SECTION 8 DISASSEMBLY AND ASSEMBLY

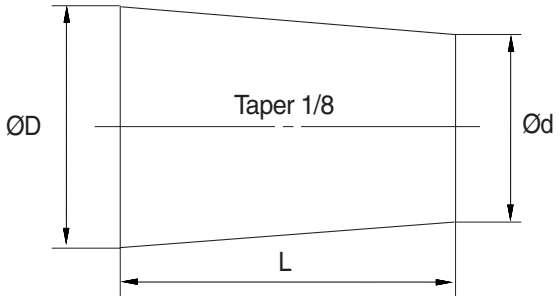
SECTION 8 DISASSEMBLY AND ASSEMBLY

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㎜ 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 (engine-bracket)	M12 × 1.75	11.5 ± 1.0	83.2 ± 7.2
2		Engine mounting bolt (bracket-frame)	M24 × 3.0	90 ± 9.0	651 ± 65
3		Radiator, oil cooler mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
4		Coupling mounting socket bolt	M20 × 2.5	46.5 ±2.5	336 ±18.1
5		Fuel tank mounting bolt	M20 × 2.5	57.8 ±5.8	418 ± 42.0
6	Hydraulic system	Main pump housing mounting bolt	M10 × 1.5	6.5 ± 0.7	47.0 ± 5.1
7		Main pump mounting socket bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
8		Main control valve mounting nut	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
9		Hydraulic oil tank mounting bolt	M20 × 2.5	57.9 ± 5.8	419 ± 42
10		Turning joint mounting bolt, nut	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
11	Power train system	Swing motor mounting bolt	M24 × 3.0	97.8 ± 15	707 ± 108
12		Swing bearing upper part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
13		Swing bearing lower part mounting bolt	M24 × 3.0	100 ± 10	723 ± 72.3
14		Travel motor mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
15		Sprocket mounting bolt	M20 × 2.5	57.9 ± 6.0	419 ± 43.4
16	Under carriage	Upper roller mounting bolt, nut	M16 × 2.0	29.7 ± 3.0	215 ± 21.7
17		Lower roller mounting bolt	M24 × 3.0	100 ± 10.0	723 ± 72.3
18		Track tension cylinder mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
19		Track shoe mounting bolt, nut	M22 × 1.5	123 ± 6.0	890 ± 43.4
20		Track guard mounting bolt	M24 × 3.0	100 ± 15	723 ± 108
21	Others	Counterweight mounting bolt	M36 × 3.0	337 ± 33	2440 ± 239
22		Cab mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7
23		Operator's seat mounting bolt	M 8 × 1.25	4.05 ± 0.8	29.3 ± 5.8
24		Under cover mounting bolt	M12 × 1.75	12.8 ± 3.0	92.6 ± 21.7

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

(2) Fine thread

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

2) PIPE AND HOSE (FLARE TYPE)

Thread size (PF)	Width across flat (mm)	kgf·m	lbf·ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130.2
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

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 drain plug under the hydraulic tank and drain the oil from the hydraulic tank.

· Hydraulic tank quantity : 210 ℓ
(55.5 U.S. gal)

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

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

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

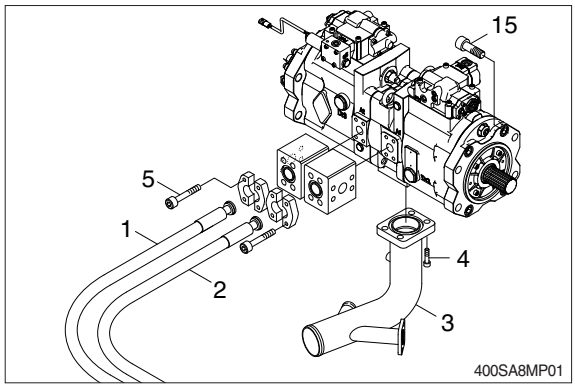
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

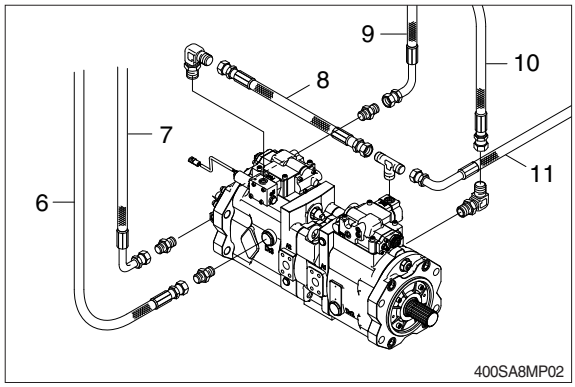
(8) Sling the pump assembly and remove the pump mounting bolts.

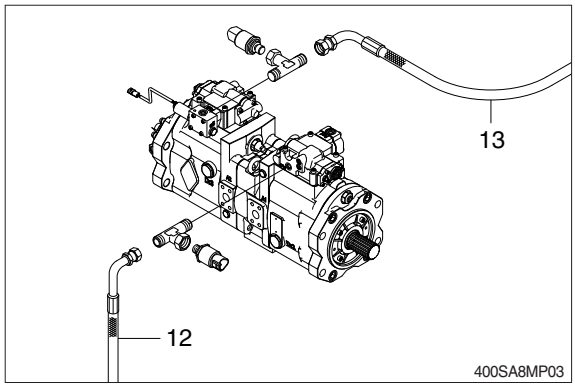
· Weight : 193 kg (425 lb)

· Tightening torque : 57.9±8.7 kgf · m
(419±62.9 lbf · ft)

※ 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 return filter with new one.

(4) Remove breather and clean it.

(5) After adding oil to the hydraulic tank to the specified level.

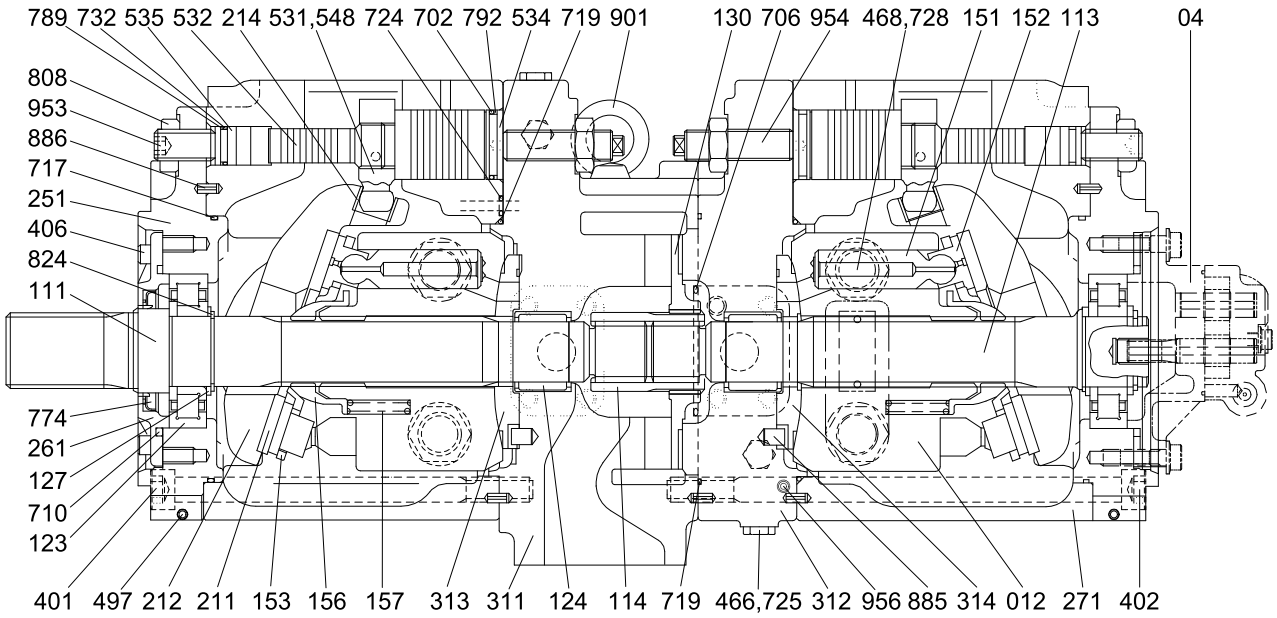
(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug (2EA).
② Tighten plug lightly.
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

(7) Start the engine, run at low idling (3~5 minutes) to circulate the oil through the system.

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

2. MAIN PUMP

1) STRUCTURE



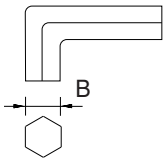
400SA2MP02

04	Gear pump	271	Pump casing	717	O-ring
111	Drive shaft (F)	311	Valve cover (F)	719	O-ring
113	Drive shaft (R)	312	Valve cover (R)	724	Square ring
114	Spline coupling	313	Valve plate (R)	725	O-ring
123	Roller bearing	314	Valve plate (L)	728	O-ring
124	Needle bearing	401	Hexagon socket bolt	732	O-ring
127	Bearing spacer	402	Hexagon socket bolt	774	Oil seal
130	Booster	406	Hexagon socket bolt	789	Back up ring
012	Cylinder block	466	Plug	792	Back up ring
151	Piston	468	Plug	808	Hexagon head nut
152	Shoe	497	MH Plug	824	Snap ring
153	Set plate	531	Tilting pin	885	Pin
156	Bushing	532	Servo piston	886	Spring pin
157	Cylinder spring	534	Stopper (L)	901	Eye bolt
211	Shoe plate	535	Stopper (S)	953	Set screw
212	Swash plate	548	Feedback pin	954	Set screw
214	Bushing	702	O-ring	956	Set screw
251	Support plate	706	O-ring		
261	Seal cover (F)	710	O-ring		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

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

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

(2) Tightening torque

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

(1) Select place suitable to disassembling.

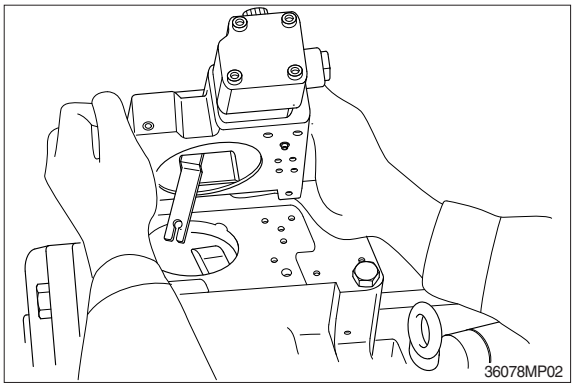
※ Select clean place.

※ Spread rubber sheet, cloth or so on on overhaul workbench top to prevent parts from being damaged.

(2) Remove dust, rust, etc, from pump surfaces with cleaning oil or so on.

(3) Remove drain port plug (468) and let oil out of pump casing (front and rear pump).

(4) Remove hexagon socket head bolts (412, 413) and remove regulator.



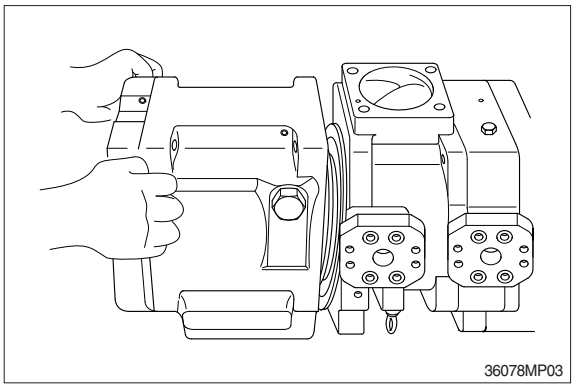
(5) Loosen hexagon socket head bolts (401) which tighten swash plate support (251), pump casing (271) and valve cover (F, 311).

※ If gear pump and so on are fitted to rear face of pump, remove them before starting this work.

(6) Loosen hexagon socket head bolts (402) which tighten swash plate support (251), pump casing (271) and valve cover (R, 312).

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

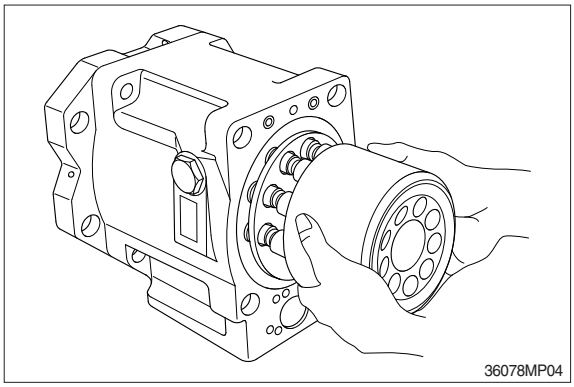
※ Before bringing this surface down, spread rubber sheet on workbench without fail to prevent this surface from being damaged.



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

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

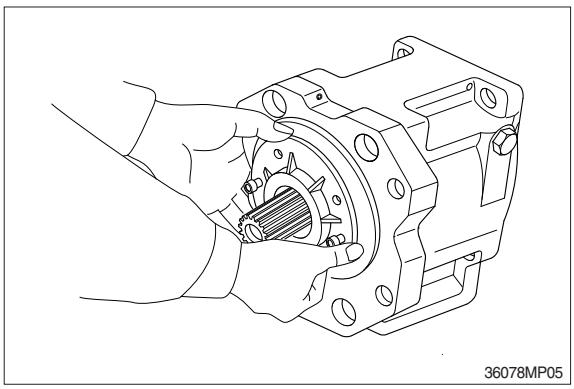
※ Take care not to damage sliding surfaces of cylinder, spherical bushing, shoes, swash plate, etc.



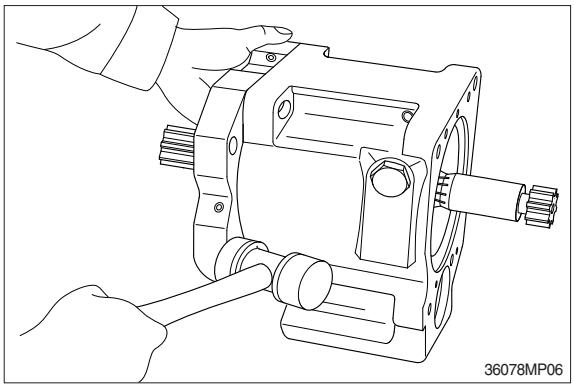
(10) Remove hexagon socket head bolts (406) and then seal cover (F, 261).

※ Fit bolt into pulling-out tapped hole of seal cover (F), and cover can be removed easily.

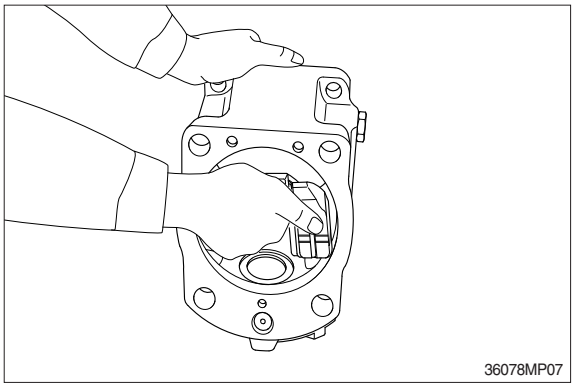
※ Since oil seal is fitted on seal cover (F), take care not to damage it when removing cover.



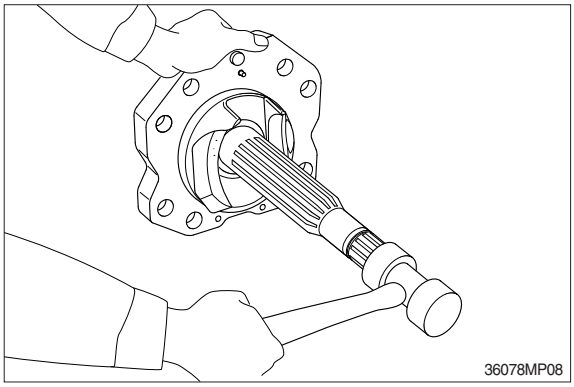
(11) Tapping lightly fitting flange section of swash plate support (251) on its pump casing side, separate swash plate support from pump casing.



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

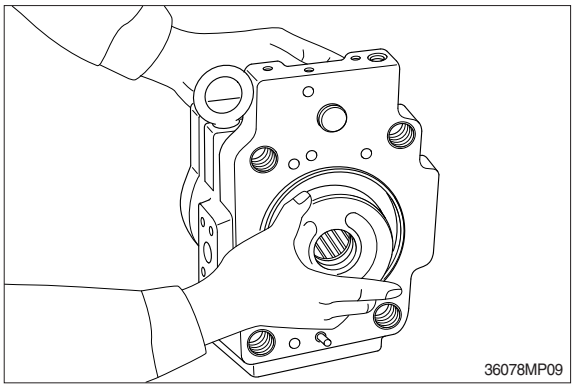


(13) Tapping lightly shaft ends of drive shafts (111, 113) with plastic hammer, take out drive shafts from swash plate supports.



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

※ These may be removed in work 7, 9.



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

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

※ Since loctite is applied to fitting areas of tilting pin and servo piston, take care not to damage servo piston.

※ Do not remove needle bearing as far as possible, except when it is considered to be out of its life span.

※ Do not loosen hexagon nuts of valve cover and swash plate support.
If loosened, flow setting will be changed.

(16) This is the end of disassembling procedures.

4) ASSEMBLY

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

① Do not fail to repair the parts damaged during disassembling, and prepare replacement parts in advance.

② Clean each part fully with cleaning oil and dry it with compressed air.

③ Do not fail to apply clean working oil to sliding sections, bearings, etc. before assembling them.

④ In principle, replace seal parts, such as O-rings, oil seals, etc.

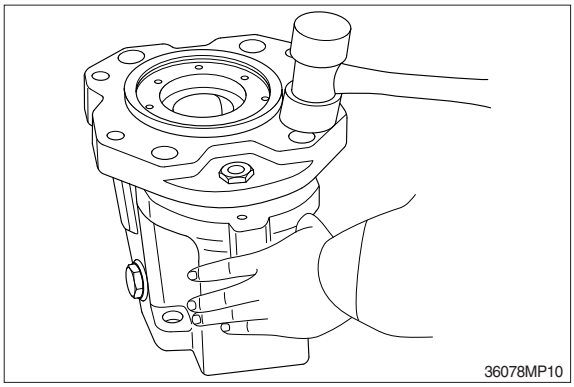
⑤ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with torques shown in page 8-10, 11.

⑥ For the double-pump, take care not to mix up parts of the front pump with those of the rear pump.

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

※ After servo piston, tilting pin, stopper (L) and stopper (S) are removed, fit them soon to pump casing in advance for reassembling.

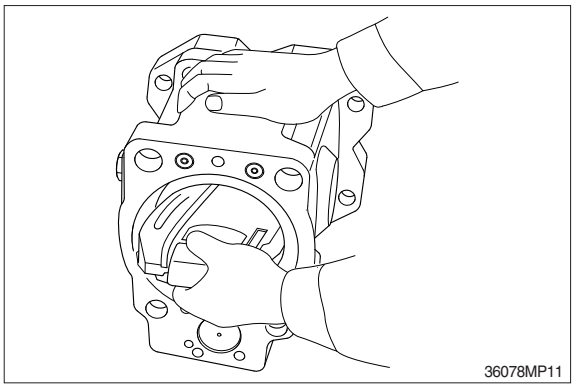
※ In tightening servo piston and tilting pin, use a protector to prevent tilting pin head and feedback pin from being damaged. In addition, apply loctite (medium strength) to their threaded sections.



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

※ Confirm with fingers of both hands that swash plate can be removed smoothly.

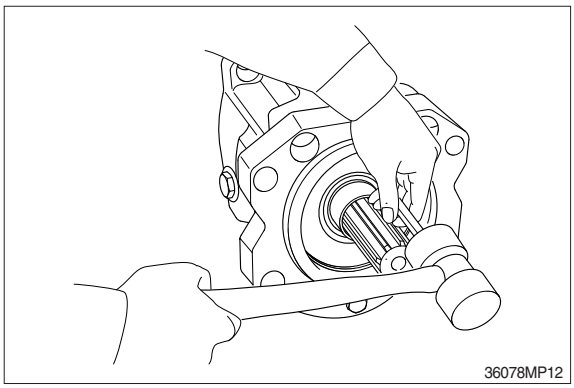
※ Apply grease to sliding sections of swash plate and swash plate support, and drive shaft can be fitted easily.



(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 with hammer or so on.

※ Assemble them into support, tapping outer race of bearing lightly with plastic hammer.
Fit them fully, using steel bar or so on.

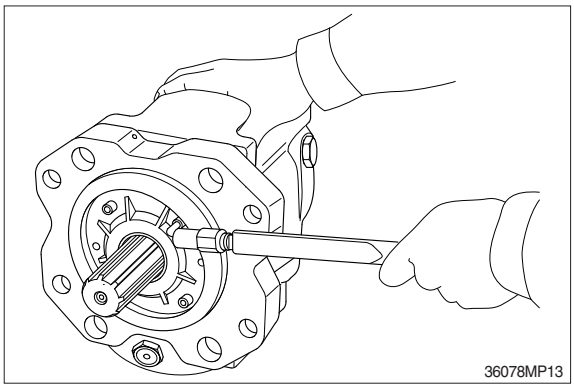


(5) Assemble seal cover(F, 261) to pump casing(271) and fix it with hexagon socket head bolts(406).

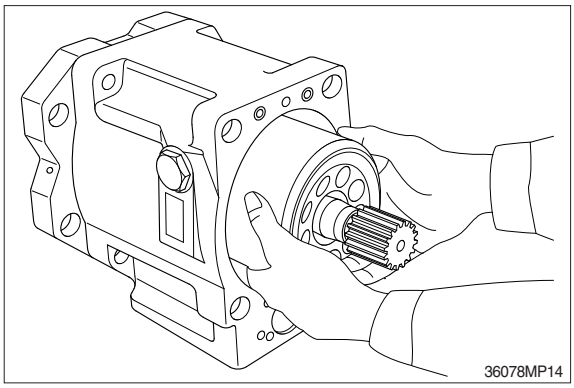
※ Apply grease lightly to oil seal in seal cover(F).

※ Assemble oil seal, taking full care not to damage it.

※ For tandem type pump, fit rear cover(263) and seal cover(262) similarly.

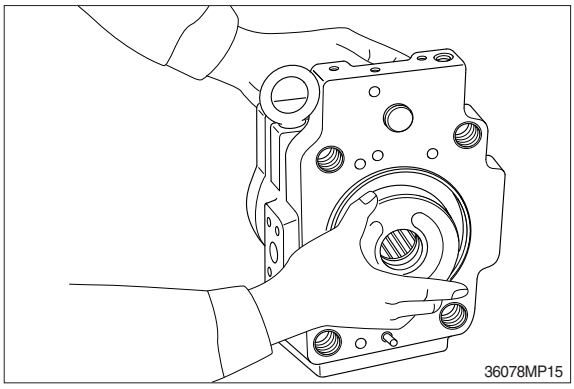


(6) Assemble piston cylinder subassembly [cylinder block (012), piston subassembly (151, 152), set plate (153), spherical bushing (156) and cylinder spring (157)].
Fit spline phases of retainer and cylinder.
Then, insert piston cylinder subassembly into pump casing (271).



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

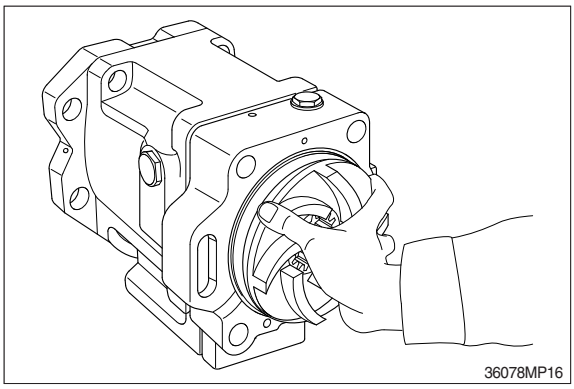
※ Take care not to mistake suction / delivery directions of valve plate.



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

※ Take care not to mistake direction of valve cover.

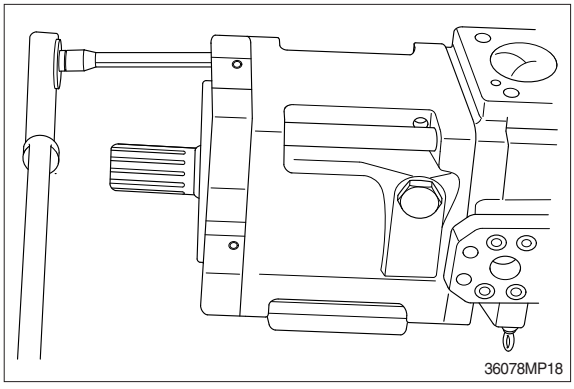
※ Fit valve cover with regulator up and with delivery flange left, viewed from front side. Take care not to mistake direction of booster (130).
(Refer to the sectional drawing)



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

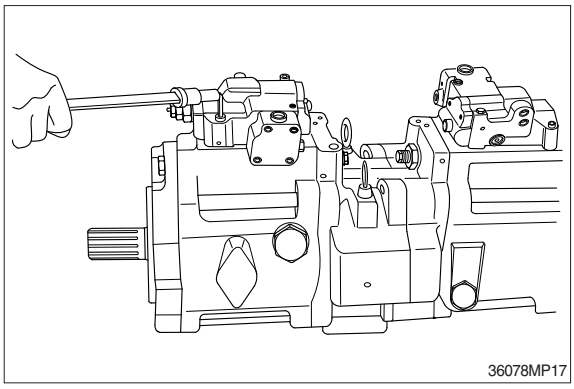
(10) Fit pump casing (271) with shaft (F, 111) to valve cover (F, 311) and tighten hexagon socket head bolts (401).

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



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

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

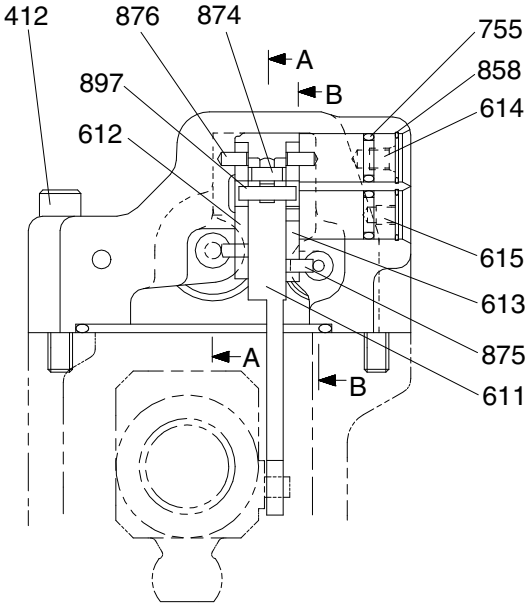


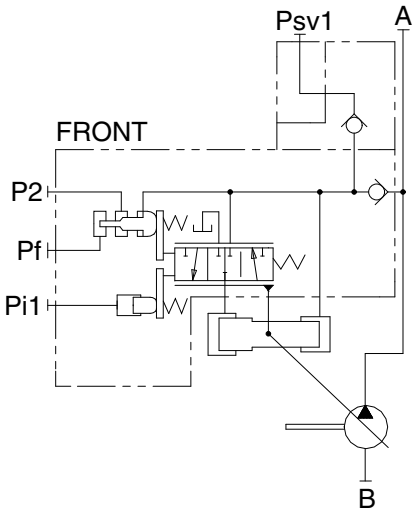
(12) Fit drain port plug (468).

This is the end of reassembling procedures.

