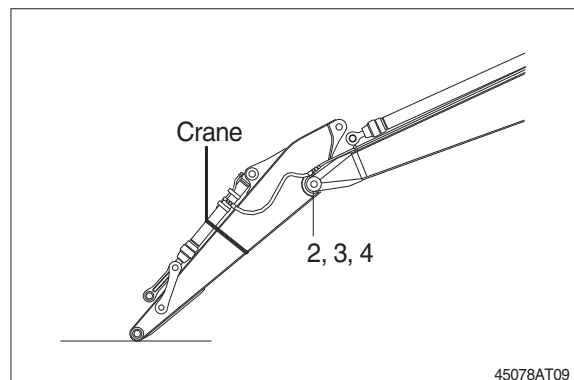
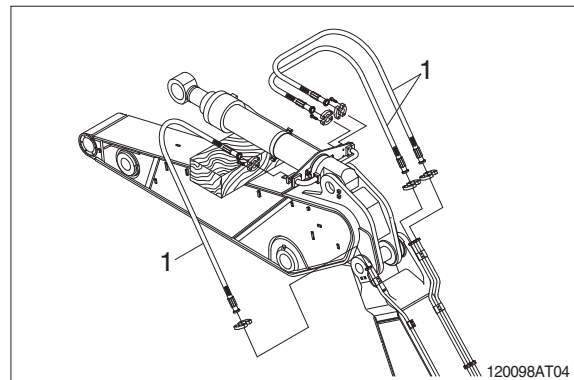
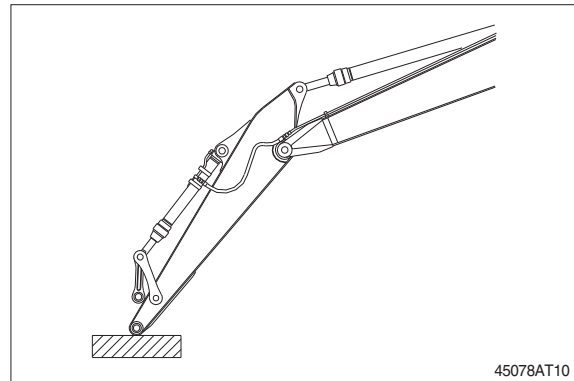
④ For details, see removal of arm cylinder assembly.

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 : 6500 kg (14330 lb)

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



### (2) Install

① Carry out installation in the reverse order to removal.

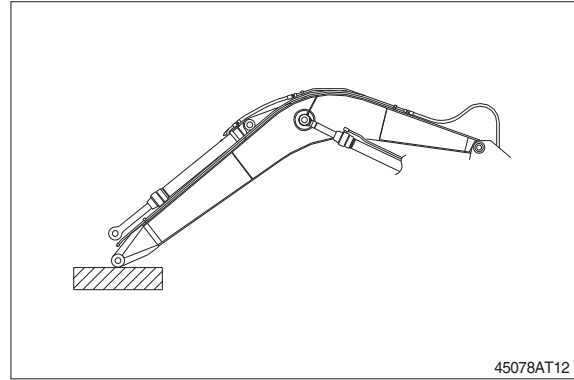
▲ When lifting the arm assembly, always lift the center of gravity.

※ Bleed the air from the cylinder.

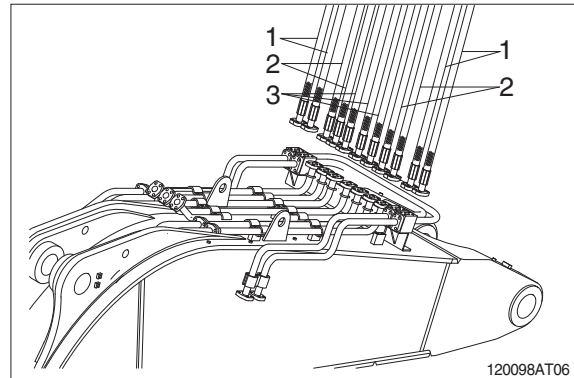
### 3) BOOM ASSEMBLY

#### (1) Removal

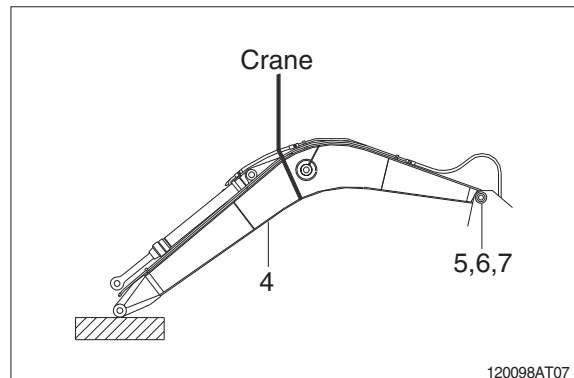
- ① Remove arm and bucket assembly.
- ② For details, see removal of arm and bucket assembly.  
Remove boom cylinder assembly from boom.  
For details, see removal of boom cylinder assembly.



- ③ Disconnect head lamp wiring.
- ④ Disconnect boom cylinder hose (1), bucket cylinder hose (2) and arm cylinder hose (3).  
\* **When the hose are disconnected, oil may spurt out.**
- ⑤ Sling boom assembly (4).



- ⑥ Remove bolt (5), plate (6) and pull out the pin (7) then remove boom assembly.  
· Weight : 12300 kg (27120 lb)  
\* **When lifting the boom assembly always lift the center of gravity.**



#### (2) Install

- ① Carry out installation in the reverse order to removal.  
▲ **When lifting the boom assembly, always lift the center of gravity.**  
\* **Bleed the air from the cylinder.**