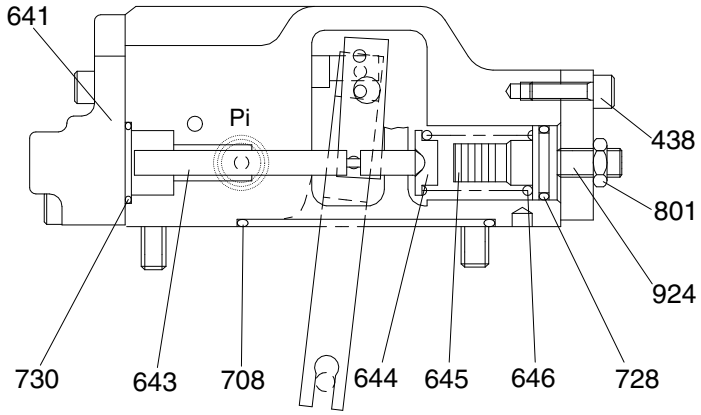
3. REGULATOR

1) FRONT REGULATOR (1/2)

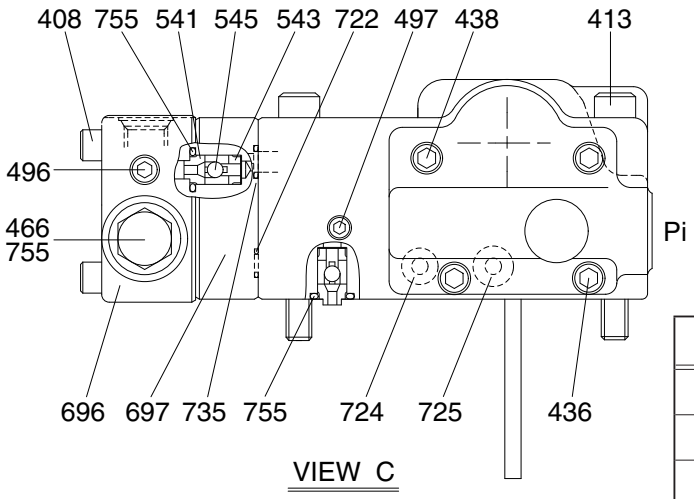




Hydraulic circuit



SECTION B-B

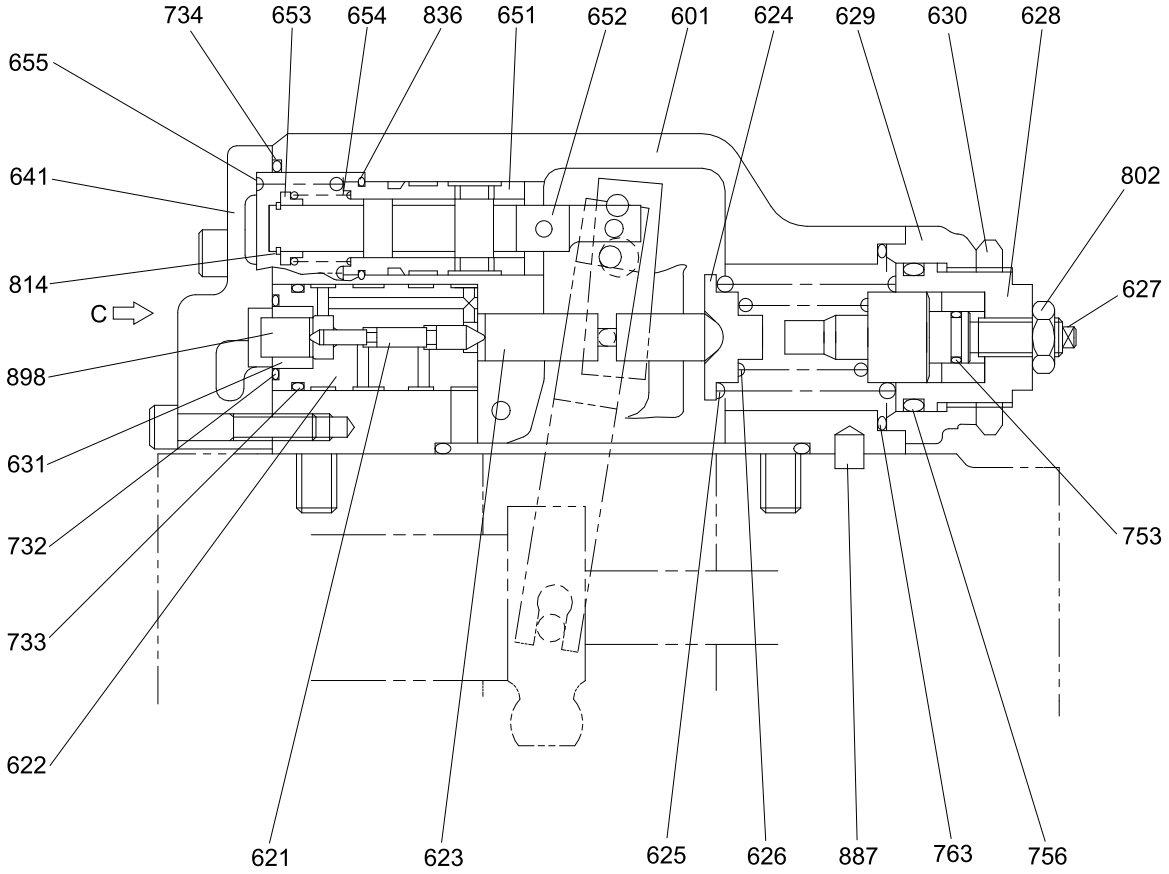


VIEW C

400SA2RG01

Port	Port name	Port size
Pi1	Pilot port	PF 1/4-15
Psv1	Servo assist port	PF 1/4-15
Pf	Power shift port	-
P2	Companion delivery port	-

FRONT REGULATOR (2/2)

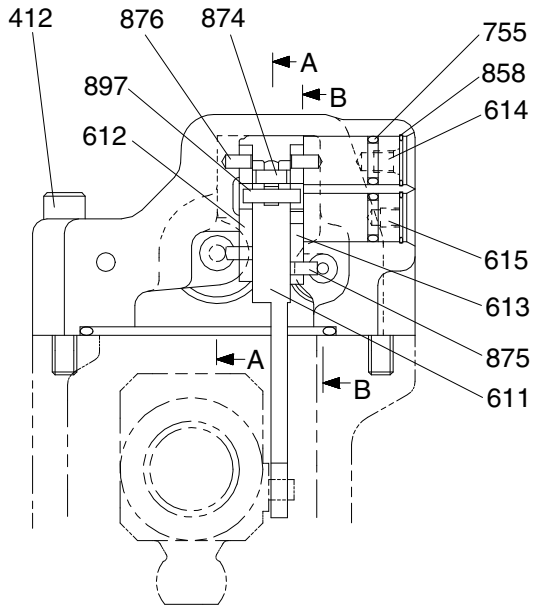


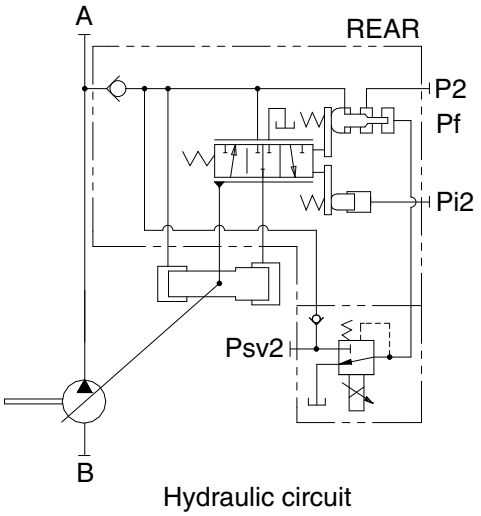
SECTION A-A

400SA2RG03

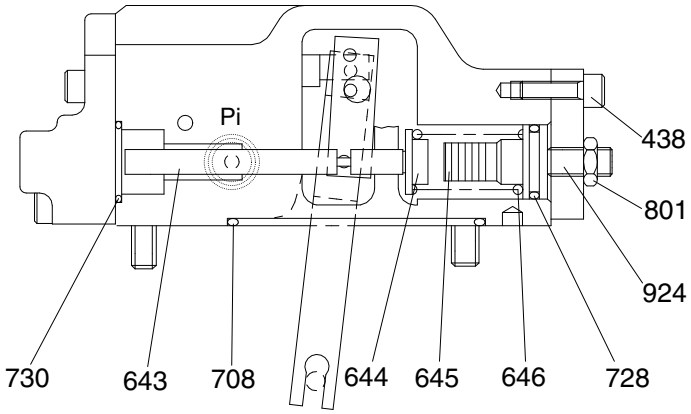
408	Hexagon socket bolt	626	Inner spring	728	O-ring
412	Hexagon socket bolt	627	Adjust stem (C)	730	O-ring
413	Hexagon socket bolt	628	Adjust screw (C)	732	O-ring
436	Hexagon socket bolt	629	Cover (C)	733	O-ring
438	Hexagon socket bolt	630	Lock nut	734	O-ring
466	Plug	631	Sleeve, pf	735	O-ring
496	Plug	641	Pilot cover	753	O-ring
497	Plug	643	Pilot piston	755	O-ring
541	Seat	644	Spring seat (Q)	756	O-ring
543	Stopper	645	Adjust stem (Q)	763	O-ring
545	Steel ball	646	Pilot spring	801	Hexagon nut
601	Casing	651	Sleeve	802	Hexagon nut
611	Feedback lever	652	Spool	814	Snap ring
612	Lever(1)	653	Spring seat	836	Stop ring
613	Lever(2)	654	Return spring	858	Snap ring
614	Center plug	655	Set spring	874	Pin
615	Adjust plug	696	Port cover	875	Pin
621	Compensator piston	697	Check valve plate	876	Pin
622	Piston case	708	O-ring	887	Pin
623	Compensator rod	722	O-ring	897	Pin
624	Spring seat (C)	724	Square ring	898	Pin
625	Outer spring	725	O-ring	924	Set screw

2) REAR REGULATOR (1/2)

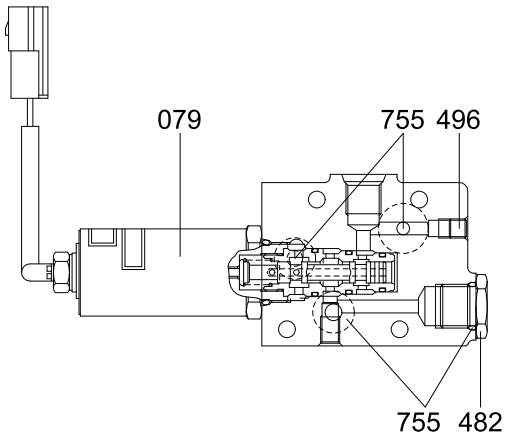




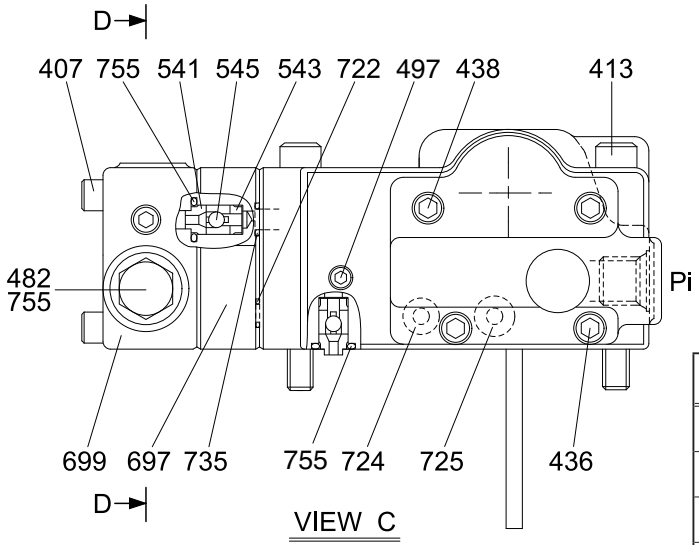
Hydraulic circuit



SECTION B-B



SECTION D-D

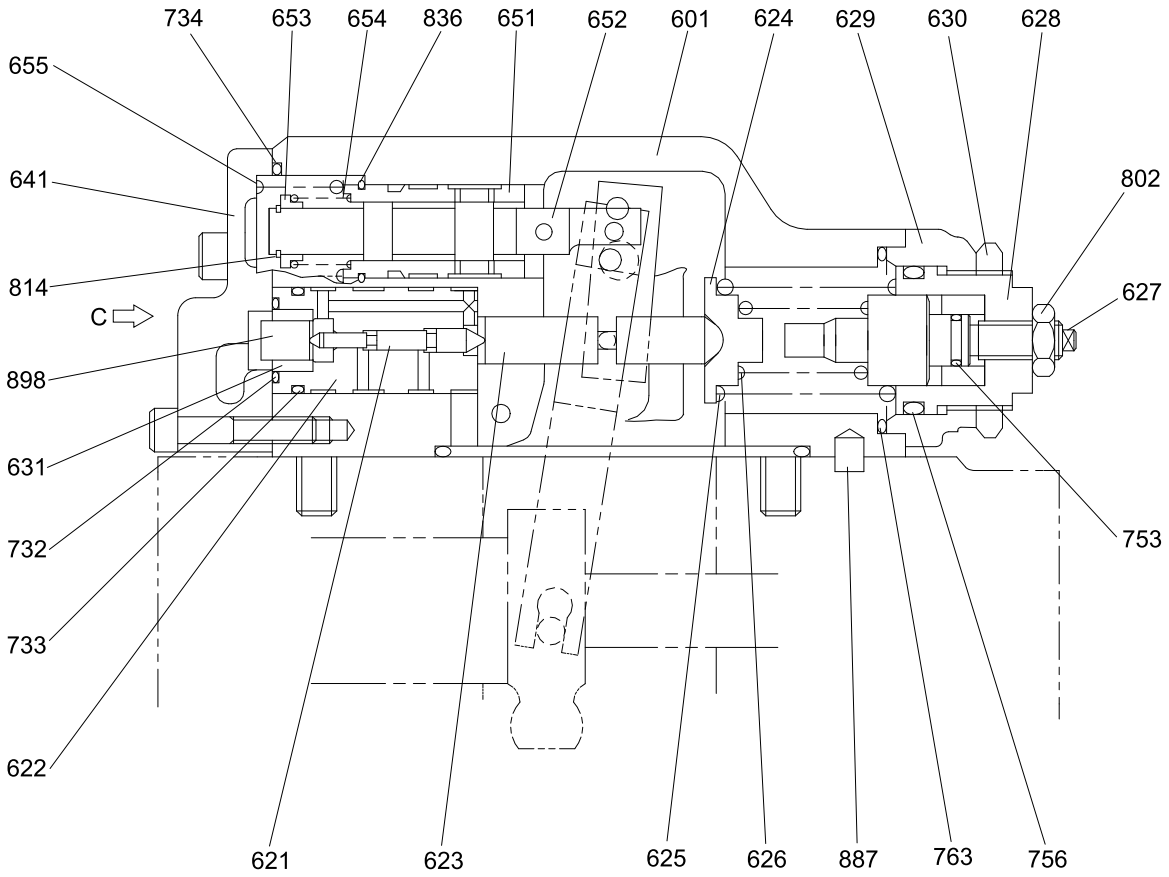


VIEW C

400SA2RG02

Port	Port name	Port size
Pi1	Pilot port	PF 1/4-15
Psv1	Servo assist port	PF 1/4-15
Pf	Power shift port	-
P2	Companion delivery port	-

REAR REGULATOR (2/2)



SECTION A-A

400SA2RG03

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412	Hexagon socket bolt	627	Adjust stem (C)	730	O-ring
413	Hexagon socket bolt	628	Adjust screw (C)	732	O-ring
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482	Plug	631	Sleeve, pf	735	O-ring
496	Plug	641	Pilot cover	753	O-ring
497	Plug	643	Pilot piston	755	O-ring
541	Seat	644	Spring seat (Q)	756	O-ring
543	Stopper	645	Adjust stem (Q)	763	O-ring
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611	Feedback lever	652	Spool	814	Snap ring
612	Lever(1)	653	Spring seat	836	Stop ring
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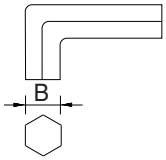
614	Center plug	655	Set spring	874	Pin
615	Adjust plug	697	Check valve plate	875	Pin
621	Compensator piston	699	Valve casing	876	Pin
622	Piston case	708	O-ring	887	Pin
623	Compensator rod	722	O-ring	897	Pin
624	Spring seat (C)	724	Square ring	898	Pin
625	Outer spring	725	O-ring	924	Set screw

3) TOOLS AND TIGHTENING TORQUE

(1) Tools

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

<table>
<tr><th colspan="2">Tool name & size</th><th colspan="4">Part name</th></tr>
<tr><td rowspan="4">Allen wrench
 
</td><td>B</td><td>Hexagon socket head bolt</td><td>PT plug (PT thread)</td><td>PO plug (PF thread)</td><td>Hexagon socket head setscrew</td></tr>
<tr><td>4</td><td>M 5</td><td>BP-1/16</td><td>-</td><td>M 8</td></tr>
<tr><td>5</td><td>M 6</td><td>BP1/ 8</td><td>-</td><td>M10</td></tr>
<tr><td>6</td><td>M 8</td><td>BP-1/ 4</td><td>PO-1/4</td><td>M12, M14</td></tr>
<tr><td rowspan="2">Double ring spanner, socket wrench, double (single) open end spanner
 
</td><td>-</td><td colspan="2">Hexagon head bolt</td><td>Hexagon head nut</td><td>VP plug (PF thread)</td></tr>
<tr><td>6</td><td colspan="2">M8</td><td>M8</td><td>-</td></tr>
<tr><td colspan="2">Adjustable angle wrench</td><td colspan="4">Small size, Max 36 mm</td></tr>
<tr><td colspan="2">Screw driver</td><td colspan="4">Minus type screw driver, Medium size, 2 sets</td></tr>
<tr><td colspan="2">Hammer</td><td colspan="4">Plastic hammer, 1 set</td></tr>
<tr><td colspan="2">Pliers</td><td colspan="4">For snap ring, TSR-160</td></tr>
<tr><td colspan="2">Steel bar</td><td colspan="4">4×100 mm</td></tr>
<tr><td colspan="2">Torque wrench</td><td colspan="4">Capable of tightening with the specified torques</td></tr>
<tr><td colspan="2">Pincers</td><td colspan="4">-</td></tr>
<tr><td colspan="2">Bolt</td><td colspan="4">M4, Length : 50mm</td></tr>
</table>

(2) Tightening torque

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

4) 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.

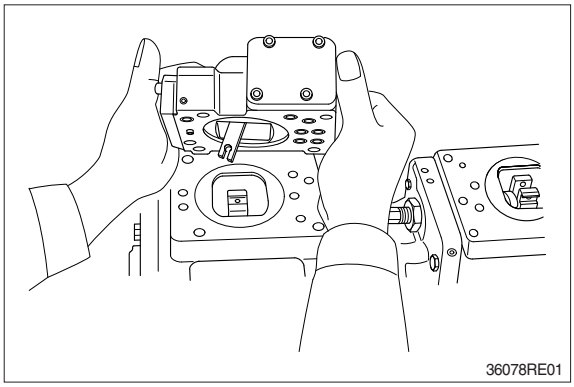
※ Choose a clean place.

※ 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.

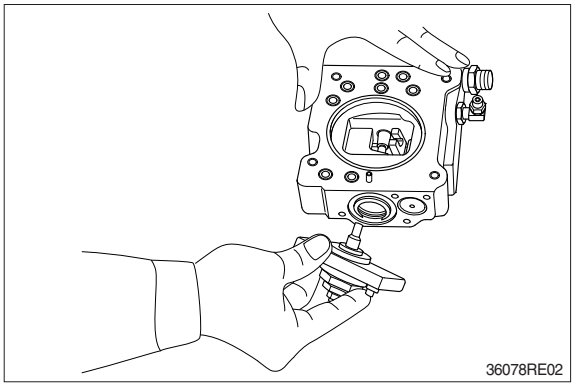


(4) Remove hexagon socket head screw (438) and remove cover (C,629)

※ Cover (C) is fitted with adjusting screw (C,QI) (628), adjusting stem (C, 627), lock nut (630), hexagon nut (801) and set screw (924).

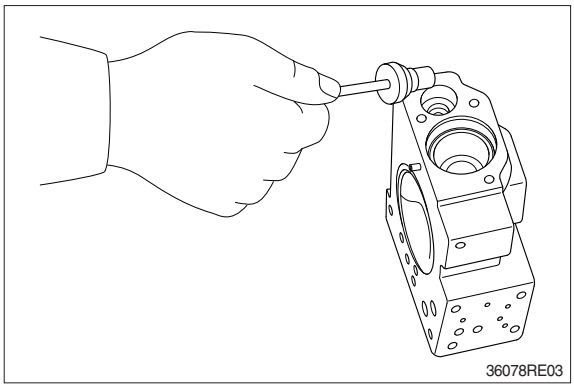
Do not loosen these screws and nuts.

If they are loosened, adjusted pressure-flow setting will vary.

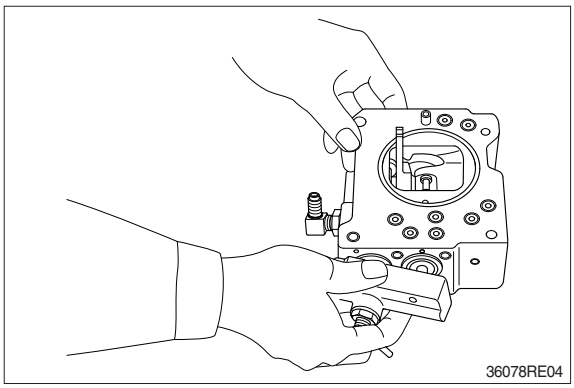


(5) After removing cover (C, 629) subassembly, take out outer spring (625), inner spring (626) and spring seat (C, 624) from compensating section.
Then draw out adjusting stem (Q, 645), pilot spring (646) and spring seat (644) from pilot section.

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



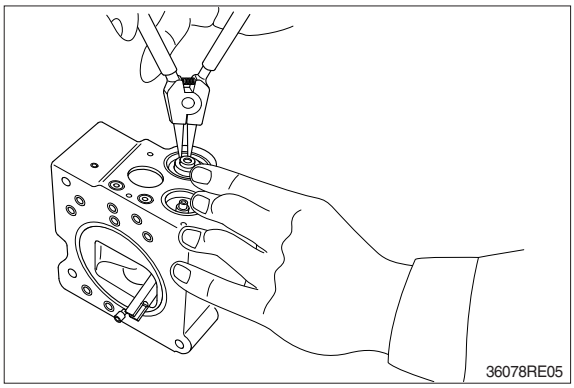
(6) Remove hexagon socket head screws (436, 438) and remove pilot cover (641).
After removing pilot cover, take out set spring (655) from pilot section.



(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).

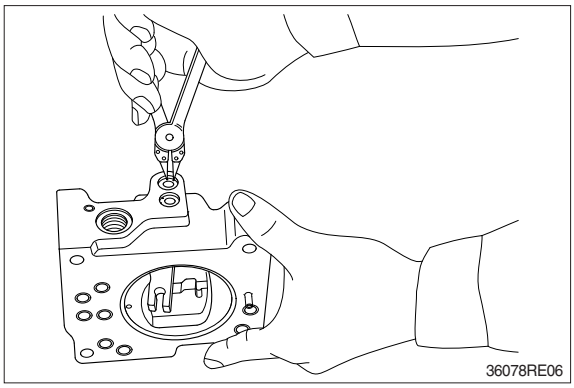
※ When removing snap ring (814), return spring (654) may pop out.

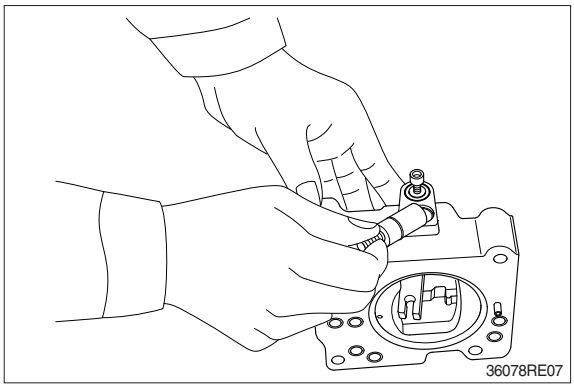
※ Take care not to lose it.



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

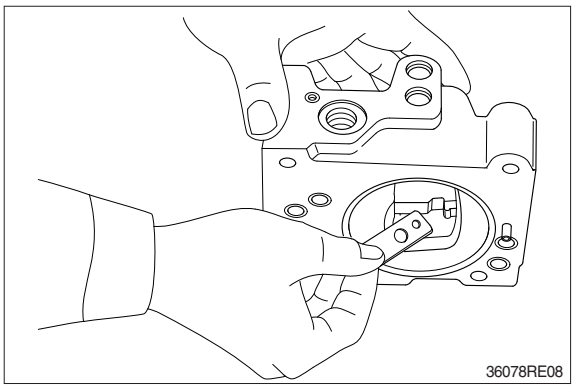
※ Fulcrum plug (614) and adjusting plug (615) can easily be taken out with M6 bolt.





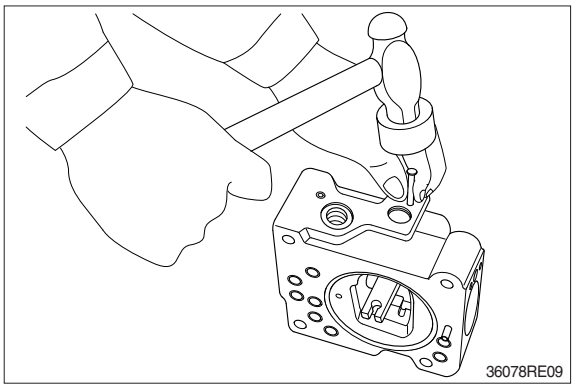
(9) Remove lever2 (613). Do not draw out pin (875).

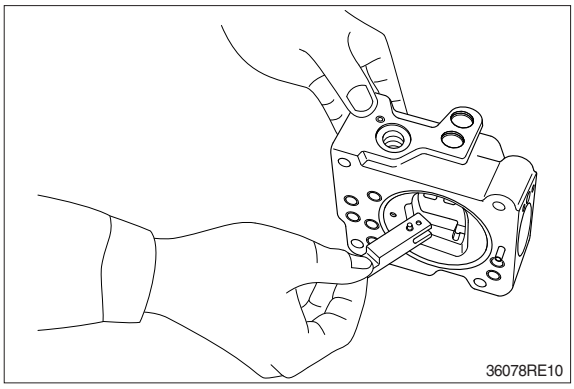
※ Work will be promoted by using pincers or so on.



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

※ Push out pin (874, 4 mm in dia.) from above with slender steel bar so that it may not interfere with lever1 (612).





(11) Remove lever1 (612). Do not draw out pin (875).

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

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

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

This completes disassembly.

4) ASSEMBLY

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

① Always repair parts that were scored at disassembly.

② Get replacement parts ready beforehand.
Mixing of foreign matter will cause malfunction.

③ Therefore, wash parts well with cleaning oil, let them dry with jet air and handle them in clean place.

④ Always tighten bolts, plugs, etc. to their specified torques.

⑤ Do not fail to coat sliding surfaces with clean hydraulic oil before assembly.
Replace seals such as O-ring with new ones as a rule.

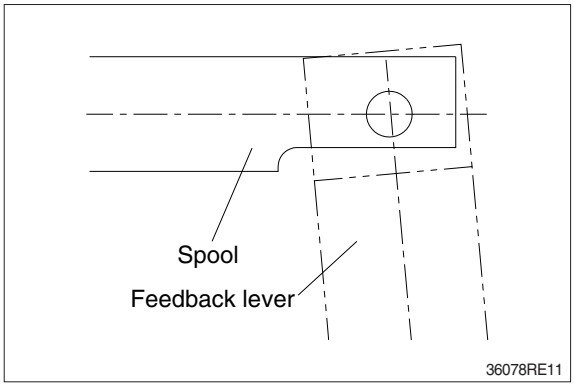
(2) Put compensating rod (623) into compensating hole of casing(601).

(3) Put pin force-fitted in lever1 (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.

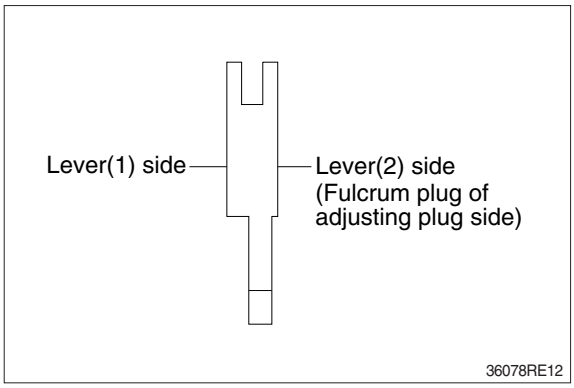
※ Pay attention to orientation of spool.



(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.

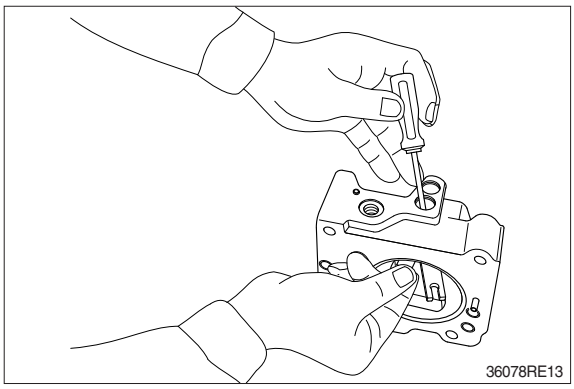
※ Take care not to mistake direction of feedback lever.



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

※ Confirm that pilot piston slides smoothly without binding.

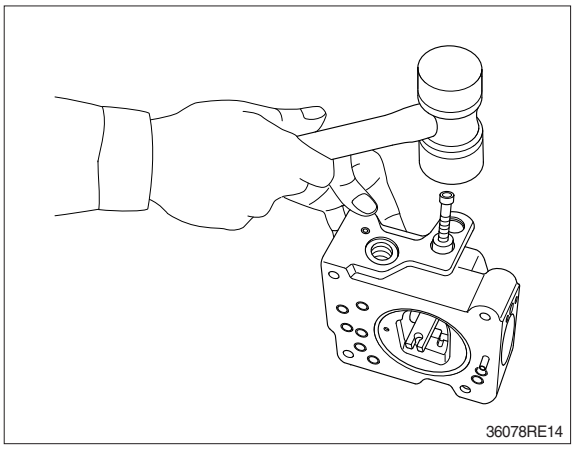
(7) Put pin force-fitted in lever2 (613) into groove of pilot piston.
Then fix lever (2).



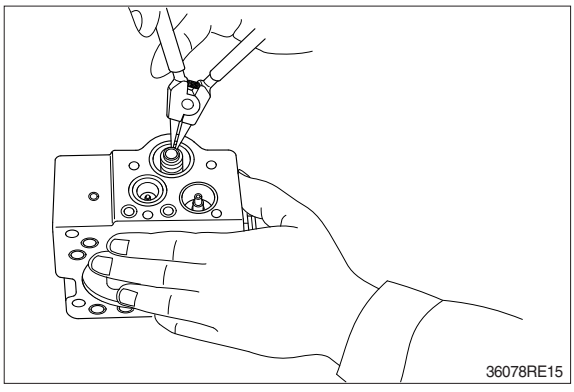
(8) Fit fulcrum plug (614) so that pin force-fitted in fulcrum plug (614) can be put into pin hole of lever (2).
Then fix locking ring (858).

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

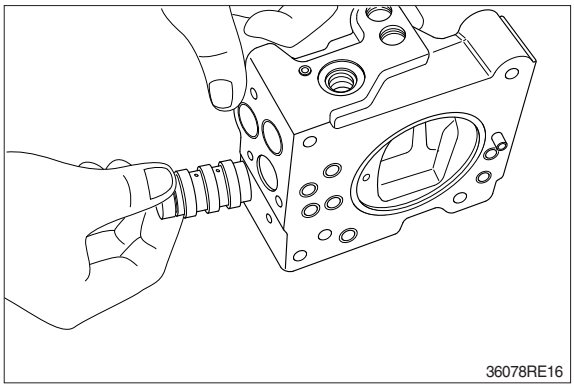
※ Take care not to mistake inserting holes for fulcrum plug and adjusting plug.
At this point in time move feedback lever to confirm that it has no large play and is free from binding.



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

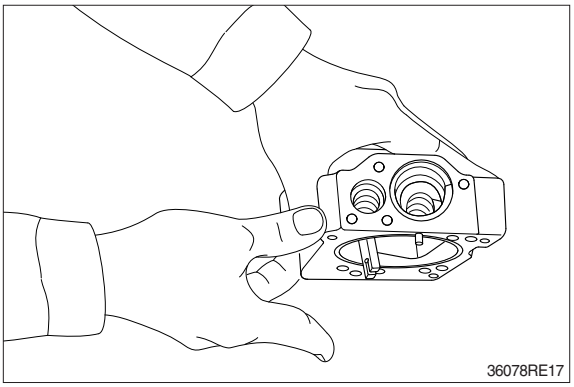


(11) Fit set spring (655) to spool hole and put compensating piston (621) and piston case (622) into compensating hole.
Fit pilot cover (641) and tighten it with hexagonal socket head screws (436, 438).



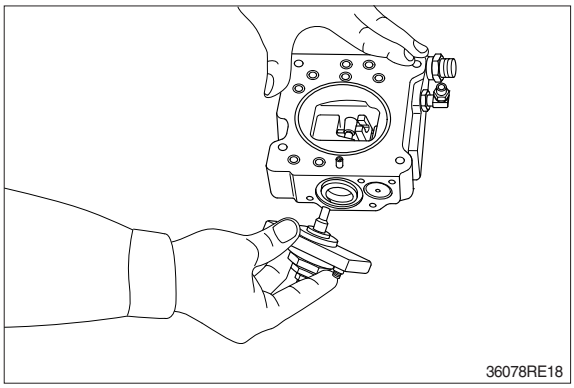
(12) Put spring seat (644), pilot spring (646) and adjusting stem (Q, 645) into pilot hole. Then fix spring seat (624), inner spring (626) and outer spring (625) into compensating hole.

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



(13) Install cover (C, 629) fitted with adjusting screws (628), adjusting stem (C, 627), lock nut (630), hexagon nut (802) and set screw (924).
Then tighten them with hexagonal socket head screws (438).

This completes assembly.



1. REMOVAL AND INSTALL

1) REMOVAL

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

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

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

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

(4) Remove bolts and disconnect pipes.

(5) Disconnect pilot line hoses.

(6) Disconnect pilot pipes.

(7) Sling the control valve assembly and remove the control valve mounting bolts.
- Weight : 380 kg (838 lb)
- Tightening torque : 57.9±8.7 kgf · m (419±62.9 lbf · ft)

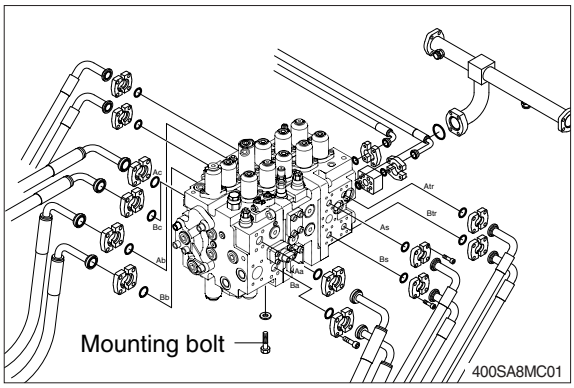
(8) Remove the control valve assembly.
When removing the control valve assembly, check that all the piping have been disconnected.

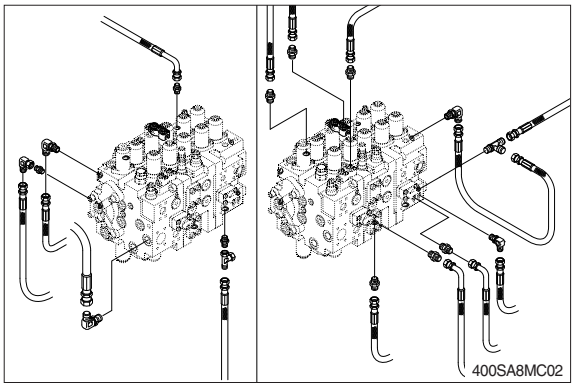
2) INSTALL

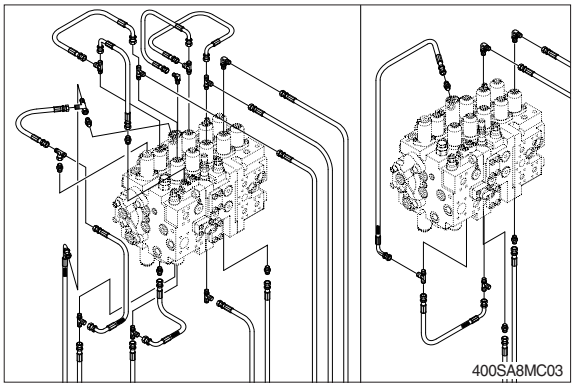
(1) Carry out installation in the reverse order to removal.

(2) Bleed the air from below items.
① Cylinder (Boom, arm, bucket)
② Swing motor
③ Travel motor
※ See each item removal and install.

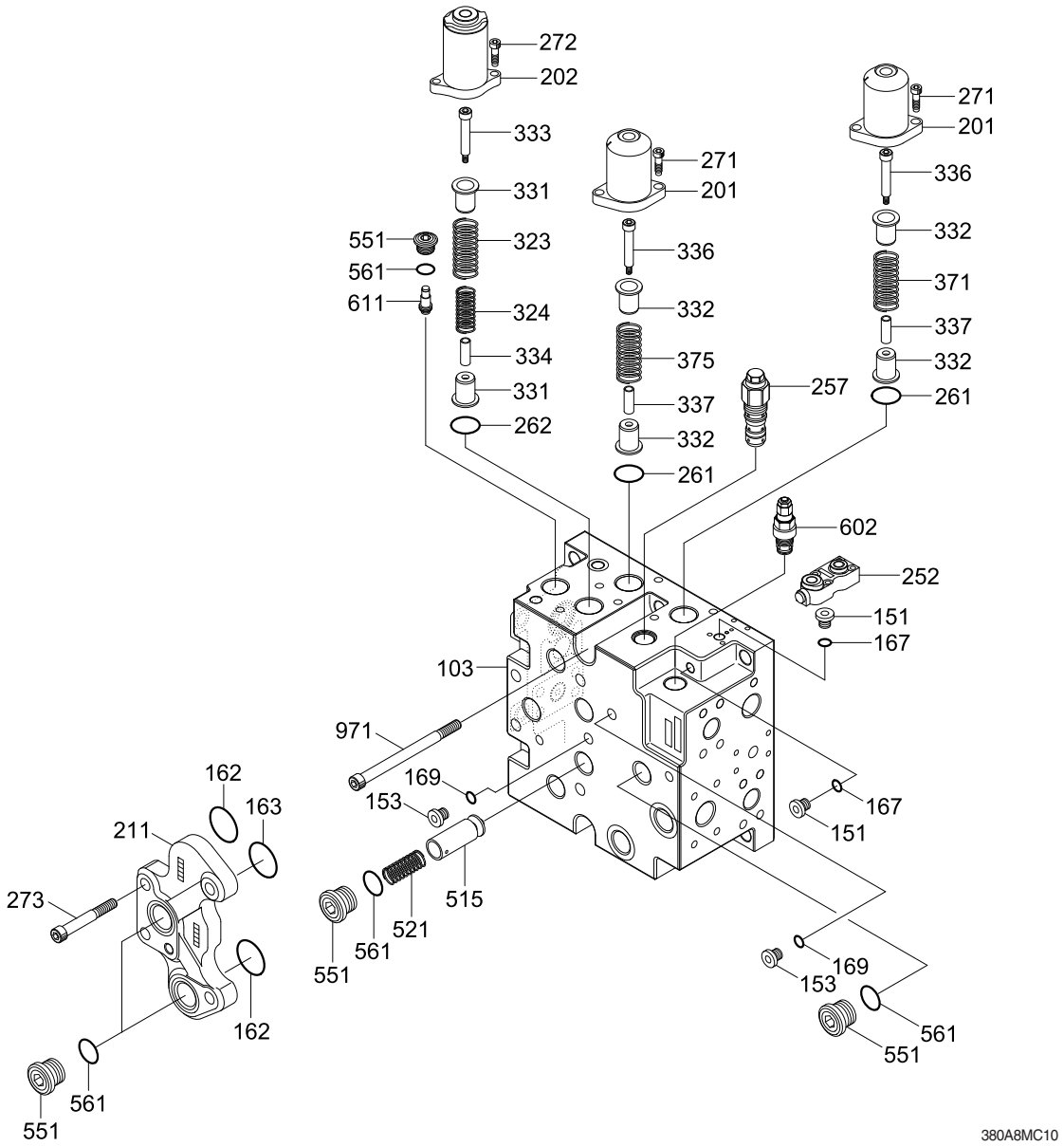
(3) Confirm the hydraulic oil level and recheck the hydraulic oil leak or not.





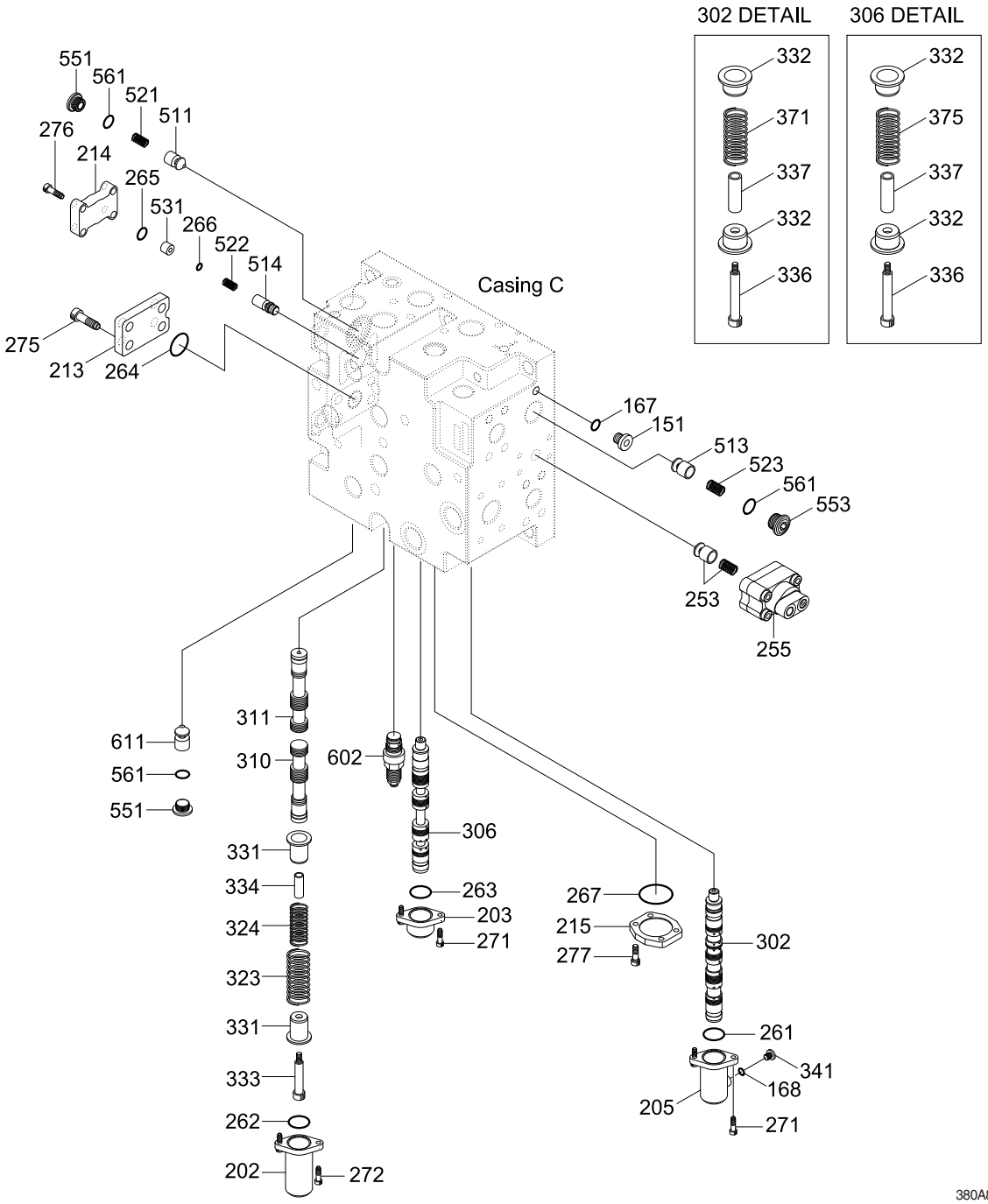


2. STRUCTURE (1/4)



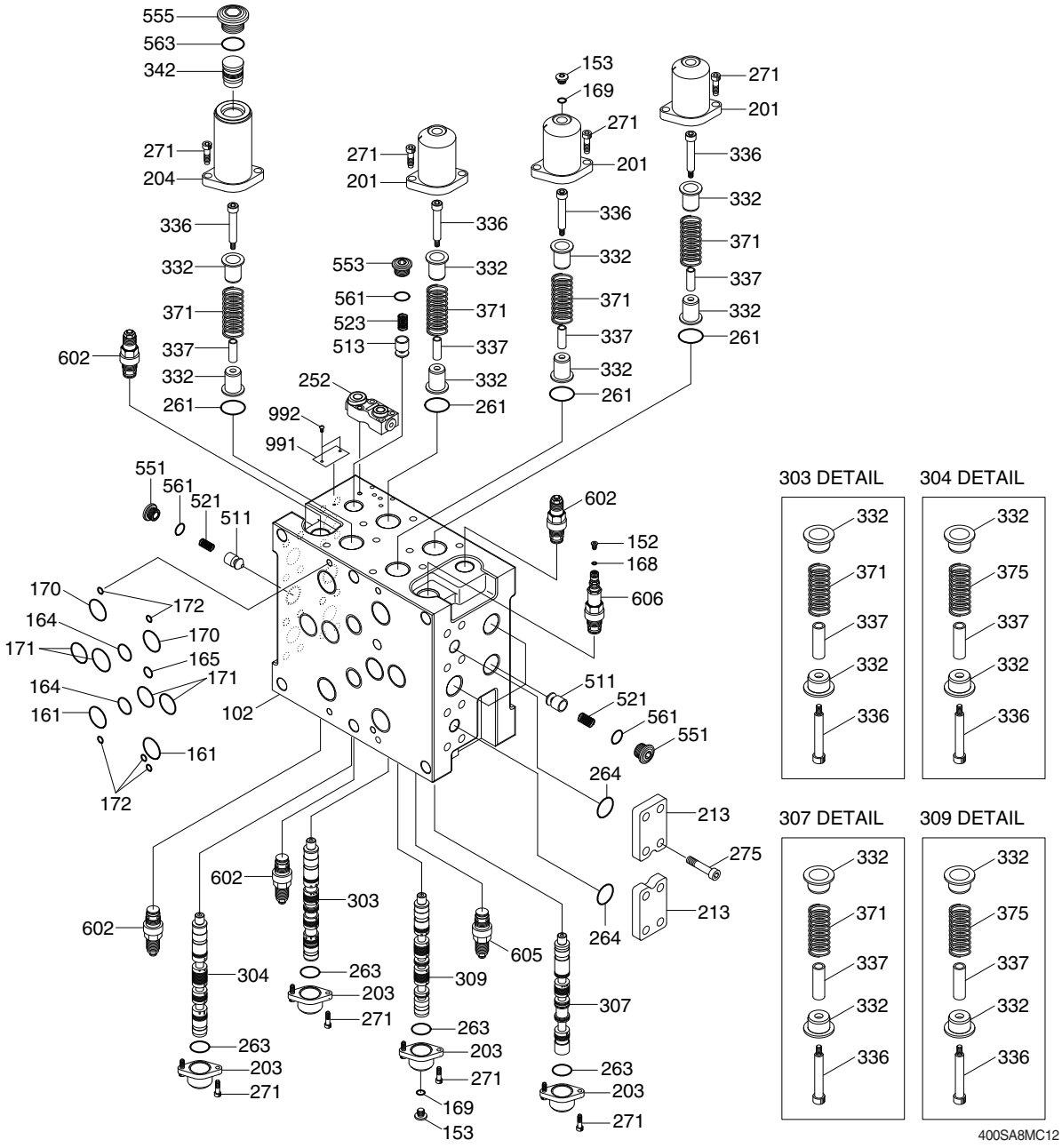
103	Casing C	252	Lock valve	371	Spring
151	Plug	257	Arm relief valve assy	375	Spring
153	Plug	261	O-ring	515	Poppet
162	O-ring	271	Hexagon socket bolt	521	Spring
163	O-ring	273	Hexagon socket screw	551	Plug
167	O-ring	331	Seat	561	O-ring
169	O-ring	332	Spring seat	602	Relief valve assy
201	Spring cover	333	Spacer bolt	611	Nega-con relief valve assy
202	Spring cover	336	Spacer bolt	971	Hexagon socket screw
211	Plate	337	Stopper		

STRUCTURE (2/4)



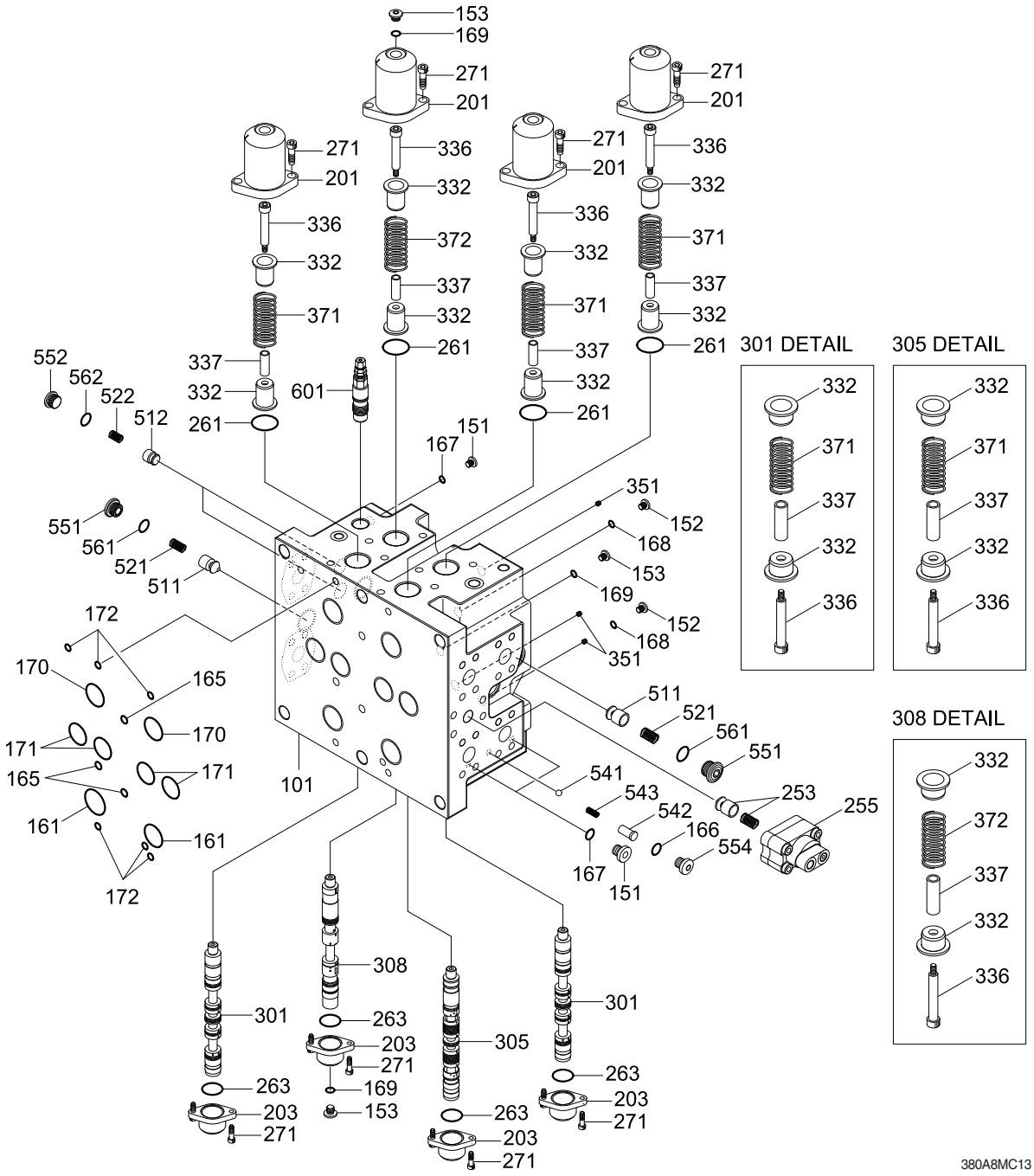
151	Plug	265	O-ring	333	Spacer bolt
167	O-ring	266	O-ring	334	Stopper
168	O-ring	267	O-ring	341	Plug
202	Spring cover	271	Hexagon socket screw	511	Poppet
203	Spool cover	272	Hexagon socket screw	513	Poppet
205	Spool cover	275	Hexagon socket screw	514	Poppet
213	Flange	276	Hexagon socket screw	521	Spring
214	Load check cover	277	Hexagon socket screw	522	Spring
215	Blank flange	302	Arm 1 spool kit	523	Spring
253	Logic control valve assy	306	Arm 2 spool kit	531	Spring seat
255	Logic control valve assy	310	Bypass spool kit	551	Plug
261	O-ring	311	Bypass spool kit	553	Plug
262	O-ring	323	Spring	561	O-ring
263	O-ring	324	Spring	602	Relief valve assy
264	Square ring	331	Seat	611	Nega-con relief valve assy

STRUCTURE (3/4)



102	Casing B	252	Lock valve	375	Spring
152	Plug	261	O-ring	511	Poppet
153	Plug	263	O-ring	513	Poppet
161	O-ring	264	Square ring	521	Spring
164	O-ring	271	Hexagon socket screw	523	Spring
165	O-ring	275	Hexagon socket screw	551	Plug
168	O-ring	303	Boom 1 spool kit	553	Plug
169	O-ring	304	Bucket spool kit	555	Plug
170	O-ring	307	Boom 2 spool kit	561	O-ring
171	O-ring	309	Option spool kit	563	O-ring
172	O-ring	332	Spring seat	602	Relief valve assy
201	Spring cover	336	Spacer bolt	605	Relief valve assy
203	Spool cover	337	Stopper	991	Name plate
204	Spring cover	342	Valve piston	992	Rivet screw
213	Flange	371	Spring		

STRUCTURE (4/4)



380A8MC13

101	Casing A	203	Spool cover	372	Spring
151	Plug	253	Logic control valve assy	511	Poppet
152	Plug	255	Logic control valve assy	512	Poppet
153	Plug	261	O-ring	521	Spring
161	O-ring	263	O-ring	522	Spring
165	O-ring	271	Hexagon socket screw	541	Steel ball
166	O-ring	301	Travel spool kit	542	Spring seat
167	O-ring	305	Swing spool kit	543	Spring
169	O-ring	308	Travel spool kit	551	Plug
168	O-ring	332	Spring seat	552	Plug
170	O-ring	336	Spacer bolt	554	Plug
171	O-ring	337	Stopper	561	O-ring
172	O-ring	351	Orifice	562	O-ring
201	Spring cover	371	Spring	601	Relief valve assy

3. DISASSEMBLY AND ASSEMBLY

1) GENERAL PRECAUTIONS

(1) All hydraulic components must be worked with precision working. Then, before disassembling and assembling them, it is essential to select an especially-clean place.

(2) In handling a control valve, pay full attention to prevent dust, sand, etc. from entering into it.

(3) When a control valve is to be removed from the machine, apply caps and masking seals to all ports. Before disassembling the valve, re-check that these caps and masking seals are fitted completely, and then clean the outside of the assembly. Use a proper bench for working, spread a paper or rubber mat on the bench, and disassemble the valve on it.

(4) Support the body section carefully in carrying, transferring and so on of the control valve. Do not support the lever, exposed spool, end cover section or so on without fail.

(5) After disassembling and assembling of the component, it is desired to carry out various tests (for the relief characteristics, leakage, flow resistance, etc.), but the hydraulic test equipment is necessary to these tests.
Therefore, even when its disassembling can be carried out technically, do not disassemble such component that cannot be tested, adjusted, and so on.
Besides, prepare clean cleaning oil, hydraulic oil, grease, etc. beforehand.

2) TOOLS

Before disassembling the control valve, prepare the following tools beforehand.

Name of tool	Quantity	Size (mm)
Vise bench	1 unit	-
Box wrench	Each 1 piece	36, 46
Hexagon key wrench	Each 1 piece	5, 6, 8, 10, 12, 14, 17
Loctite #262	1 piece	-
Spanner	Each 1 piece	32 (main relief valve, 601) 36 (port relief valve, 602, 605)

3) DISASSEMBLING

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

(1) Place control valve on working bench.

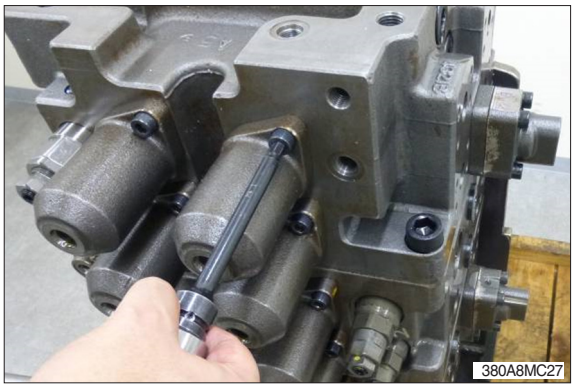
※ Disassemble it in clean place and pay attention not to damage flange face.

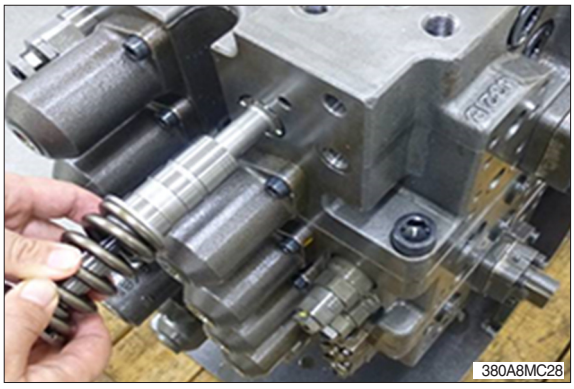
(2) Disassembling of main spool (travel (301), bucket (304), swing (305), option (309), arm 2 (306), boom 2 (307))

① Loosen the hexagon the socket head bolts (271), and remove the spring cover (201 or 204) and the O-ring (261). (hexagon key wrench 8 mm)

② Pull out spool, spring, spring seats (332), stopper (337) and spacer bolt (336) in spool assembly condition from casing.

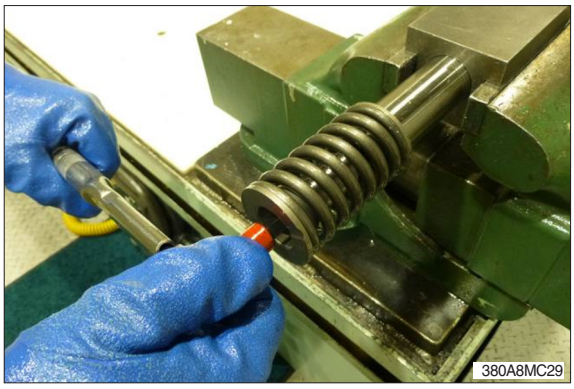
※ When pulling out spool assembly from casing, pay attention not to damage casing.





③ Hold the spool in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Remove spacer bolt (336) and disassemble spring, stopper (337) and spring seats (332).
(hexagon key wrench 8 mm)

Loosen plug (555) before removing bucket spring cover (204) from casing B (102). Then, pull out piston (342).
(hexagon key wrench 17 mm)



(3) Disassembling of the boom1 spool (303)

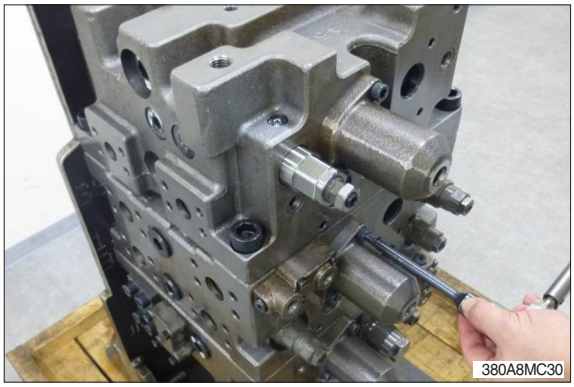
① Loosen the hexagon socket head bolts (271) and remove the spring cover (201) and O-ring (261).
(hexagon key wrench 8 mm)

② Pull out the boom1 spool (303), spring (371), spring seat (332), stopper (337) and spacer bolt (336) in the spool assembly condition from the casing B (102).

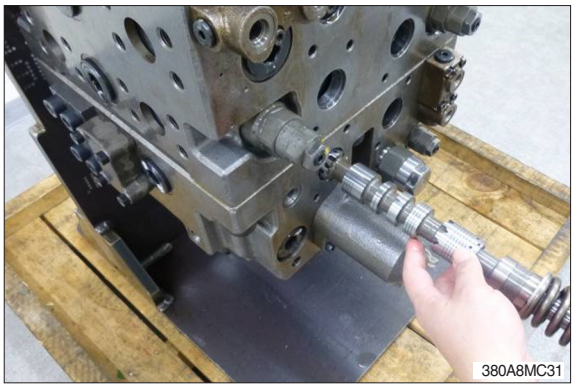
※ When pulling out the spool assembly from casing B (102), pay attention not to damage the casing.

③ Hold the boom1 spool (303) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Remove the spacer bolt (336) and disassemble spring (371), stopper (337) and spring seats (332).
(hexagon key wrench 8 mm)

④ Do not disassemble the boom1 spool (303) more than these conditions.



(4) Disassembling of the arm 1 spool (302)



① Loosen the hexagon socket head bolts (271) and remove the spring cover (201) and O-ring (261).
(hexagon key wrench 8 mm)

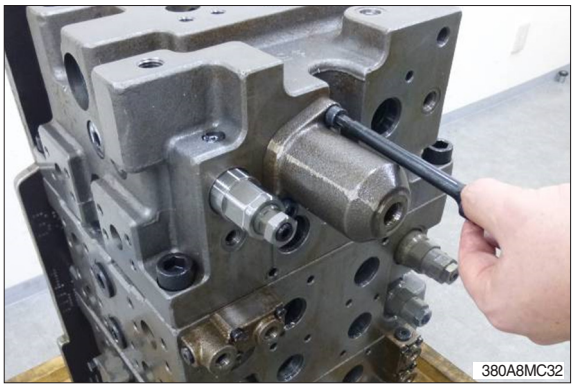
② Pull out the arm1 spool (302), spring (371), spring seat (332), stopper (337) and spacer bolt (336) in the spool assembly condition from casing C (103).

※ When pulling out the spool assembly from casing C (103), pay attention not to damage the casing.

③ Hold the arm1 spool (302) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Remove spacer bolt (336) and disassemble spring (371), stopper (337) and spring seats (332).
(hexagon key wrench 8 mm)

④ Do not disassemble the arm1 spool (302) more than these conditions.

(6) Disassembling of the travel straight spool (308)



① Loosen hexagon socket head bolts (271) and remove the spring cover (201) and O-ring (261).
(hexagon key wrench 8 mm)

② Remove travel the straight spool (308), spring (372), spring seat (332), stopper (337) and spacer bolt (336) in the spool assembly condition from the casing A (101).

③ Hold the travel straight spool (308) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Remove spacer bolt (336) and disassemble spring (372), stopper (337) and spring seats (332).
(hexagon key wrench 8 mm)

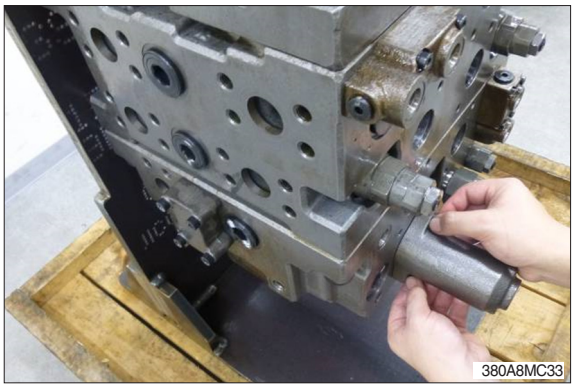
④ Do not disassemble the travel straight spool (308) more than these conditions.

(6) Disassembling of the bypass cut spool (310)

① Loosen hexagon socket head bolts (272) and remove the spring cover (202) and O-ring (262).
(hexagon key wrench 6 mm)

② Pull out the bypass cut spool (310), spring (323, 324), spring seats (331), stopper (334) and spacer bolt (333) in the spool assembly condition from casing C (103).

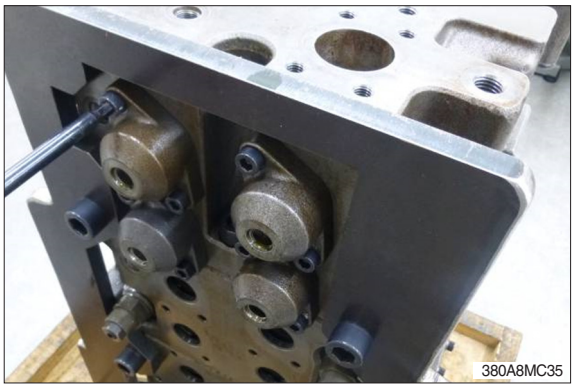
※ When pulling out the spool assembly from casing C (103), pay attention not to damage the casing.



③ Hold the travel spool (310) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Remove spacer bolt (333) and disassemble spring (323, 324), stopper (334) and spring seats (331).
(hexagon key wrench 10 mm)

(7) Disassembly of spool covers (203, 205)

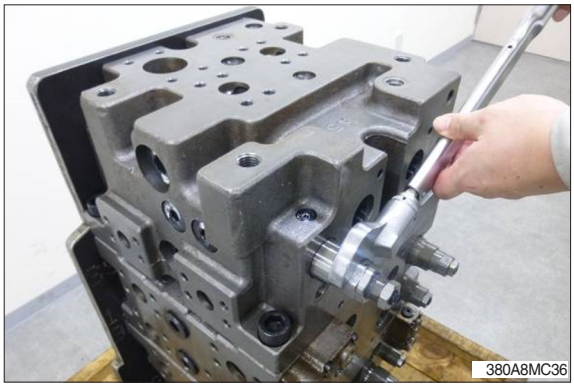
Loosen hexagon socket head bolts (271), and remove the spool cover (203, 205) and O-ring (261, 263).
(hexagon key wrench 8 mm)



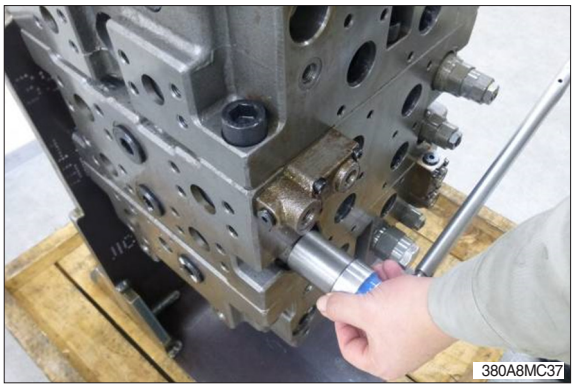
(8) Removal of the main relief valve (601) and the port relief valves (602, 605,606).

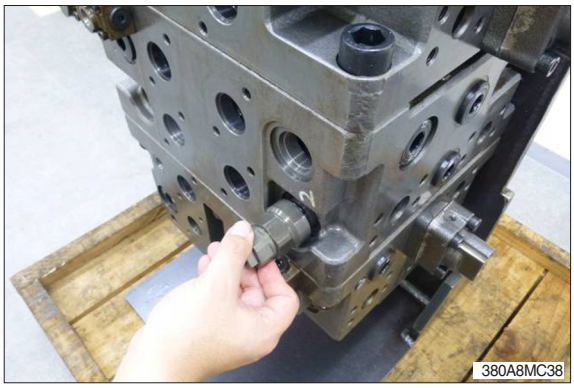
Remove the main relief valve (601) and the port relief valve (602, 605,606) from the casing.

Main relief valve (601) : spanner 32 mm
Port relief valve (602) : box wrench or spanner 36 mm
Port relief valve (605) : box wrench or spanner 36 mm
Port relief valve (606) : spanner 36 mm



※ Do not disassemble the relief valves more after.

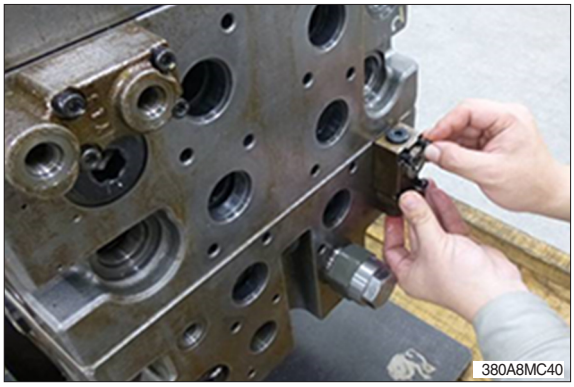


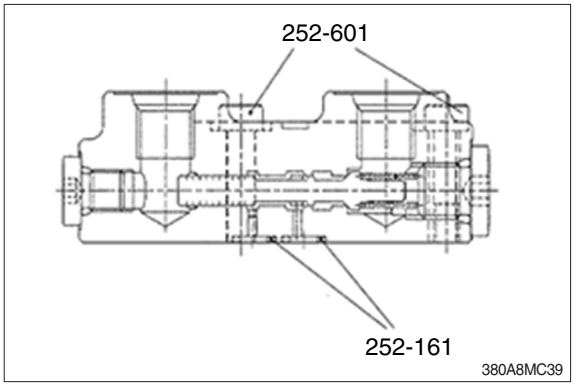


(9) Removal of the lock valve selector (252)

Loosen hexagon socket head bolts (252-601) and remove the lock valve selector (252) and O-ring (252-161).
(hexagon key wrench 5 mm)

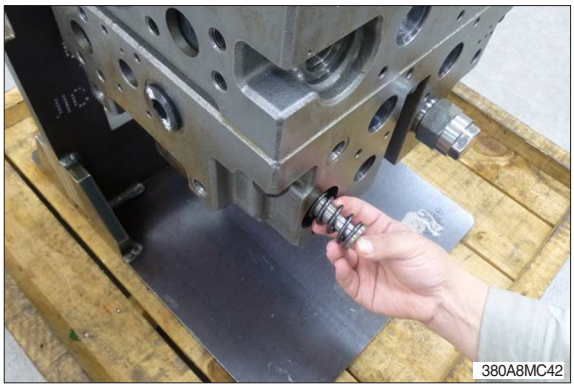
Do not disassemble the lock valve selector (252) more than these conditions.

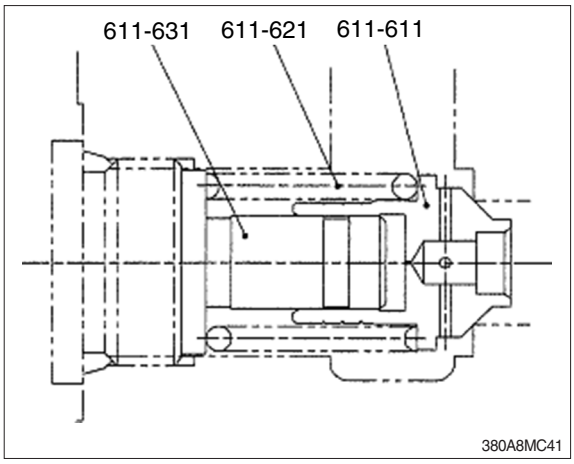




(10) Removal of the negative control relief valve (611)

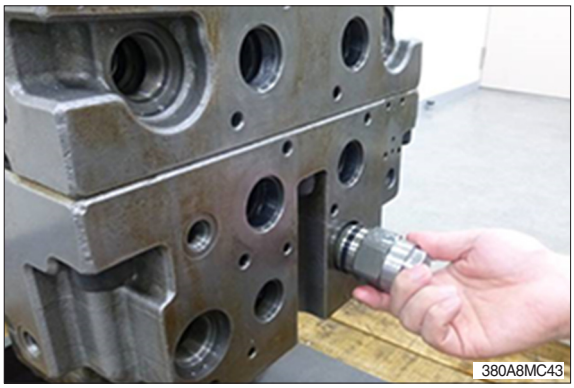
Remove the plug (551) from the casing C (103). Pull out poppet (611-611), spring (611-621) and damping rod (611-631).
(hexagon key wrench 17 mm)

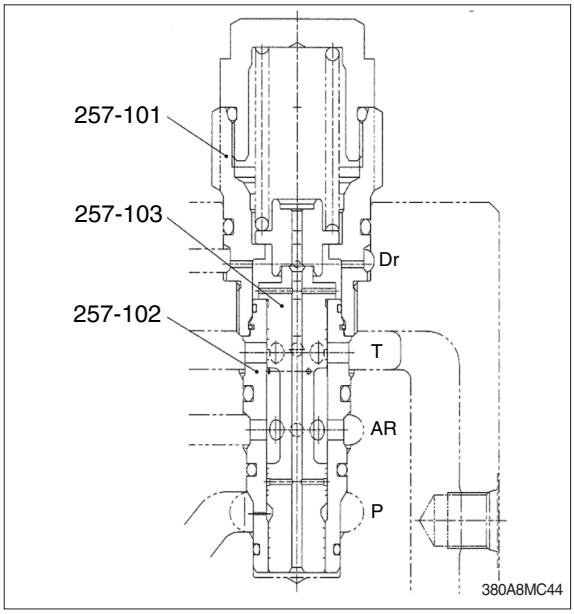




(11) Removal of the arm regeneration cut valve (257)

Remove the body (257-101), the spool (257-103) and sleeve (257-102) from the casing C (103).
(box key wrench 46 mm)



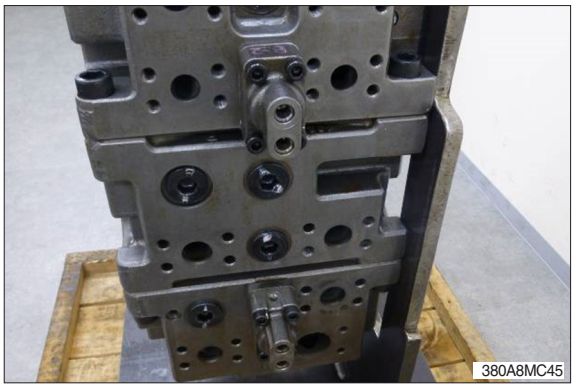


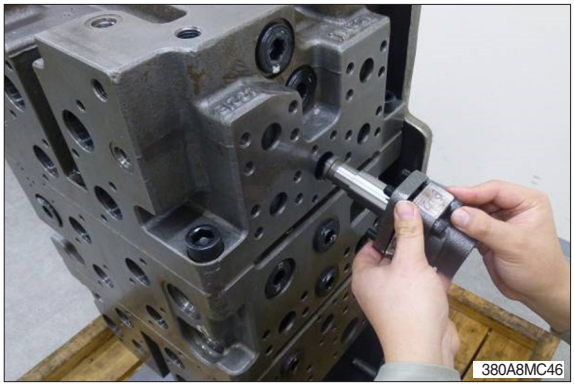
(12) Disassembly of the logic control valve (255), the swing logic valve assembly (254) and the arm 1 logic valve assembly (253)

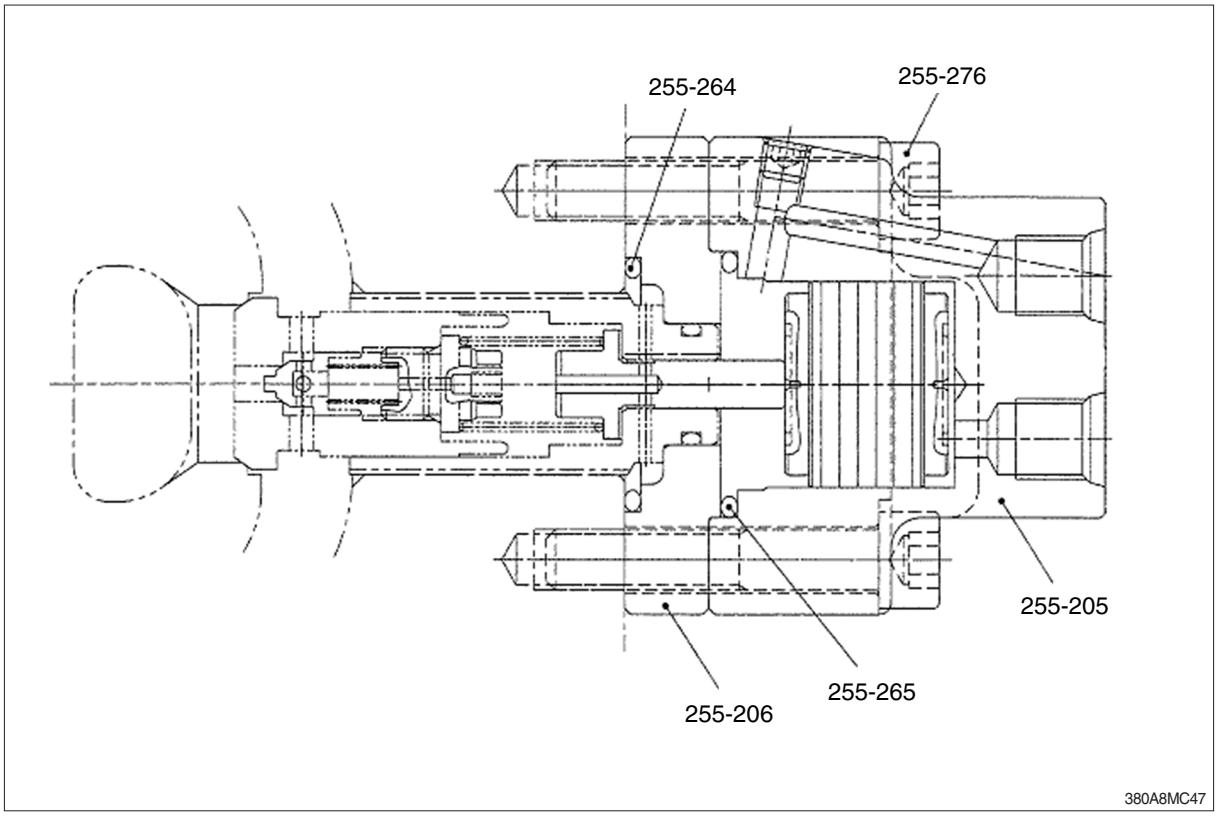
① Loosen hexagon socket head bolts (255-276) and remove the logic control valve (255) and O-ring (255-264).
(hexagon key wrench 8 mm)

② Pull out the swing logic valve (254) and the arm 1 logic valve (253) in the assembly condition from casing.

③ Do not disassemble the logic poppet and the logic valve assy (253, 254) more than these conditions.



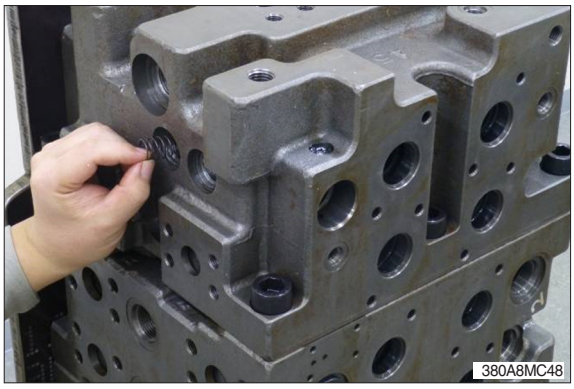




(13) Disassembly of the check valve

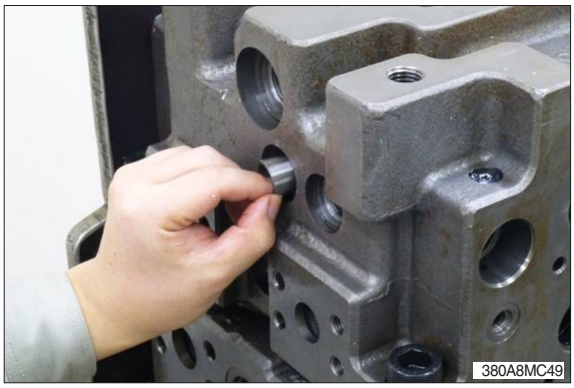
① CT1, CT2, CP1, CP2, LCb, LCb2, CCb, LCk, LCo, LCAT2

Remove the plug (551) and take out poppet (511) and spring (521).
(hexagon key wrench 17 mm)



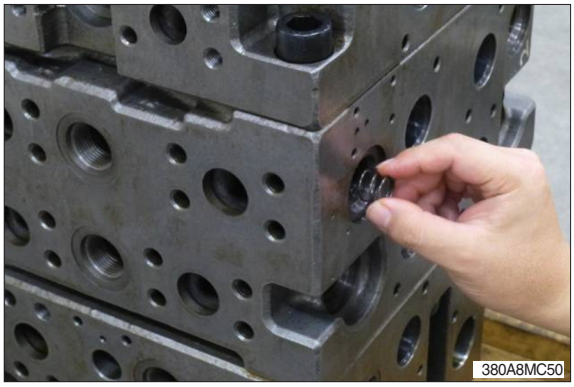
② CMR1, CMR2

Remove the plug (552) and take out poppet (512) and spring (522).
(hexagon key wrench 12 mm)



③ Hva, Hvb

Remove the plug (553) and take out poppet (513) and spring (523).
(hexagon key wrench 17 mm)



④ CCk, CCo

Remove the plug (551) and take out poppet (515) and spring (521).
(hexagon key wrench 17 mm)

⑤ Remove the plug (554) and take out steel ball (541), spring (543) and spring seat (542).
(hexagon key wrench 6 mm)

(14) Disassembly of the flanges (213)

Loosen hexagon socket head bolts (275) and remove the flange (213) and O-ring (264).
(hexagon key wrench 12 mm)

(15) Disassembly of the plate (211)

Loosen hexagon socket head bolts (273) and remove the plate (211) and O-ring (162, 163).
(hexagon key wrench 14 mm)

(16) Disassembly of the orifices for signal line

Do not disassemble the plug (152) and the orifice (351) unless required specifically.

(17) Disassembly of the casing:

① Except when required specially, do not disassemble tie bolts of the casing A (101) and C (103).

② Since the plugs not described in above disassembling procedures are the blind plugs for sacrifice holes and blind plugs for casing sanitation, do not disassemble them as far as not required specially.

(18) Inspection after disassembling

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

① Control valve

a. Check whole surfaces of all parts for burrs, scratches, notches and other defects.

b. Confirm that seal groove faces of casing and covers are smooth and free of dust, dent, rust etc.

c. Correct dents and damages on check seat faces of casing and block, if any, by lapping.

※ Pay attention not to leave lapping agent in casing and block.

d. Confirm that all sliding and fitting parts can be moved manually and that all grooves and paths are free from foreign matter.

e. If any spring is broken or deformed, replace it with new one.

f. When relief valve do not function properly, repair it, following its disassembling assembling procedures.

g. Replace all seats and O-rings with new ones.

② Relief valve

a. Confirm that all seat faces at ends of all poppets and seats are free of defects and are uniform contact faces.

b. Confirm manually that main poppet and seat can slide lightly and smoothly.

c. Confirm that outside face of main poppet and inside face of seat are free from scratches and so on.

d. Confirm that springs are free from breaking, deformation, and wear.

e. Confirm that orifices of main poppet and seat section are not clogged with foreign matter.

f. Replace all O-rings with new ones.

g. When any light damage is found in above inspections, correct it by lapping.

h. When any abnormal part is found, replace it with a relief valve assembly.

4) ASSEMBLING

(1) In this assembling section, explanation only is shown. Refer to figures and photographs shown in disassembling section.

(2) Figure in ( ) shown after part name in explanation sentence shows number in construction figure.

(3) Cautions in assembling seals

① Pay attention to keep seals free from defects in its forming and damages in its handling.

② Apply grease, hydraulic oil or so on to seals and seal-fitting sections for full lubrication.

③ Do not stretch seals so much to deform them permanently.

④ In fitting O-ring, pay attention not to roll it into its position. In addition, twisted O-ring cannot remove its twisting naturally with ease after being fitted, and causes oil leakage.

⑤ Tighten fitting bolts at all sections with torque wrench to their respective tightening torques shown in "Maintenance standards".

(4) Assembly of check valve

① Assemble poppets (511, 512, 513, 515) and springs (521, 522, 523).
② Put O-rings (561, 562) onto the plugs (551, 552, 553).
③ Tighten the plugs (551, 552, 553) with their specified torques.

※ Use poppets, springs and plugs in following groups.

Poppet	Spring	Plug	Remark
511	521	551	511 in 10 positions
512	522	552	512 in 2 positions
513	523	553	513 in 2 positions
515	521	551	515 in 2 positions

Tightening torque

Plug no.	Hex wrench	Tightening torque	
		kgf · m	lbf · ft
551	17 mm	37.7~41.8	273~302
552	12 mm	23.5~26.5	170~192
553	17 mm	37.7~41.8	273~302

(5) Assembly of the plate (211)

Fit O-rings (162, 163) to the casing C (103), and tighten hexagon socket head bolts (273) with specified torque.

(box wrench 14 mm)

· Tightening torque : 21.4~26.5 kgf · m (155~192 lbf · ft)

So turn the control valve that the plate face may be directed downward.

(6) Assembly of the flange (213)

Fit O-rings (264) to the flange (213), and tighten hexagon socket head bolts (275) with specified torque.

(box wrench 12 mm)

· Tightening torque : 14.3~18.4 kgf · m (103~133 lbf · ft)

(7) Assembly of the logic control valve (255) and the swing logic valve assembly (254)

① Assemble the swing logic valve ass'y (254) into the casing A (101).

② Fit the O-rings (255-264) to the plate (255-206). Fit the O-rings (255-265) to the cover (255-205), and tighten the hexagon socket head bolts (255-276) with specified torque.

(box wrench 8 mm)

· Tightening torque : 5.3~6.3 kgf · m (38.4~45.7 lbf · ft)

(8) Assembly of the logic control valve (255) and the arm 1 logic valve assembly (253)

① Assemble the arm 1 logic valve ass'y (253) into the casing C (103).

② Fit the O-rings (255-264) to the plate (255-206). Fit the O-rings (255-265) to the cover (255-205), and tighten the hexagon socket head bolts (255-276) with specified torque.

(box wrench 8mm)

· Tightening torque : 5.3~6.3 kgf · m (38.4~45.7 lbf · ft)

(9) Assembly of the negative control relief valve (611)

Assemble poppet (611-611), spring (611-621) and damping rod (611-631) into the casing C (103).

Put O-ring (561) onto the plug (511) and tighten the plug (511) with its specified torque.

(box wrench 17 mm)

· Tightening torque : 37.7~41.8 kgf · m (273~302 lbf · ft)

(10) Assembly of the arm regeneration cut valve (257)

Assemble the sleeve (257-102), spool (257-103), and body (257-101) into the casing C (103).

Tighten it with specified torque.

(box wrench 46mm)

· Tightening torque : 14.3~16.3 kgf · m (103~118 lbf · ft)

(11) Assembly of the lock valve selector (252)

Fit the O-rings (252-161) to the lock valve selector (252) and tighten the hexagon socket head bolts (252-601) with specified torque.

(box wrench 5 mm)

· Tightening torque : 1.0~1.4 kgf · m (7.2~10.3 lbf · ft)

(12) Assembling of the main relief valve (601) and the port relief valve (602, 605, 606)

Assemble the main relief valve (601) and the port relief valves (602, 605,606) to the casing and tighten it with specified torque.

Item	Size	Tightening torque	
		kgf · m	lbf · ft
Main relief valve (601)	Spanner 32 mm	12.2~14.3	88.2~103
Port relief valve (602, 605)	Spanner 36 mm Box wrench 36 mm	12.2~14.3	88.2~103
Port relief valve (606)	Spanner 36 mm	12.2~14.3	88.2~103

(13) Assembling of the travel straight spool (308) :

① Hold the middle of the travel straight spool (308) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Set spring seat (332), stopper (337) and spring (372), and tighten spacer bolt (336) with specified torque.

※ Before tightening spacer bolt (336), apply loctite #262 to it.

(box wrench 8 mm)

· Tightening torque : 3.8~4.2 kgf · m (22.8~30.2 lbf · ft)

Pay attention not to fasten the vise excessively to the shape of the travel straight spool (308) is deformed.

② Insert the spool assemblies of Items ① above into the casing A (101).

※ Fit the spool assemblies into casing A (101) carefully and slowly.

Do not push them forcibly without fail.

(14) Assembling of the boom1 spool (303)

① Hold the middle of the boom1 spool (303) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Set spring seat (332), spring (371) and stopper (337), and tighten spacer bolt (336) with specified torque.

※ Before tightening spacer bolt (336), apply Loctite #262 to them.

(box wrench 8 mm)

· Tightening torque : 3.8~4.2 kgf · m (22.8~30.2 lbf · ft)

Pay attention not to fasten the vise excessively to the shape of the boom 1 spool (303) is deformed.

② Insert the spool assemblies of Items ① above into the casing B (102).

※ Fit the spool assemblies into the casing B (102) carefully and slowly.

Do not push them forcibly without fail.

(15) Assembling of the arm 1 spool (302)

① Hold the middle of the arm 1 spool (302) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Set spring seats(332), spring (371) and stopper (337), and tighten spacer bolt (336) with specified torque.

※ Before tightening spacer bolt (336), apply Loctite #262 to it.
(box wrench 8 mm)
· Tightening torque : 3.8~4.2 kgf · m (22.8~30.2 lbf · ft)
Pay attention not to fasten the vise excessively to the shape of the arm1 spool (302) is deformed.

② Insert the spool assemblies of Items ① above into the casing C (103).

※ Fit the spool assemblies into the casing C (103) carefully and slowly.
Do not push them forcibly without fail.

(16) Assembling of the main spool (travel (301), bucket (304), swing (305), option (309), arm 2 (306), boom 2 (307))

① Hold the middle of each spool in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Set spring seats (332), springs and stopper (337), and tighten spacer bolt (336) with specified torque.

※ Before tightening spacer bolt (336), apply loctite #262 to it.
(hexagon key wrench 8 mm)
· Tightening torque 3.8~4.2 kgf · m (22.8~30.2 lbf · ft)
Pay attention not to fasten the vise excessively to the shape of spool is deformed.

② Insert spool assemblies of Items ① above into the casing A (101), B (102) and C (103).

※ Fit spool assemblies into the casing A (101), B (102) and C (103) carefully and slowly. Do not push them forcibly without fail.

(17) Assembly of the bypass cut spool (310)

① Hold the middle of the bypass cut spool (310) in the mouthpiece-attached vise applying a protection plate (aluminum plate and the like) in between. Set spring seats(331), spring (323, 324) and stopper (334), and tighten spacer bolt (333) with specified torque.

※ Before tightening spacer bolt (333), apply loctite #262 to it.
(box wrench 10 mm)
· Tightening torque : 1.6~1.8 kgf · m (11.8~13.3 lbf · ft)
Pay attention not to fasten the vise excessively to the shape of the bypass cut spool (310) spool is deformed.

② Insert the spool assemblies of Items ① above into the casing C (103).

※ Fit the spool assemblies into the casing C (103) carefully and slowly. Do not push them forcibly without fail.

(18) Assembling of the covers

① Fit the spool covers (203, 205) to sides reverse to spring sides of spools, and tighten hexagon socket head bolts (271) with specified torque.
(box wrench 8 mm)
· Tightening torque : 5.3~6.3 kgf · m (38.4~45.7 lbf · ft)

※ Confirm that O-rings (261, 263) have been fitted to spool cover (203, 205).

② Bucket the spring cover (204):
Assemble piston (342) into the bucket spring cover (204). Put O-ring (563) onto the plug (555) and tighten it with specified torque.
(box wrench 17 mm)
· Tightening torque : 22.4~26.5 kgf · m (162~192 lbf · ft)

③ Fit the spring covers (201, 202, 204) to spring sides of spools, and tighten hexagon socket head bolts (271, 272) with specified torque.

(271 : Hexagon key wrench 8mm, tightening torque 5.3~6.3 kgf · m (38.4~45.7 lbf · ft)
(272 : Hexagon key wrench 6mm, tightening torque 2.5~3.5 kgf · m (18.4~25.1 lbf · ft)

※ Confirm that O-rings (261) have been fitted to spring covers (201, 202, 204).

1. REMOVAL AND INSTALL OF MOTOR

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.

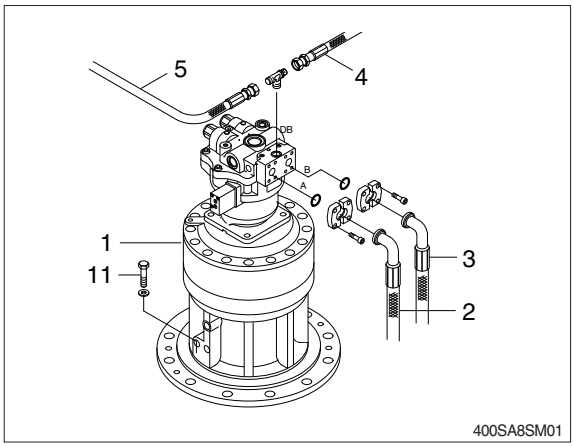
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(4) Disconnect hoses (2, 3, 4, 5, 6, 7, 8, 9, 10).

(5) Sling the swing motor assembly (1) and remove the swing motor mounting bolts (11).
- Motor device weight : 443 kg (977 lb)
- Tightening torque : 97.8 ± 15 kgf·m (707 ± 108 lbf·ft)

(6) Remove the swing motor assembly.

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

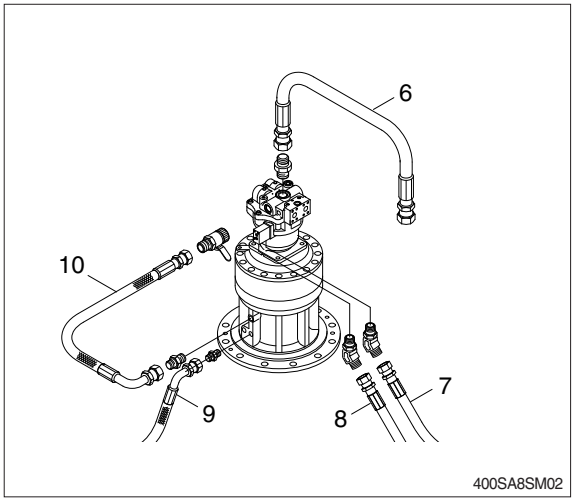


2) INSTALL

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

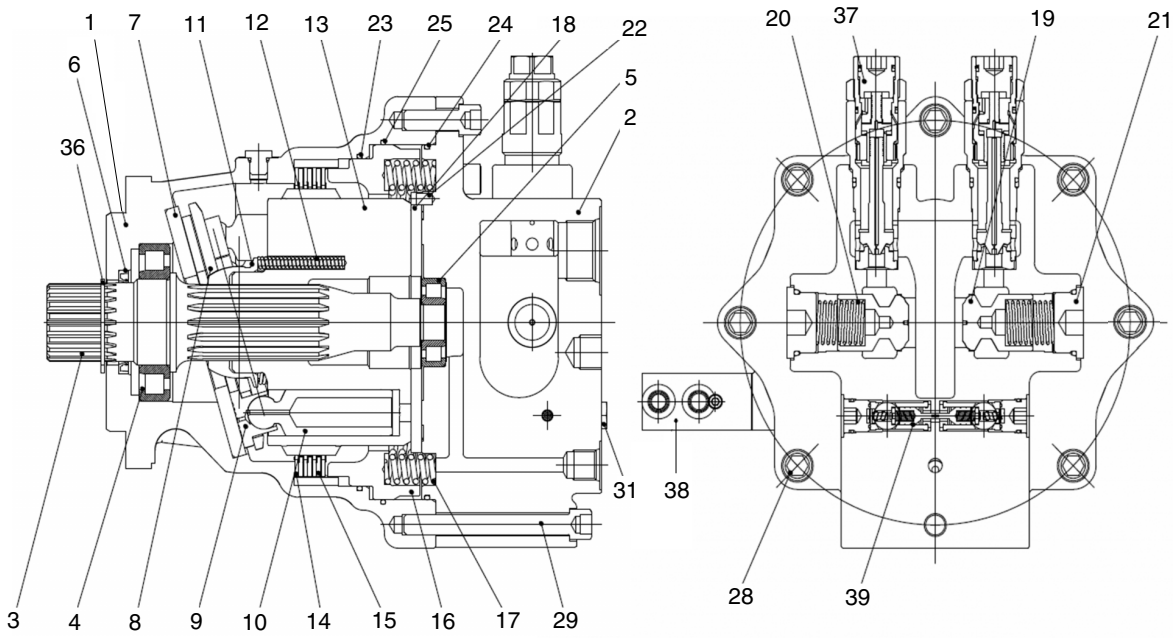
(2) Bleed the air from the swing motor.
① Remove the air vent plug.
② Pour in hydraulic oil until it over flows from the port.
③ Tighten plug lightly.
④ Start the engine, run at low idling, and check oil come out from plug.
⑤ Tighten plug fully.

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



2. SWING MOTOR (TYPE 1)

1) STRUCTURE

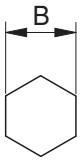


380A8SM05

1	Casing	12	Cylinder spring	23	O-ring
2	Valve casing	13	Cylinder block	24	O-ring
3	Drive shaft	14	Friction plate	25	O-ring
4	Roller bearing	15	Separation plate	28	Socket bolt
5	Roller bearing	16	Brake piston	29	Socket bolt
6	Oil seal	17	Brake spring	30	Socket bolt
7	Shoe plate	18	Valve plate	31	VP plug assy
8	Retainer plate	19	Plunger	36	Snap ring
9	Shoe	20	Check spring	37	Relief valve
10	Piston	21	RO plug assy	38	Brake valve
11	Thrust ball	22	Pin	39	Reactionless valve

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	17	
Socket for socket wrench, spanner	5	
	19	
	36	
Plier (for stop ring)	For shaft Φ 45 mm	
Plier (for lock ring)	For hole Φ 100 mm For hole Φ 45 mm	
Driver	(-) type, 2EA	
Steel rod	10x8x200 mm, 1EA	
Hammer	Plastic hammer, steel hammer, each 1EA	
Torque wrench (adjust range)	1.0~4.5 kgf·m (7.2~32.5 lbf·ft) 4.0~18 kgf·m (28.9~130 lbf·ft) 12~48 kgf·m (86.8~347 lbf·ft)	
Slide hammer bearing plier	-	
Brake piston subtract jig	-	

(2) Tightening torque

Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	mm	inch
Socket bolt	30	M6	1.2±0.2	8.7±1.4	5	0.20
Socket bolt	28, 29	M14	11.3±1.1	81.7±8.0	17	0.67
Relief valve	37	M33	18±1.0	130±7.2	19	0.75
Plug	31	PF 1/4	3.7±0.2	26.8±1.4	36	1.42

3) DISASSEMBLING

※ The disassembling procedures are as following.

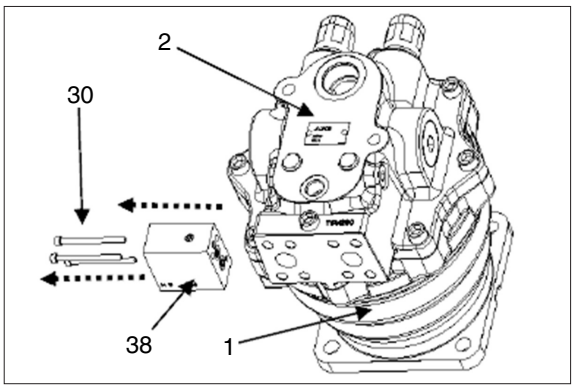
※ Figure in ( ) shown after part name in explanation sentence shows number in construction figure.

(1) Bind the circumference of the motor and lift up by crane.
Clean the motor with cleaning oil and dry it with compressed air.

(2) Drain the oil from the casing (1) through the drain port.

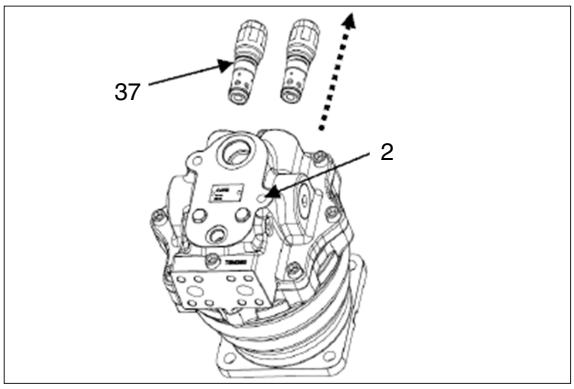
(3) Place the drive shaft (3) with the shaft side with down ward and fix it on a work table for easy disassembling.

(4) Put a fitting mark on the casing (1) and valve casing (2) and loosen the socket bolt (30) and remove the brake valve (38) form the swing motor.



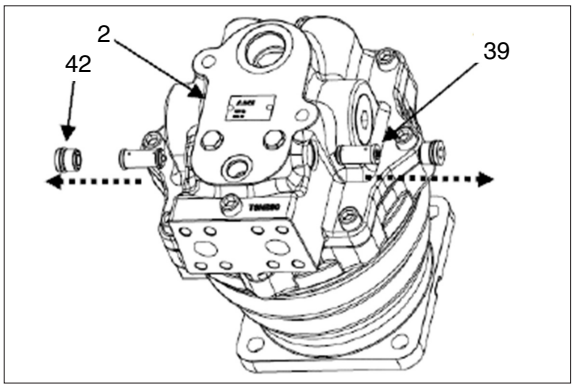
380A8SM06

(5) Loosen the relief valve (37) and take off it from the valve casing (2).



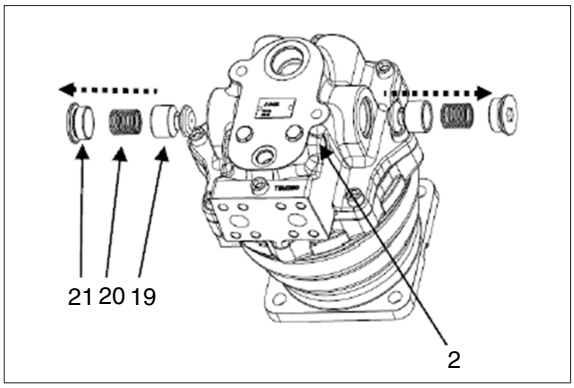
380A8SM07

(6) Remove the RO plug (42) from the valve casing (2) and pull out the reactionless valve (39).



380A8SM08

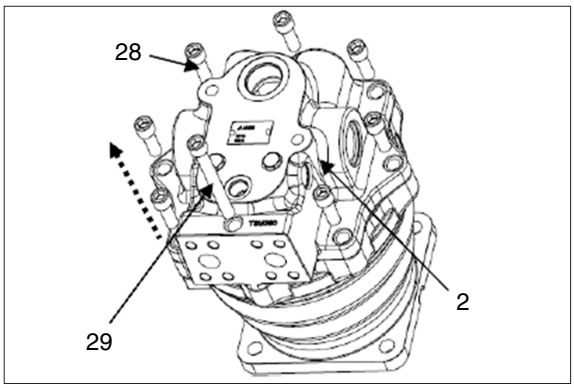
(7) Loosen the RO plug (21) from the valve casing (2) and pull out the spring (20) and plunger (19).



380A8SM09

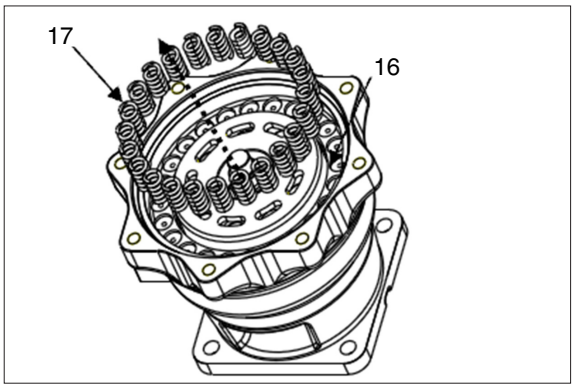
(8) Loosen the socket bolt (28, 29) and take off the valve casing (2).

※ The valve casing (2) is separated from the casing (1) automatically by the brake spring (17) force when the socket bolt (28, 29) is loosened.



380A8SM10

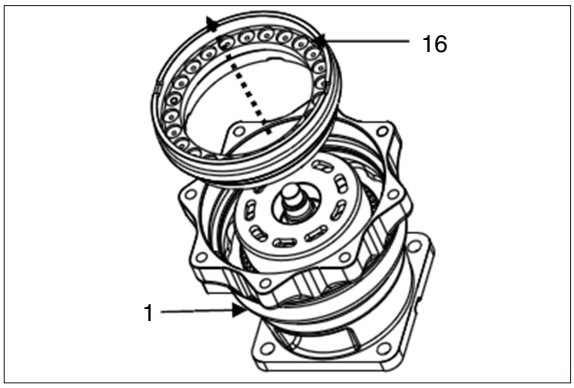
(9) Pull out the brake spring (17) from the brake piston (16).



380A8SM11

(10) The brake piston (16) from the casing (1) by using a jig.

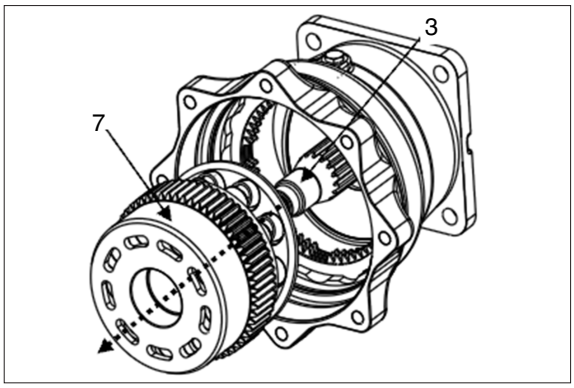
※ Pull the brake piston (16) straight up when using the bolt hole of the brake piston (16).



380A8SM12

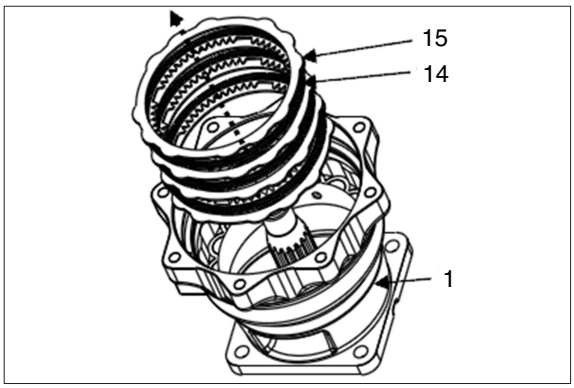
(11) Put the motor horizontally and pull out the cylinder block (13) from the drive shaft (3). And the piston assy (9, 10), retainer (8), thrust ball (11) and shoe plate (7).

※ Take care not to damage sliding face of the cylinder block (13), thrust ball (11) and shoe (9) when pull out the cylinder block (13).



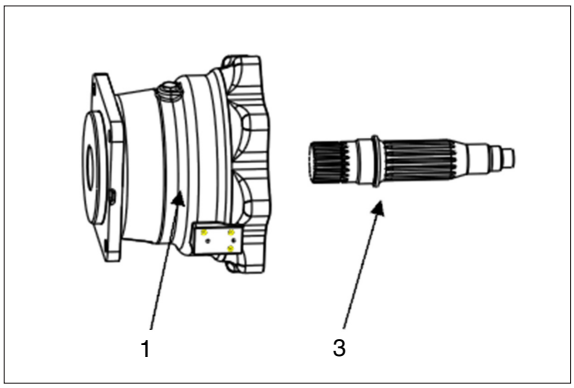
380A8SM13

(12) Take off the friction plate (14) and separation plate (15) from the casing (1).



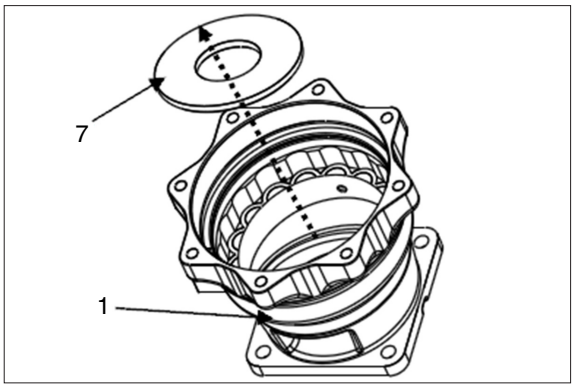
380A8SM14

(13) Separate drive shaft (3) from the casing (1).



380A8SM15

(14) Pull the shoe plate (7) from the casing (1) by tapping lightly the cylinderical roller bearing (4) side with a plastic hammer.

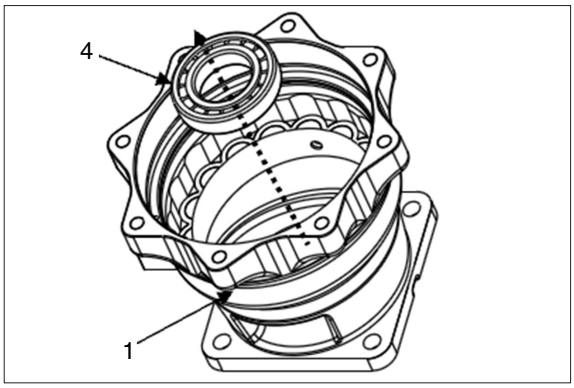


380A8SM16

(15) Pull the roller bearing (4) from the casing (1) by tapping lightly with a steel rod.

※ Take care not to damage the bearing by tapping the inner race of the cylinderical roller bearing evenly with a steel rod.

※ Do not reuse the dissembled bearing.

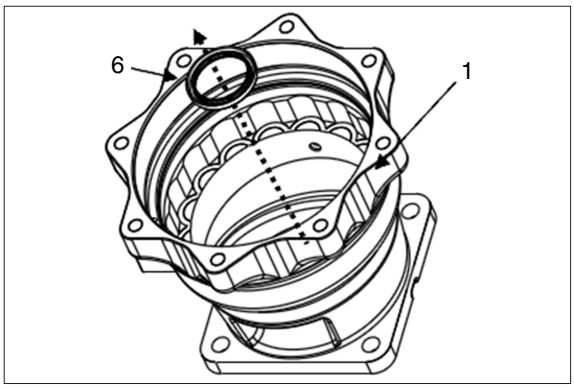


380A8SM17

※ Following works perform if necessary.

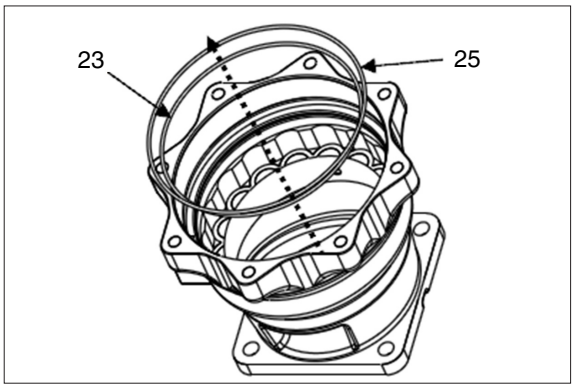
(16) Disassemble the oil seal (6) from the casing (1).

※ Disassemble the oil seal (6) by tapping bottom side of the oil seal with a steel rod.



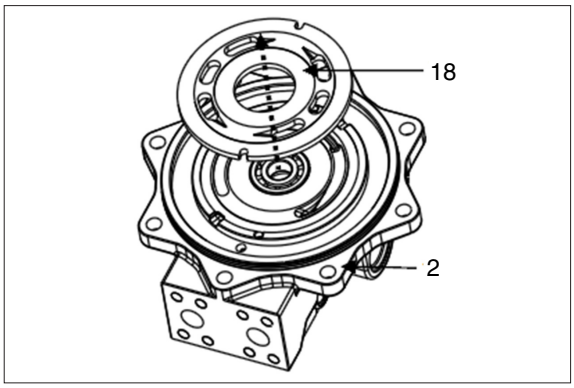
380A8SM18

(17) Disassemble the O-ring (23, 25) from the casing (1).



380A8SM19

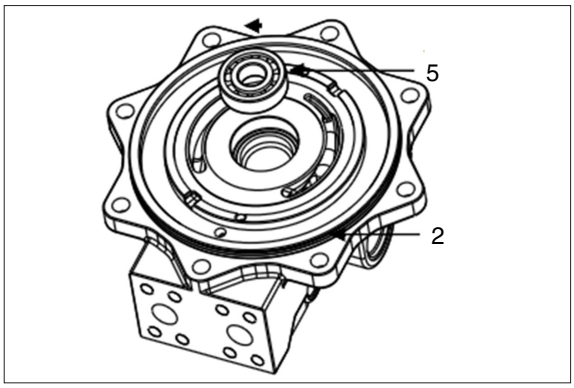
(18) Disassemble the valve (18) from the valve casing (2).



380A8SM20

(19) Disassemble the roller bearing (5) from the valve casing (2) with a plastic hammer.

※ Do not reuse the dissembled bearing.



380A8SM21

(20) This is the end of disassembling procedures.

※ Check every part for any abnormals.

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.

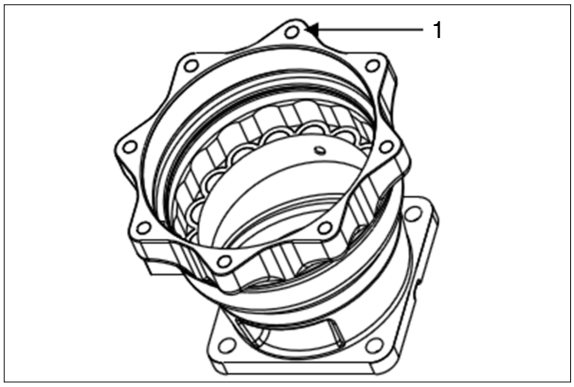
② Clean each part fully with cleaning oil and dry it with compressed air.

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.

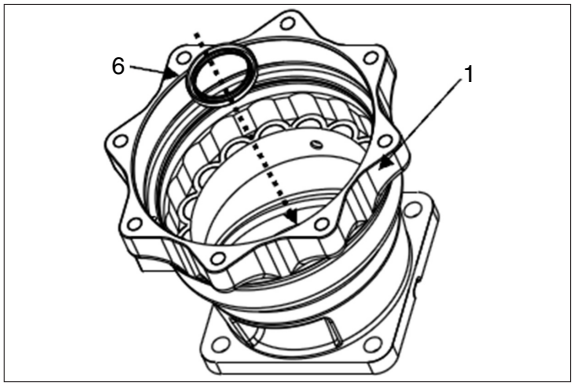
⑤ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with torques shown in page 8-62-2.

(2) Place the casting (1) on a suitable place.



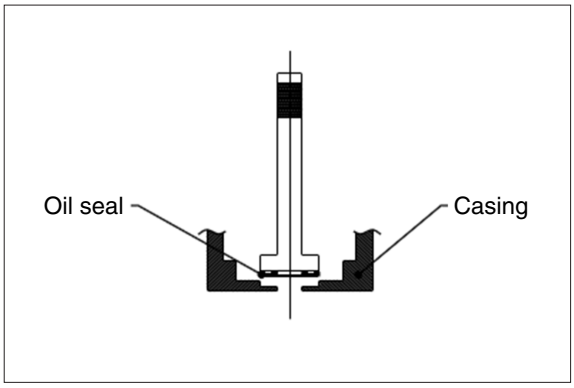
380A8SM22

(3) Assemble the oil seal (6) on the casting (1).



380A8SM23

(4) Assemble the oil seal with a jig when assembling it and take care not to damage the lip of the oil seal (6).

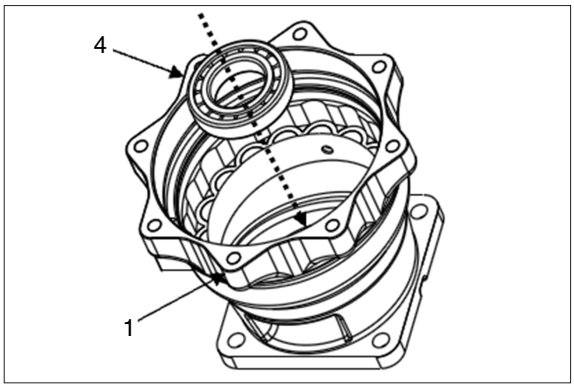


380A8SM24

(5) Using a jig, assemble the roller bearing (4) on the casting (1) by tapping the roller bearing (4) lightly.

※ Take care not to damage the bearing by tapping the inner race of the cylinderical roller bearing evenly with a steel rod.

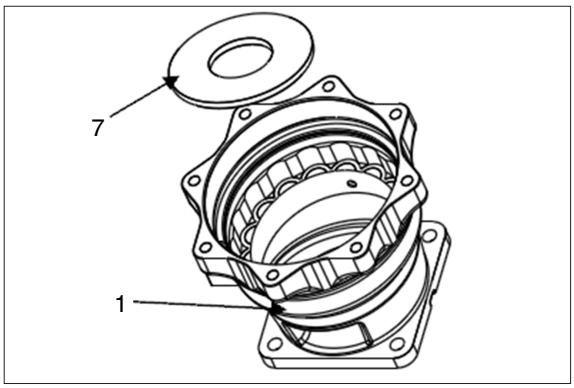
※ Do not reuse the dissembled bearing.



380A8SM25

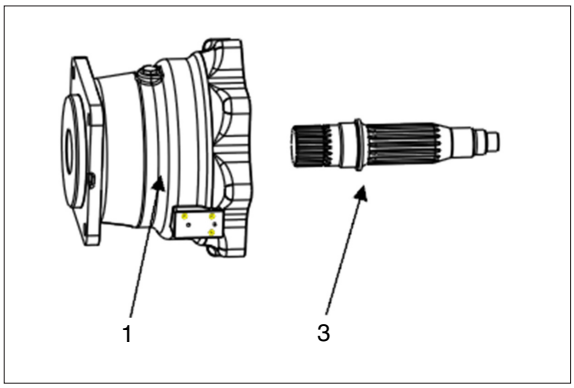
(6) Apply some grease to the back side of the show plate (7) and assemble it on the swash plate of the casing (1).

※ Take care not to mistake front and rear side of the shoe plate (7).



380A8SM26

(7) Assemble the drive shaft (3) into the casing (1).

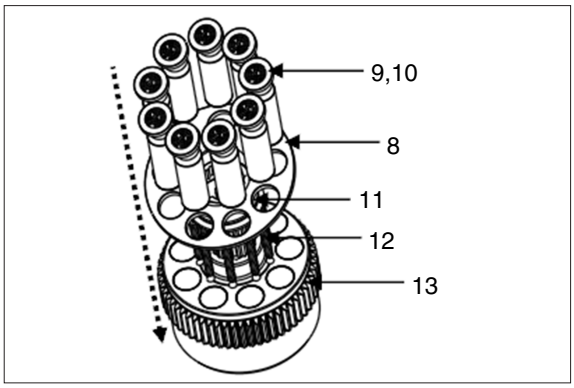


380A8SM27

(8) Insert the nine cylinder block springs (12) into the cylinder block (13).

(9) Confirm the assembling of the springs and put the thrust ball (11) on the springs.

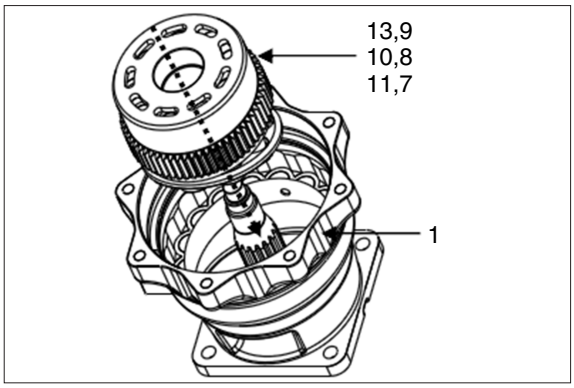
(10) Assemble the retainer (8) and piston assy (9, 10) after assembling thrust ball (11).



380A8SM28

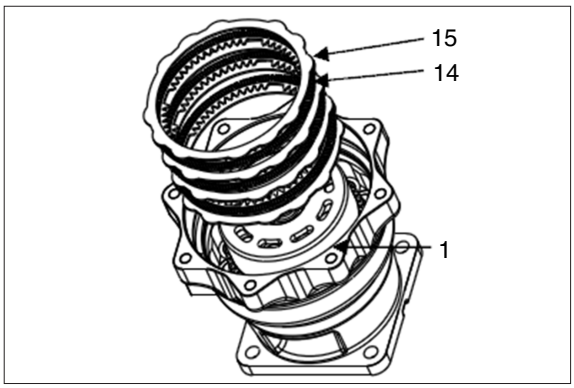
(11) Place the motor horizontally and assemble the cylinder block (13), piston assy (9, 10), retainer (8), thrust ball (11) and shoe plate (7) into the drive shaft (3).

※ Take care not to sliding face of the thrust ball (11) and shoe (9).



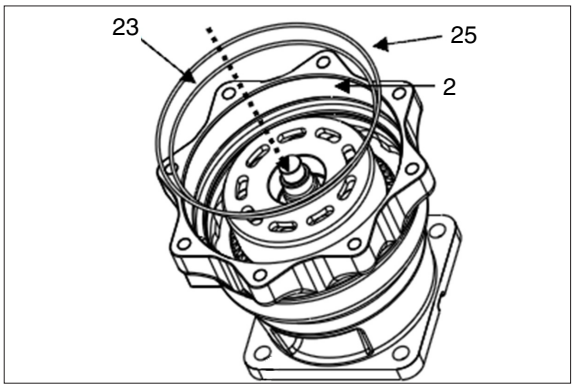
380A8SM29

(12) Assemble the three friction plates (14) and four separation plates into the casing (1).



380A8SM30

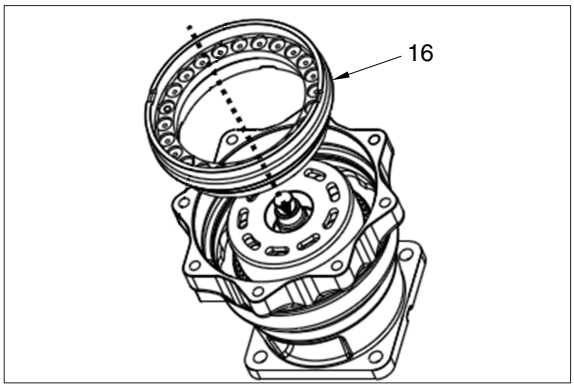
(13) Apply some grease to the O-ring (23, 25) and assemble them on the valve casing (2).



380A8SM31

(14) Assemble the brake piston (16) into casing (1).

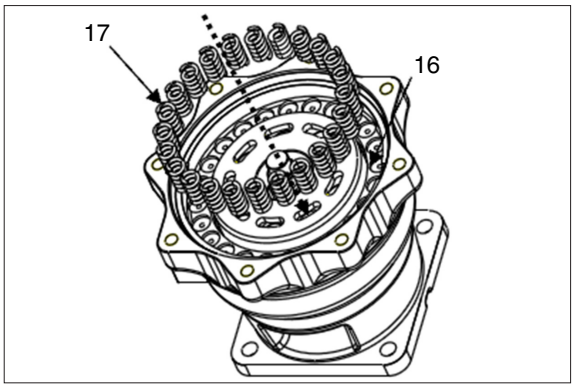
※ Assemble the brake piston (16) by tapping lightly with a plastic hammer when assembling it.



380A8SM32

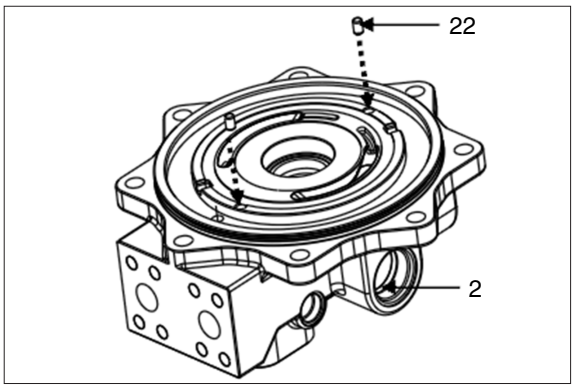
(15) Put the twenty four brakes springs (17) on the brake piston (16).

※ Take care not to slip down brake springs (17) when assembling them.



380A8SM33

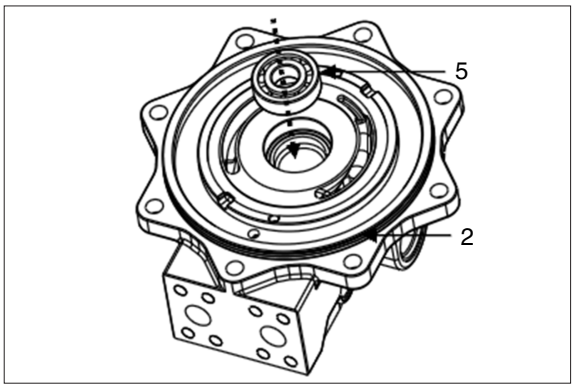
(16) Insert the pin (22) into the valve casing (1) by using a jig.



380A8SM34

(17) Assemble the cylinderical roller bearing (5) into the valve casing (2) by using a plastic hammer.

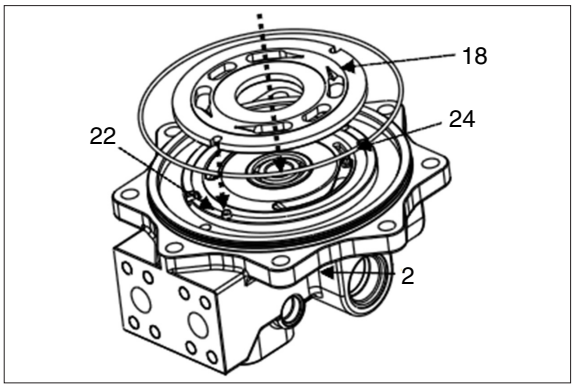
※ Tap the bearing with a hammer lightly when assembling them.



380A8SM35

(18) Apply some grease to the back side of the valve plate (18) and align the hole of the pin (22) and assemble it on the valve casing (2).

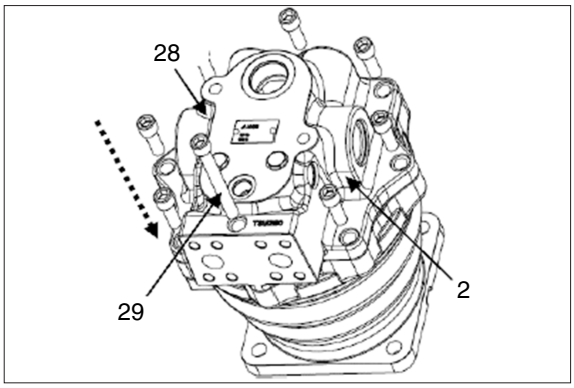
And assemble the O-ring into the hole of the O-ring.



380A8SM36

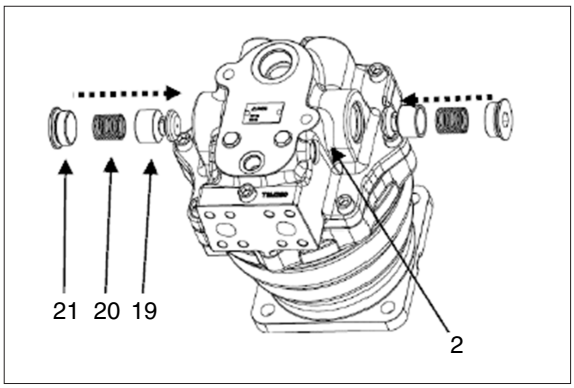
(19) Align the bolt hole of the valve casing (2) and casing (1) and tightening the socket bolt (28, 29) as specification torques.

※ Take care not to damage the bearing when assembling it.



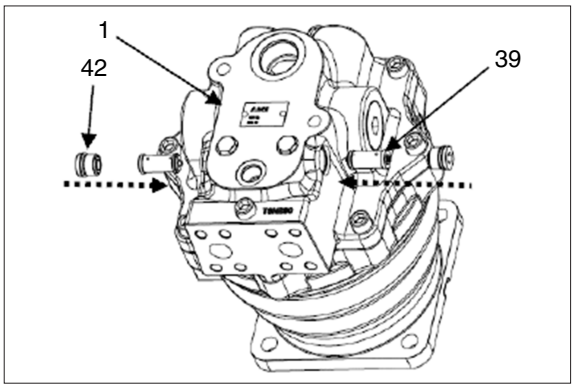
380A8SM37

(20) Assemble the spring (20) and RO plug (21) into the valve casing (2) after seat making the plunger (19) on the valve casing (2) two or three times.



380A8SM38

(21) Assemble the reactionless valve (39) into the valve casing (2) and assemble the RO plug (42) by using L-wrench.

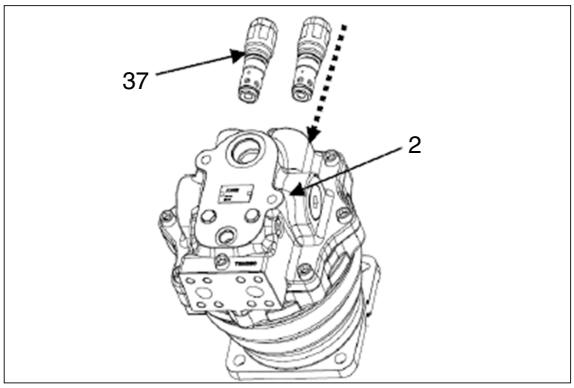


380A8SM39

(22) Assemble the relief valve (37) into the valve casing (2).

※ Apply some grease to O-ring of the relief valve when assembling it.

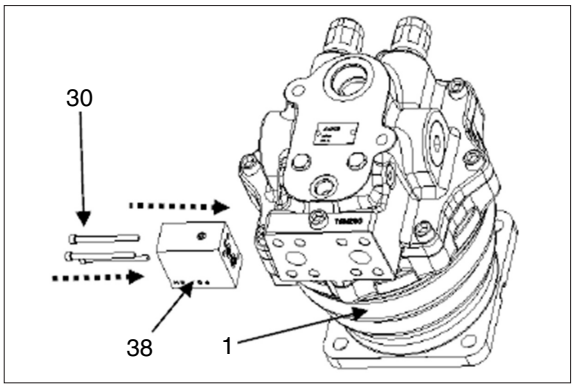
※ Tighten with a specified torque when tightening.



380A8SM40

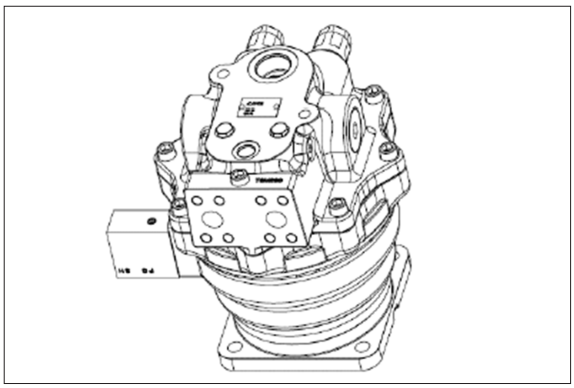
(23) Assemble the brake valve (38) on the casing (1) with the socket bolts (30).

※ Take care not to miss the O-ring of the brake valve when assembling.



380A8SM41

(24) Clean the face of the motor to the reduction gear with cleaning oil and dry it by compressed air.

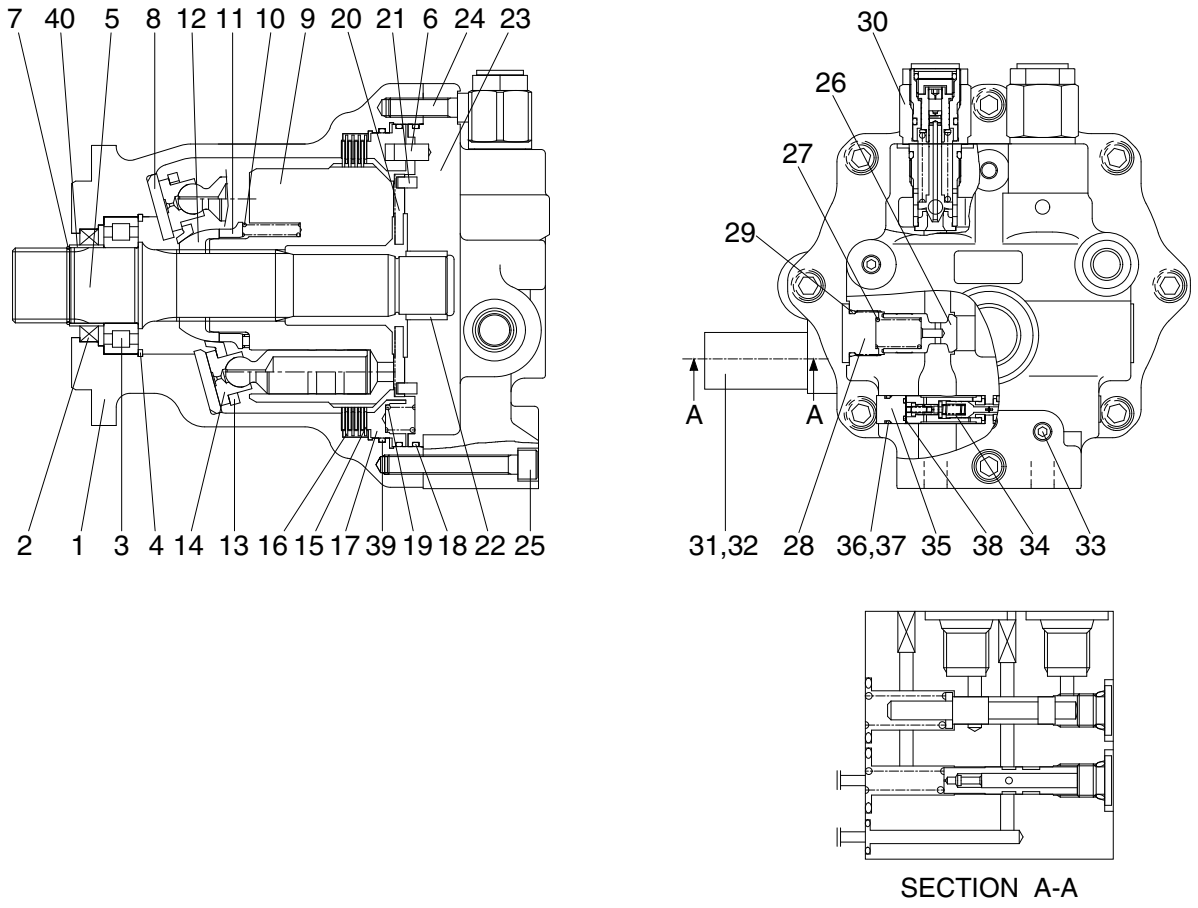


380A8SM42

(25) This is the end of assembling procedures.

SWING MOTOR (TYPE 2)

1) STRUCTURE

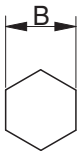


38092SM02

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	Swing 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)	

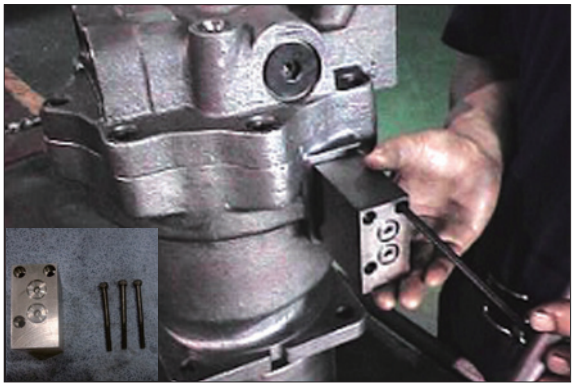
(2) Tightening torque

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

2) DISASSEMBLING

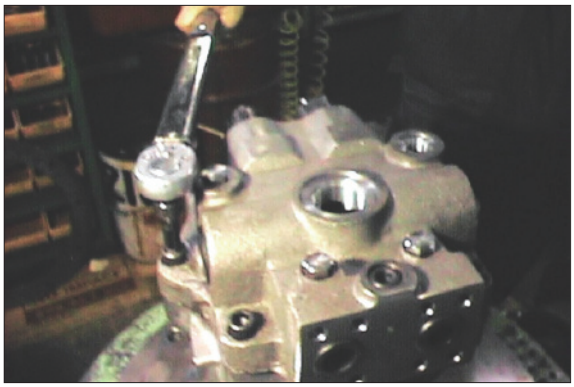
(1) Disassemble the sub of a TURNING AXIS

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



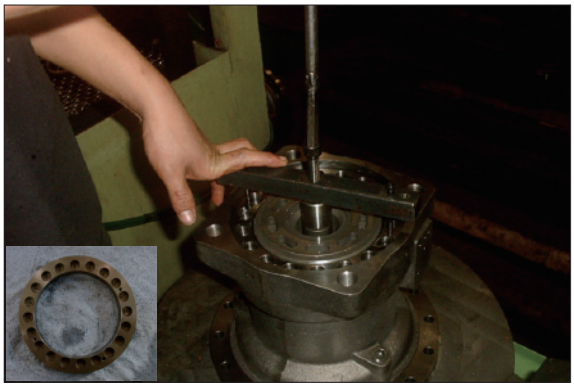
3607A8SM01/01A

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



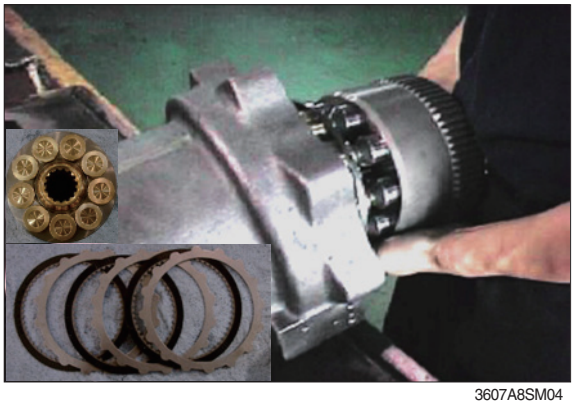
3607A8SM02

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



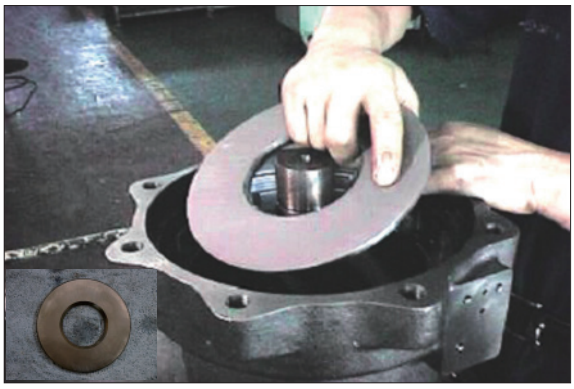
3607A8SM03

④ Disassemble respectively cylinder block assy, fricktion 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).

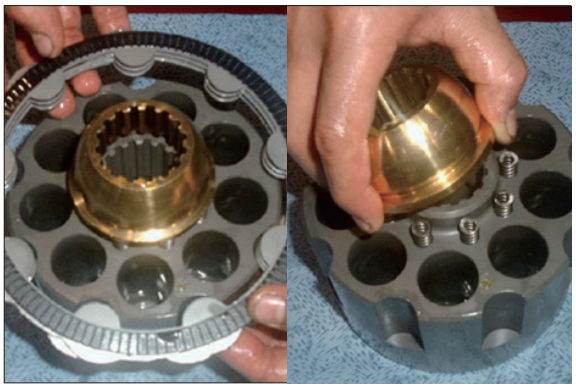
3607A8SM06/06A

(2) Disassemble cylinder block assy sub

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

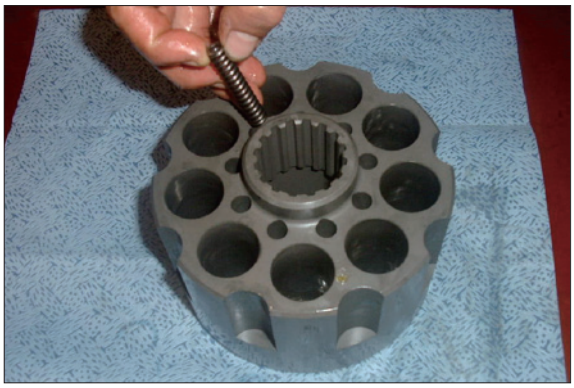
3607A8SM07

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



3607A8SM08A/08B

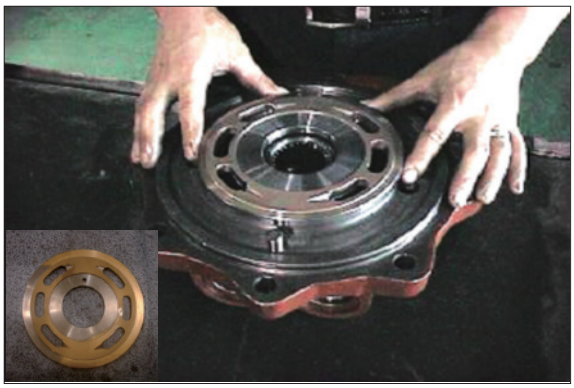
③ Disassemble spring (10) from cylinder block (9).



3607A8SM09

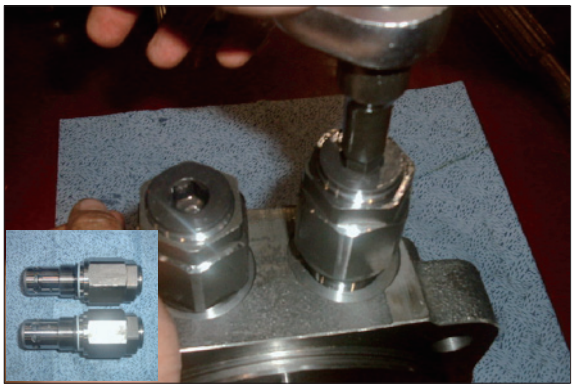
(3) Disassemble rear cover assy sub

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 axls

① Put roller bearing (3) on preheater and provide heat to inner wheel (compress ing temp : 290˚C for 2 minutes)

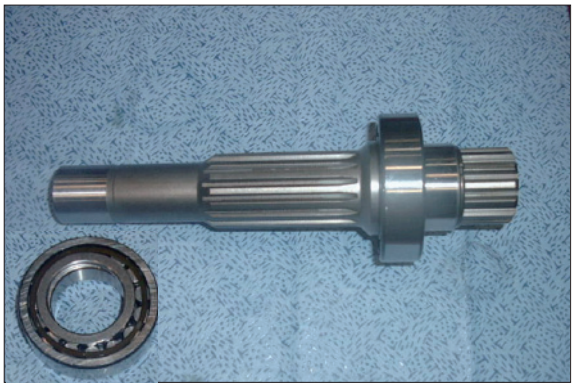
· Roller bearing ×1EA

3607A8SM21

② After assembling and compressing pre-heated roller bearing (3), stop ring (7) into shaft (5).

· Stop ring ×1EA

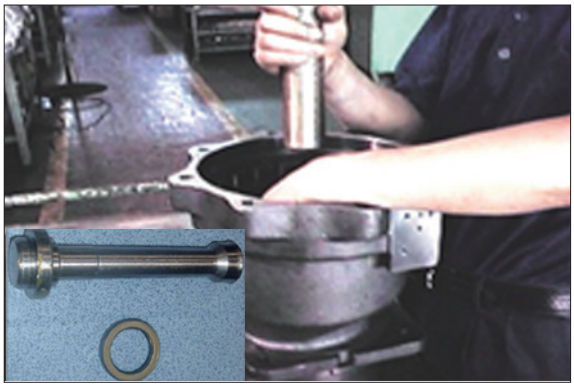
· Shaft× 1EA



3607A8SM22/22A

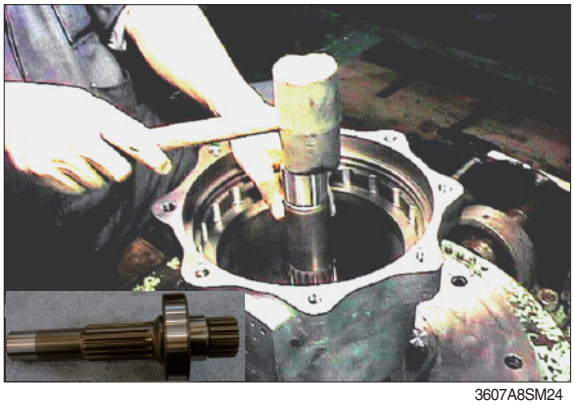
③ Using a compressing tool and steel stick, assemble oil seal (2) into body (1).

· Oil seal ×1EA



3607A8SM23/23A

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

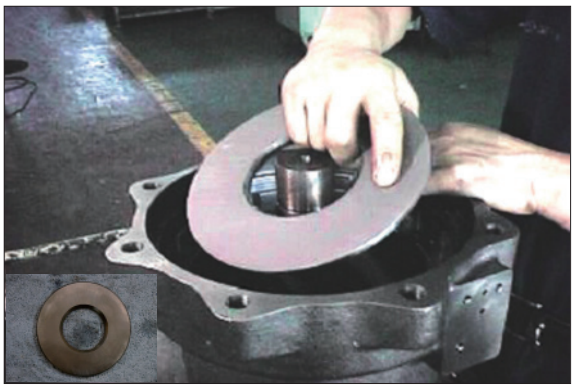


3607A8SM24

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

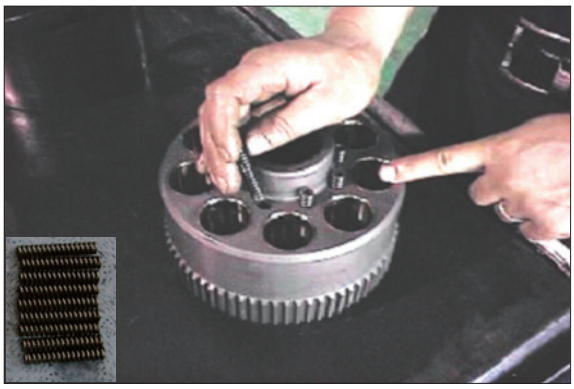

3607A8SM06

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

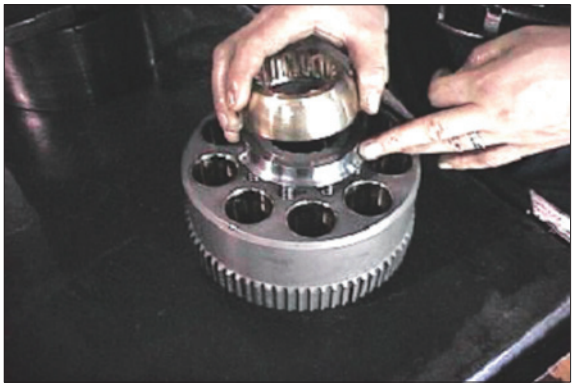

3607A8SM05

(2) Assemble the sub of cylinder block assy

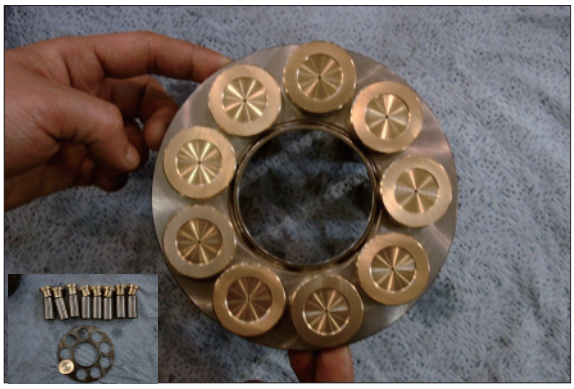
① Assemble spring (10) 9 set into cylinder block (9).
· Spring ×9EA


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

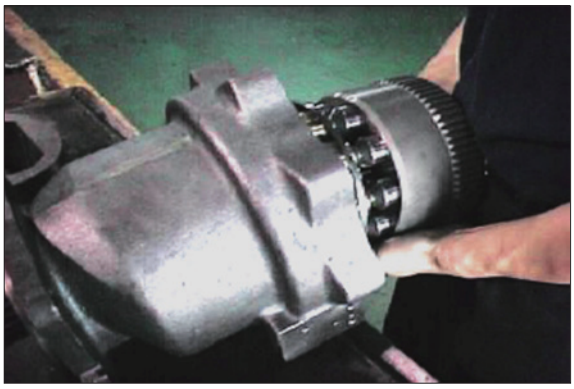


3607A8SM27

④ Assemble above item ② and ③.

3607A8SM28

⑤ Assemble cylinder block assy into body (1).



3607A8SM04

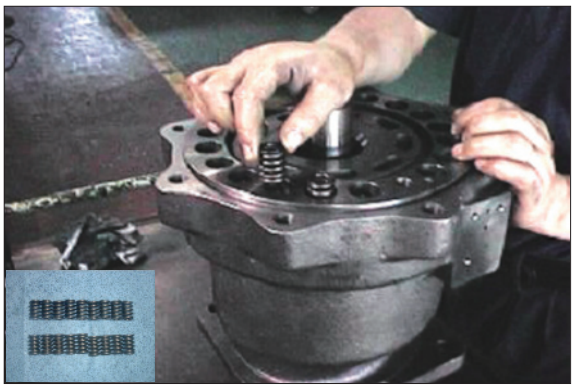
⑥ Assemble 4 set of lining plate (16), friction plate (15) respectively into body.
- Lining plate ×4EA
- Friction plate ×4EA

3607A8SM29

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

3607A8SM30

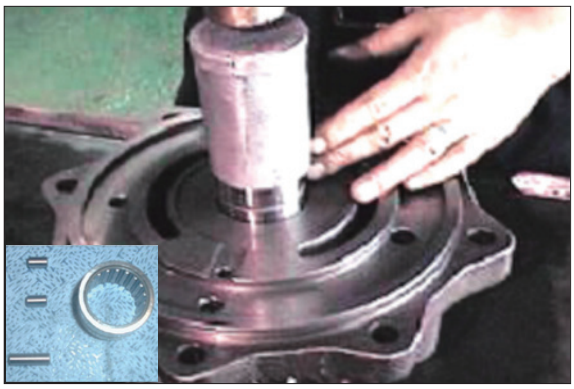
⑧ Insert break piston assy into body (1) and assemble spring (19) into break piston (17).
· Spring×19EA



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

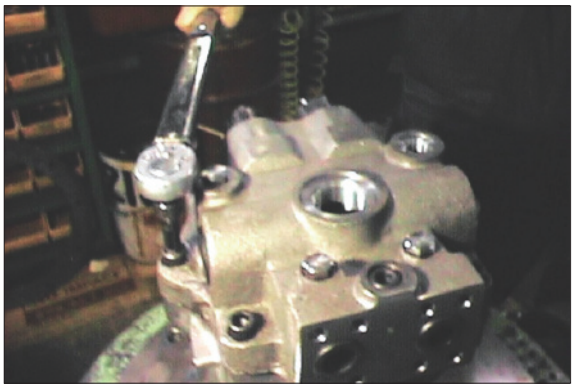
③ Assemble relief valve assy (30) 2set into rear cover (23) with a torque wrench.

3607A8SM34/11A

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

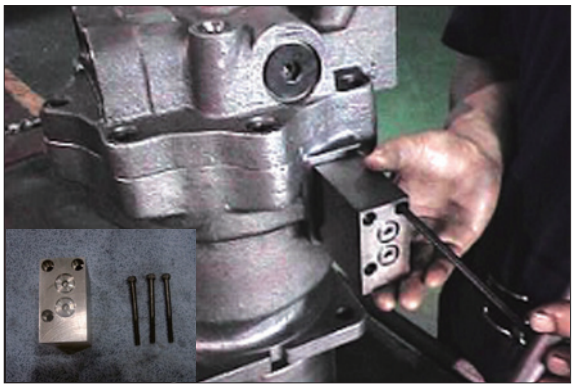
3607A8SM10/10A

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



3607A8SM02

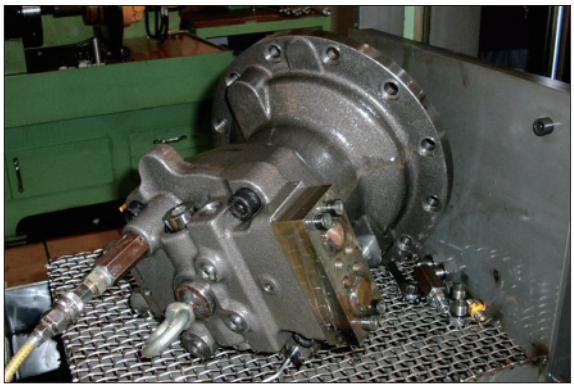
⑥ Assemble time delay valve assy (31) into rear cover (23) with a wrench bolt (32).



3607A8SM01/01A

(4) Air pressing test

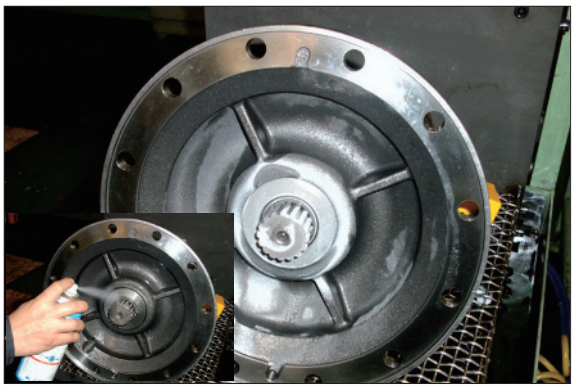
Be sure of leakage, after press air into assembled motor.



14078SM232

(5) Leakage check

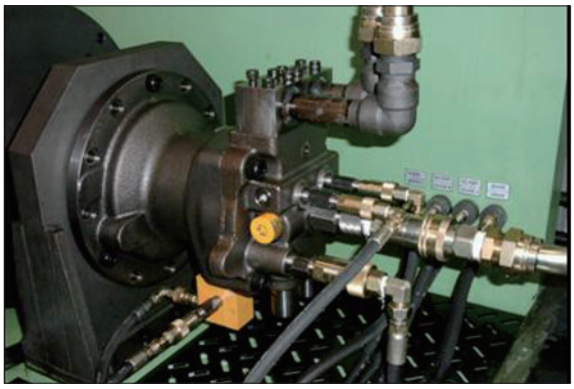
After cleaning motor by color check No.1, paint No.3 and be sure of leakage.



14078SM233/233A

(6) Mount test bench

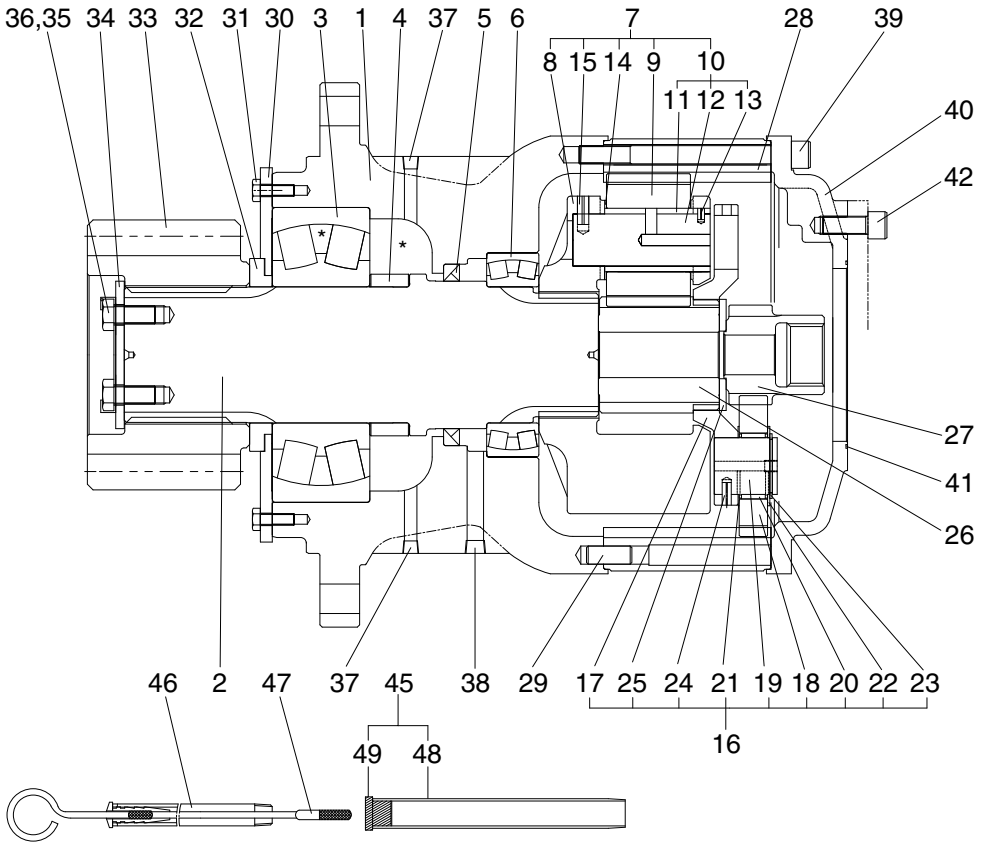
Mounting motor test bench, test the availability of each part.



220078SM14

3. REDUCTION GEAR (TYPE 1, 2)

1) STRUCTURE



380A2SM03

1	Casing	17	Carrier 1	33	Pinion gear
2	Drive shaft	18	Planetary gear 1	34	Lock plate
3	Taper roller bearing	19	Pin 1	35	Hexagon bolt
4	Spacer ring	20	Needle cage	36	Lock washer
5	Oil seal	21	Side plate 1	37	Plug
6	Taper roller bearing	22	Side plate 2	38	Plug
7	Carrier 2 assy	23	Stop ring	39	Socket bolt
8	Carrier 2	24	Spring pin	40	Cover
9	Planetary gear 2	25	Thrust ring	41	O-ring
10	Pin 2 assy	26	Sun gear 2	42	Hexagon socket bolt
11	Pin 2	27	Sun gear 1	43	Plug
12	Bushing 2	28	Ring gear	45	Air breather assy
13	Spring pin	29	Knock pin	46	Gauge pipe
14	Thrust washer	30	Cover plate	47	Gauge bar
15	Spring pin	31	Hexagon bolt	48	Air breather post
16	Carrier 1 assy	32	Spacer	49	Air breather cap

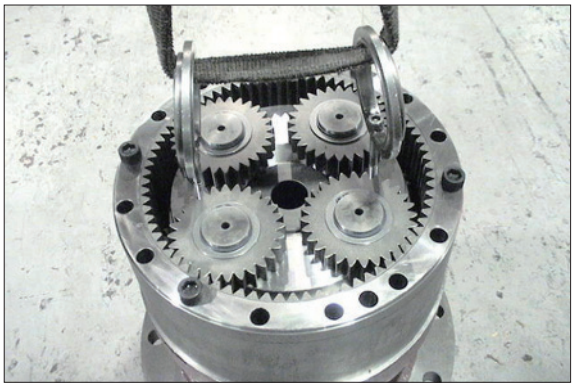
2) DISASSEMBLY

(1) Removal of cover

※ Loosen the socket bolt (39) with 16mm hexagonal socket and remove the cover (40).

(2) Removal of carrier 1 assembly assembly

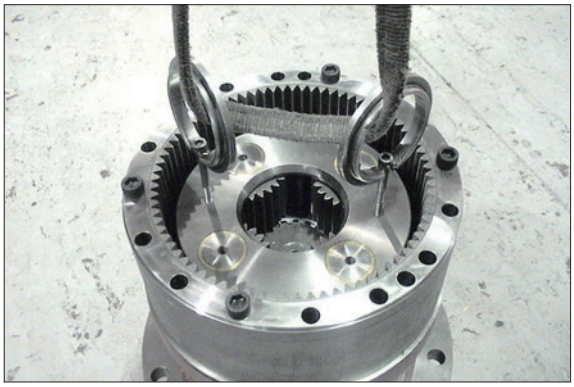
Remove sun gear 1 (27) and thrust ring (25), install eye bolt to tap hole (M10) and remove carrier 1 assembly (16) itself.



3607A8SR03

(3) Removal of carrier 2 assembly

Remove sun gear 2 (26), install eye bolt to tap (M10) of carrier 2 (8) and remove carrier 2 assembly (7) itself.

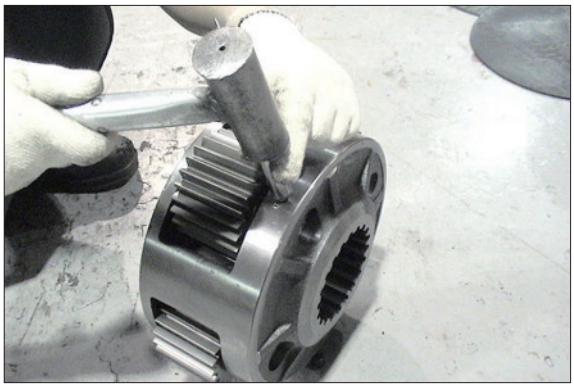


3607A8SR04

(4) Disassembly of carrier 2 assembly

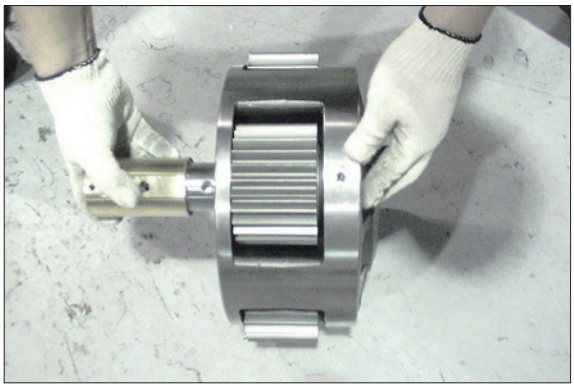
① Insert spring pin (15) into pin 2 (11) by hammering.

※ Do not reuse spring pin after removal.



3607A8SR05

② Remove pin 2 (11), planetary gear 2 (9) and thrust washer (14) from carrier 2 (8) with hands.

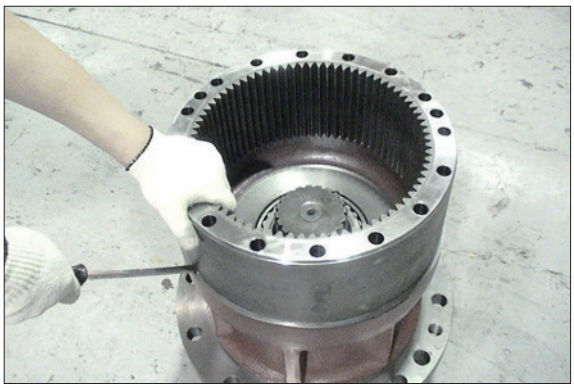


3607A8SR06

(5) Removal of ring gear

Remove ring gear (28) from casing (1).

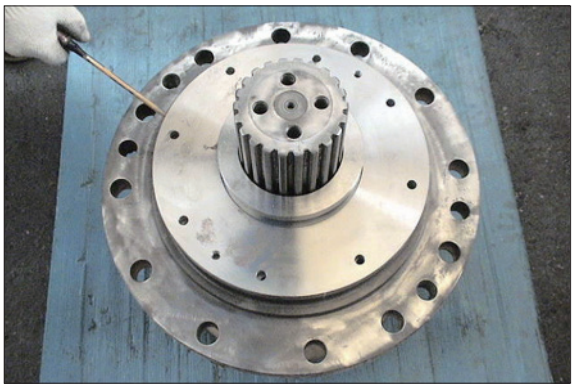
※ Fluid packing is applied on contacting face of ring gear and gear casing. Therefore, remove ring gear from casing by minus screw driver.



3607A8SR07

(6) Removal of drive shaft (2) assembly

① Spread off the corners of spacer (32), and loosen hex bolt (31) with a tool and remove cover plate (30).



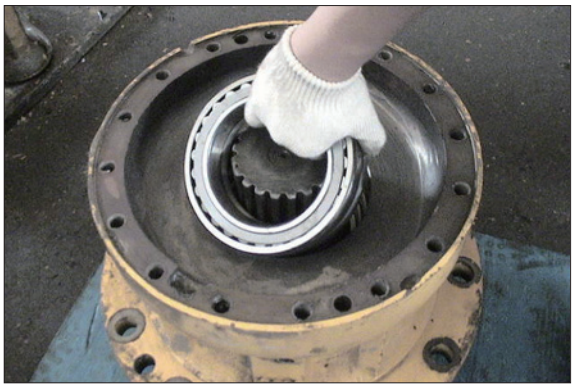
3607A8SR08

② Install hydraulic press at the end face of shaft, and remove drive shaft (2), spacer ring (4), and taper roller bearing (3) as assembly.

※ Do not reuse oil seal after removal.

3607A8SR09

③ Remove taper roller bearing (6) from gear casing (1).



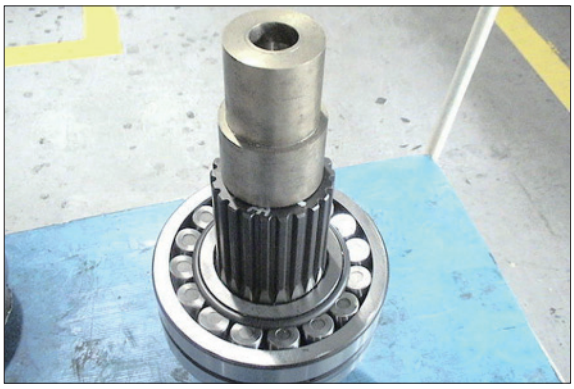
3607A8SR10

④ Remove oil seal (5) from gear casing (1).

3607A8SR11

(7) Disassembly of shaft assembly

Insert motor side of shaft (2) into steel tube (inner dia : Ø145 mm) and push the end of output shaft side with hydraulic press and then remove taper roller bearing (3), and spacer ring (4) as assembly from drive shaft (2).



3607A8SR12

3) ASSEMBLY

(1) Assembly of drive shaft assembly

① After heat taper roller bearing (3) up to 50˚C plus surrounding temperature and assemble it to shaft with hydraulic press and then assemble spacer ring (4) in this order.

※ Pay attention to the assembling direction of cover plate (30).

3607A8SR13

(2) Installation of oil seal

Remove oil from assembled face of oil seal of gear casing (1) and oil seal (5).
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) Install 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.

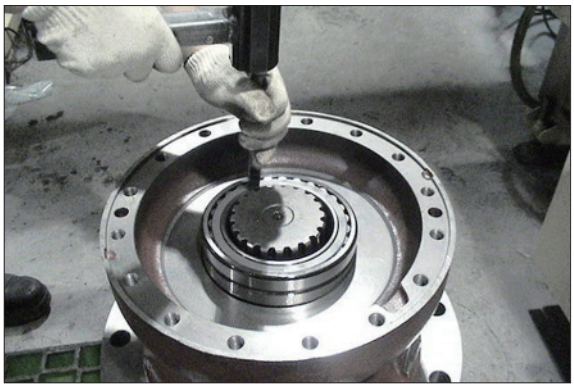
② Put drive shaft of gear casing (1) upward. Assemble drive shaft assembly to gear casing by tightening eye bolt into tap hole (M16) of output side of drive shaft (2).

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

3607A8SR15

(4) Install of taper roller bearing

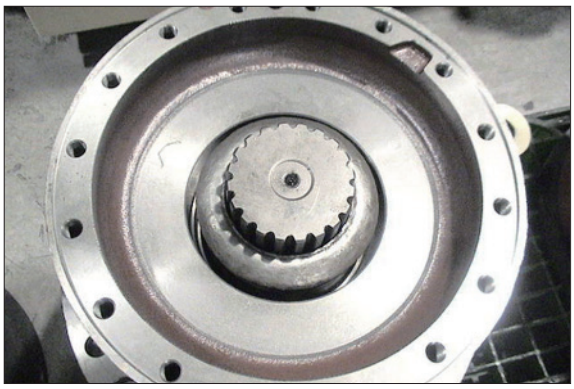
Put gear casing under output shaft and heat taper roller bearing (6) up to 50˚C plus surrounding temperature and then assemble it to the shaft (2).



3607A8SR16

(5) Assembly of ring gear

① Remove oil from mating faces between gear casing (1) and ring gear (28), and knock pin (29). Assemble collar of gear casing and apply fluid packing (three bond of grey color).



3607A8SR17

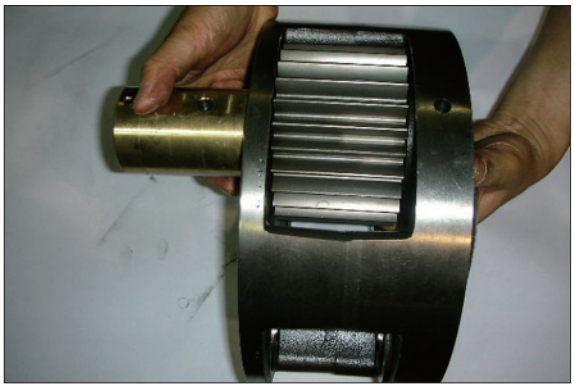
② Assemble ring gear (28).

36078SR18

(6) Assembly of carrier 2 assembly

① Assemble planetary gear 2 (9) to carrier 2 (8) with thrust washer (14) and insert pin 2 (11).

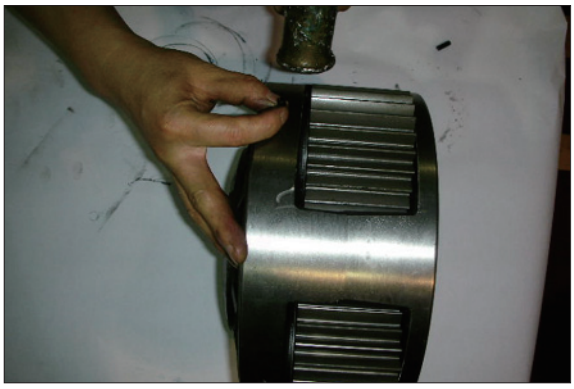
※ Lubricate gear oil to inside of gear and outside of shaft.



3607A8SR19

② Insert spring pin (15) by hammering.

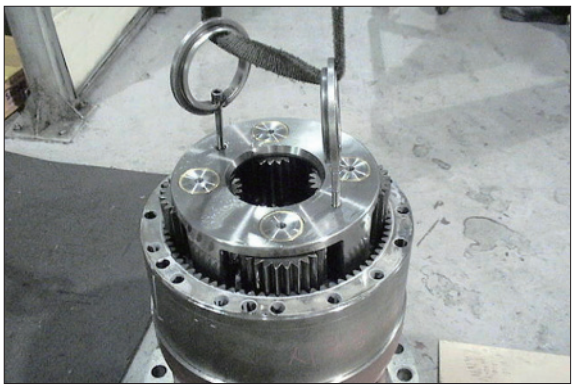
※ Insert as the clearance between spring pins toward planetary gear 2 (9).



3607A8SR20

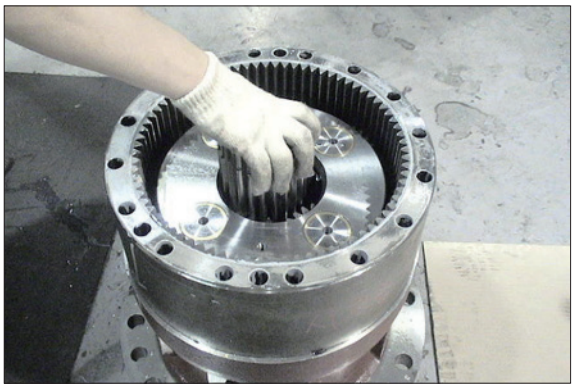
(7) **Assembly of carrier 2 assembly and sun gear 2**

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 (28). Rotate carrier assembly lightly so that splines of drive shaft (2) are engaged.



3607A8SR21

② Insert sun gear 2 (26) to planetary gear 2 (9).

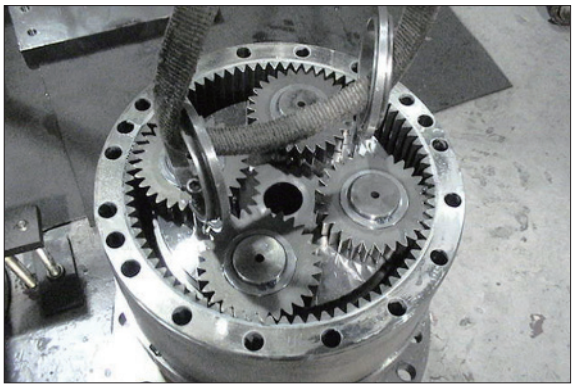


3607A8SR22

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

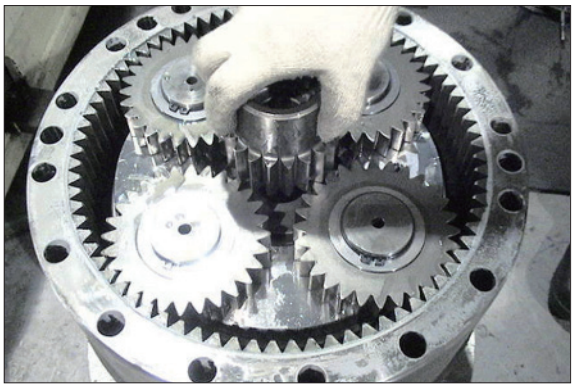
① Mount eye bolt into tap hole (M10) of carrier 1 (17) and lift carrier assembly and then insert carrier assembly being engaged with internal teeth of ring gear (28).

Rotate holder assembly lightly so that sun gear 2 (26) is engaged with teeth of carrier 1 (17).



3607A8SR23

② Insert sun gear 1 (27) to planetary gear 1 (18).



3607A8SR24

(9) Check rotation of sun gear 1 (27) by turning plunge part of gear casing with hands.

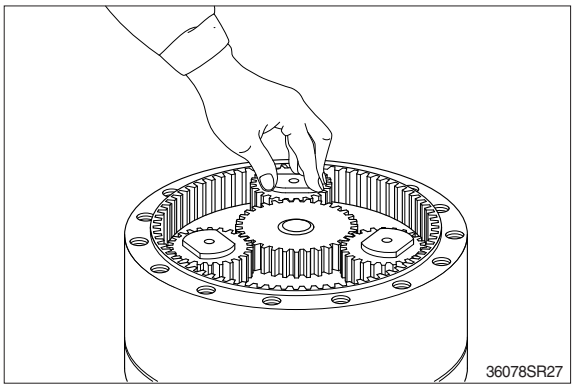
(10) Assembly of cover

Remove oil from mating faces between ring gear (28) and cover (40) and apply fluid packing.

Assemble cover (40) and tighten socket bolt (39) with 16 mm hexagonal socket.

Tightening torque : 28.5±3.0 kgf · m
(206±21.7lbf · ft)

This completes assembly



36078SR27

1. REMOVAL AND INSTALL

1) REMOVAL

(1) Swing the work equipment 90° and lower it completely to the ground.

(2) Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

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

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

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

(5) Remove the cover.

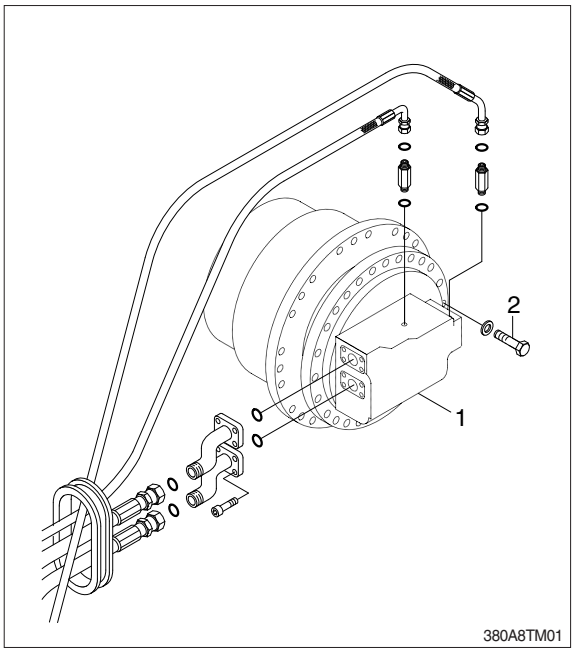
(6) Remove the hoses.

※ Fit blind plugs to the disconnected hoses.

(7) Remove the bolts and the sprocket.

(8) Sling travel device assembly (1).

(9) Remove the mounting bolts (2), then remove the travel device assembly.
- Weight : 380 kg (838 lb)
- Tightening torque : 57.9 ± 8.7 kgf·m (419 ± 62.9 lbf·ft)



2) INSTALL

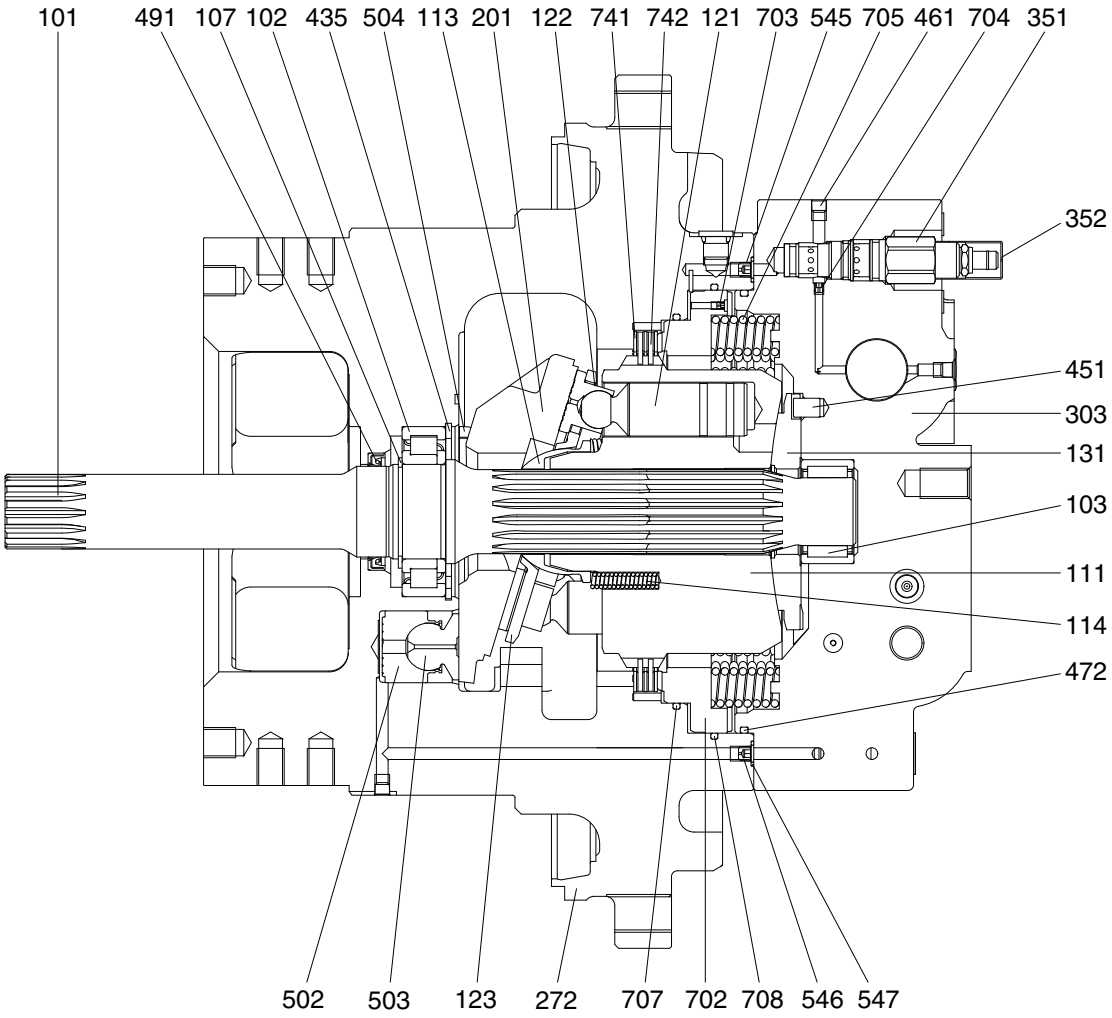
(1) Carry out installation in the reverse order to removal.

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

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

2. TRAVEL MOTOR

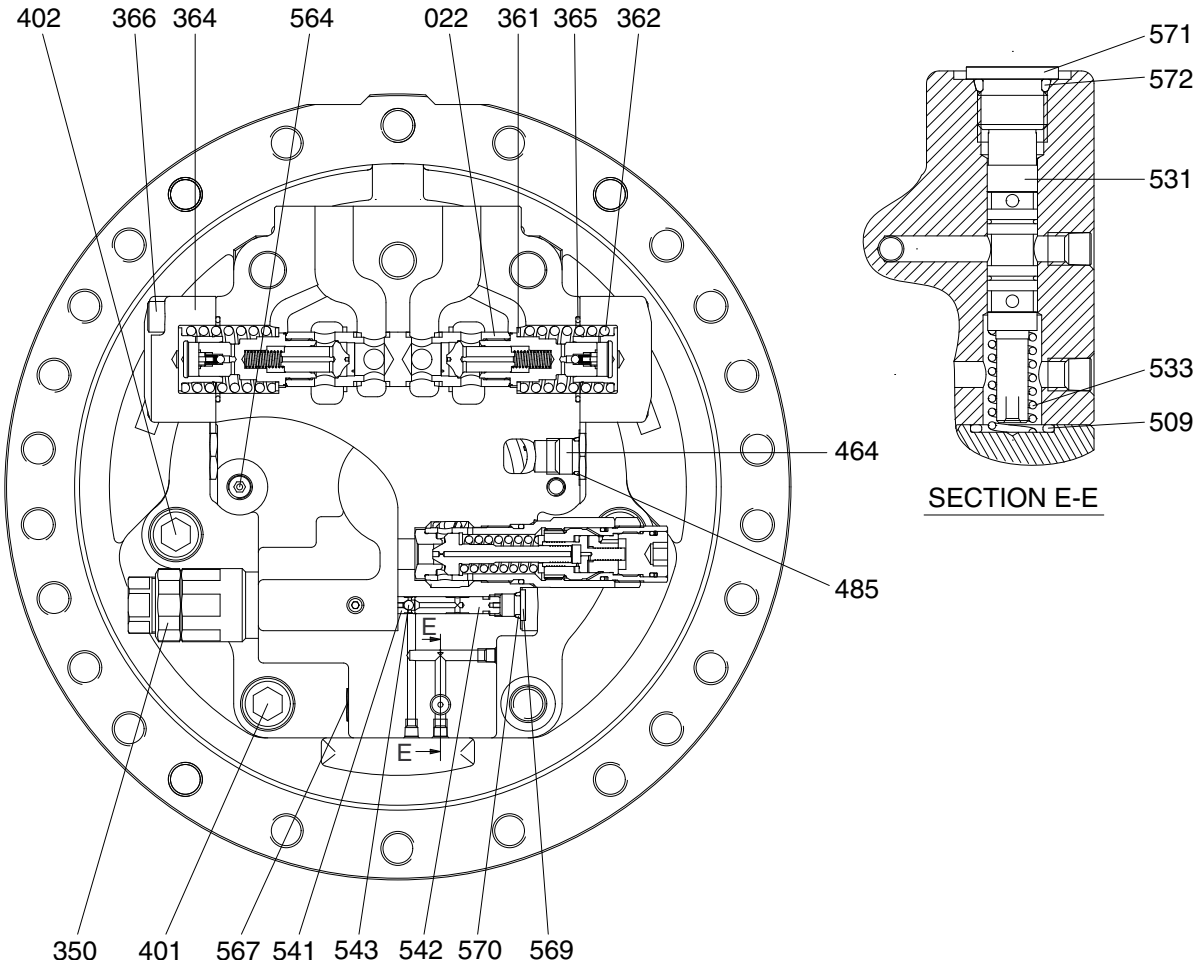
1) STRUCTURE (1/2)



3809A2TM02

101	Drive shaft	272	Shaft casing	545	Orifice
102	Roller bearing	303	Valve casing	546	Orifice
103	Needle bearing	351	Reducing valve	547	O-ring
107	Snap ring	352	Cover	702	Brake piston
111	Cylinder block	435	Snap ring	703	Orifice
113	Spherical bushing	451	Pin	704	Orifice
114	Cylinder spring	461	Plug	705	Brake spring
121	Piston	472	O-ring	707	O-ring
122	Shoe	491	Oil seal	708	O-ring
123	Set plate	502	Piston	741	Separation plate
131	Valve plate	503	Shoe	742	Friction plate
201	Swash plate	504	Pivot ball		

STRUCTURE (2/2)

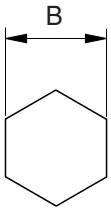


3607A2TM03

022	Counterbalance spool	402	Hex socket bolt	543	Steel ball
350	Relief valve	464	VP plug	564	Plug
361	Washer	485	O-ring	567	VP plug
362	Counterbalance spring	509	O-ring	569	RO plug
364	Counterbalance cover	531	Tilting spool	570	O-ring
365	O-ring	533	Tilting spring	571	RO plug
366	Hex socket	541	Seat	572	O-ring
401	Hex socket	542	Stopper		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

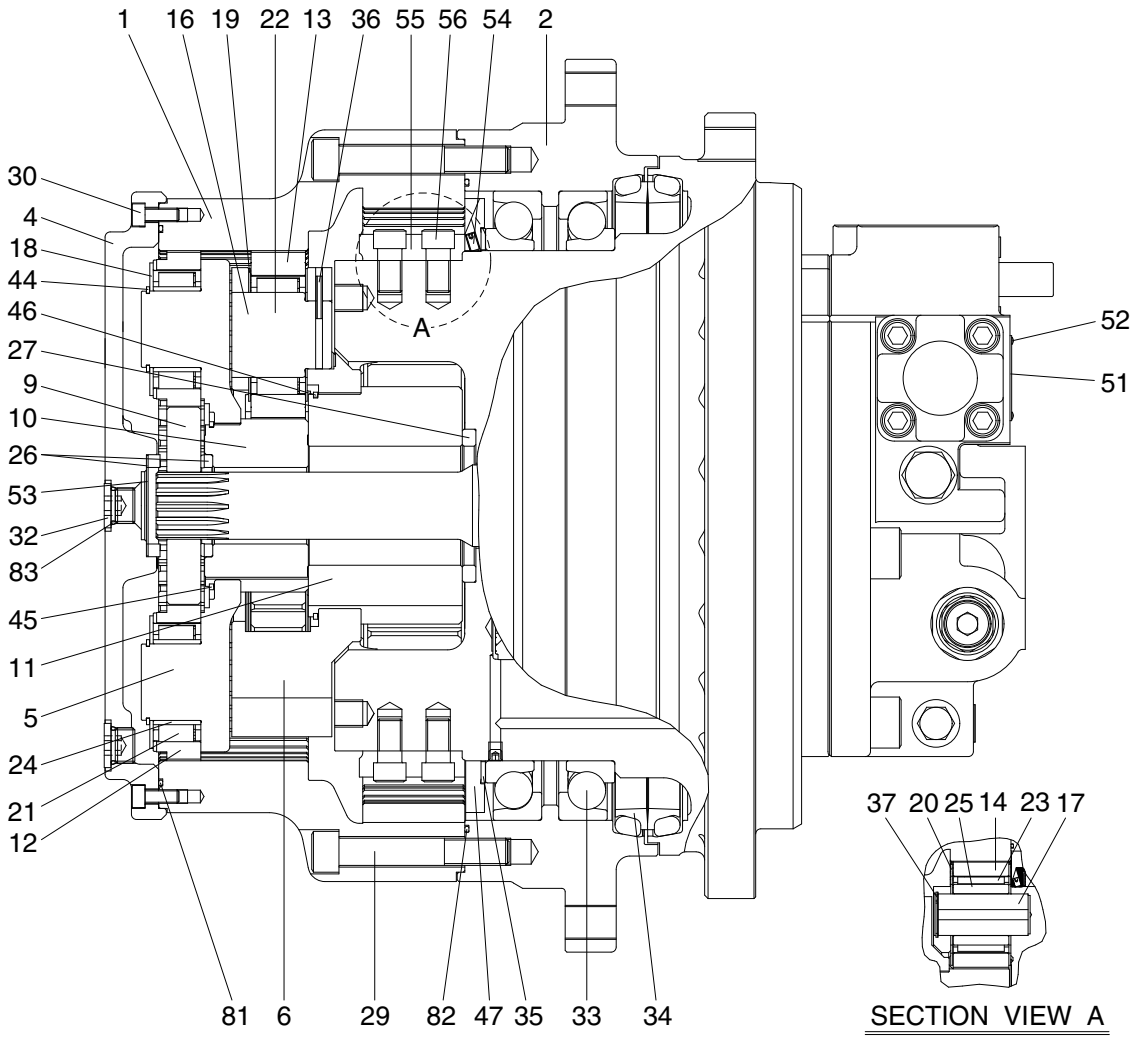
Tool name	Remark	
Allen wrench	2	
	2.5	
	4	
	6	
	8	
	10	
	17	
Socket for socket wrench, spanner	19	
	22.4	
	27	
	42	
Torque wrench	Capable of tightening with the specified torques.	
Plier (For hole, TPR-90)	For snap ring (435)	
Plier (For shaft)	For snap ring (107)	
(-) Driver	-	
Plastic hammer	Wooden hammer allowed. Nominal 1 or so	
Steel rod approx	7×7×200㎜, Bearing (102, 103)	
Monkey wrench	-	
Oil seal inserting jig	-	
Bearing plier	-	
Seal tape	-	

(2) Tightening torque

Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	in	mm
Socket bolt	366	M12×45	10	72.3	0.39	10
Socket bolt	401	M20×100	44	318	0.67	17
Socket bolt	402	M20×50	44	318	0.67	17
Plug	461	NPTF 1/16	0.9	6.5	0.16	4
VP Plug	464	PF 1/4	11	79.6	1.06	27
Orifice	545, 546	NPTF 1/16	0.7	5.1	0.16	4
Plug	564	PT 1/2	2.2	15.9	0.24	6
VP Plug	567	PF 1/4	3.7	26.8	0.75	19
Plug	569	PF 1/4	3.7	26.8	0.24	6
Plug	571	PF 3/8	7.5	54.2	0.31	8
Orifice	703	M4×0.7	0.35	2.5	0.08	2
Orifice	704	M5×0.8	0.7	5.1	0.1	2.5

3. TRAVEL REDUCTION GEAR

1) STRUCTURE

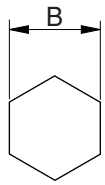


3809A2TRG01

1	Ring gear	20	Side plate	37	Snap ring
2	Housing	21	Needle cage	44	Snap ring
4	Side cover	22	Needle cage	45	Clip
5	Carrier 1	23	Needle cage	46	W clip
6	Carrier 2	24	Inner ring	47	Nutring
9	Sun gear 1	25	Floating bushing	51	Name plate
10	Sun gear 2	26	Thrust ring	52	Rivet
11	Sun gear 3	27	Thrust ring	53	Washer
12	Planetary gear 1	29	Socket bolt	54	Set screw
13	Planetary gear 2	30	Socket bolt	55	Nutring stopper
14	Planetary gear 3	32	RO plug	56	Hex socket bolt
16	Pin 2	33	Angular bearing	81	O-ring
17	Pin 3	34	Floating seal	82	O-ring
18	Side plate	35	Shim	83	O-ring
19	Side plate	36	Spring pin		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tool name	Remark	
Allen wrench	4	
	8	
	10	
	14	
Spanner	27	
Torque wrench	Capable of tightening with the specified torques.	
Plier (for shaft)	Snap ring (037, 044)	
(-) Driver	For removing floating seal	
Plastic hammer	Wooden hammer allowed	
Eye bolt	M8, M10, M16, M20, For lifting-up	
Press (1 ton)	Angular bearing (033)	
Depth gauge straight edge	100㎜ depth, for adjusting shins (053)	
Tap M16	For removing screw lock in tapped holes	
Oil stone	For finishing mating faces	
Punch	For preventing spring pin from coming out	
Loctite (three bond 1373B)	Set screw (054)	
Loctite	Socket bolt (029)	
Nut ring inserting jig	Nut ring (047)	

(2) Tightening torque

Part name	Item	Size	Torque		Wrench size	
			kgf · m	lbf · ft	in	mm
Socket bolt	29	M16×100	30	217	0.55	14
	30	M8×20	3.5	25.3	0.24	6
Plug	32	PF 1/2	11	79.6	0.39	10
Set screw	54	M8×16	1.0	7.2	0.24	6

4. DISASSEMBLING

1) GENERAL PRECAUTIONS

(1) Pay attention to not damaging contact surfaces for O-rings, oil seals, etc. and contact/sliding surfaces for gears, pins, bearings, etc.

(2) This motor can be disassembled even in a state on the reduction gear.
However, in that case, pay full attention to preventing mud, dust, etc. from entering in it.

(3) The numerical in parentheses following each part name indicates its part number shown in the attached **assembly drawings.**

(4) The piping side of the motor is referred to as the rear side, and the output side as the front side.

2) DISASSEMBLY OF REDUCTION GEAR

(1) Select a disassembling place.
※ Select a clean place.
※ Spread rubber sheet or cloth on work bench to prevent parts from being damaged.

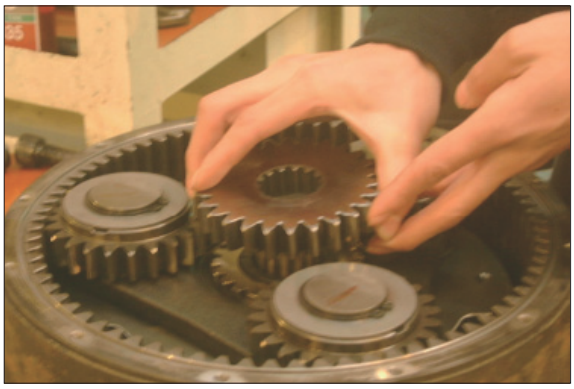
(2) Remove dust, mud, etc. from reduction gear surfaces with washing oil or so.

(3) Place reduction gear with its gear oil drain port or level gauge at the lowest position, and drain reduction gear oil.
※ Receive gear oil with clean vessel and check it for abnormalities.
Renew gear oil.

(4) Place reduction gear with its side cover (4) upward, and remove socket bolt (30), and remove side cover (4) and O-ring (81).

370078TM01

(5) Remove sun gear 1 (9).



370078TM02

(6) Remove carrier 1 (5), together with planetary gears 1 (12), sun gear 2 (10), etc. fitted.

370078TM03

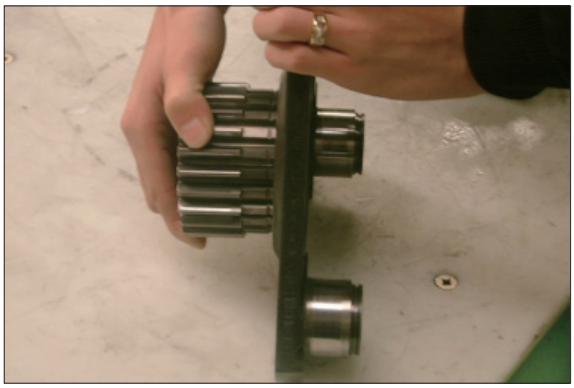
(7) Disassembling of carrier 1 sub-assembly

① Remove snap ring (44), and then remove side plate (18), planetary gear 1 (12), needle cage (21) and side plate (18).

※ If flaking is observed on the inner ring surface replace inner ring. In this case, replace planetary gear 1 and needle cage simultaneously.

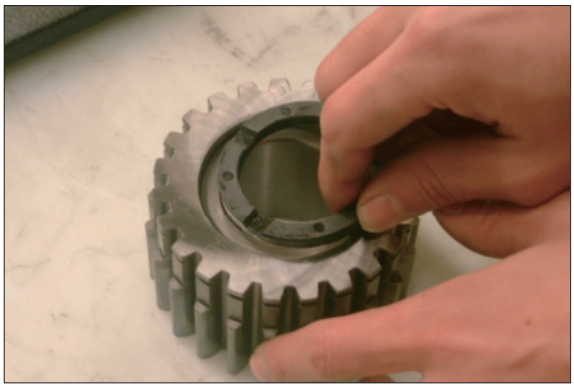
370078TM04

② Remove circlip (45), and then remove carrier 1 (5) from sun gear 2 (10).



370078TM05

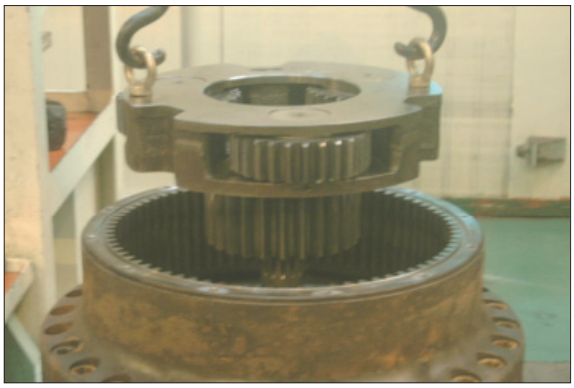
③ Remove thrust ring (26).



370078TM06

(8) Remove carrier 2 (6), with planetary gears 2 (13), sun gear 3 (11), etc. fitted.

※ Use M10 eyebolt. In this case, thrust ring (26) is removed simultaneously.



370078TM07

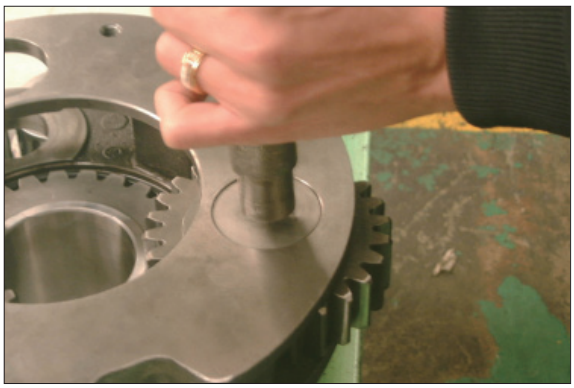
(9) Disassembling of carrier 2 sub-assembly

① Push in spring pin (36), and remove pin 2 (16), from carrier 2.

※ Carry out the following check in advance. If any abnormality should be found, carry out disassembling.

· Is there any crevice, crack or pitting on tooth surface of planetary gear?

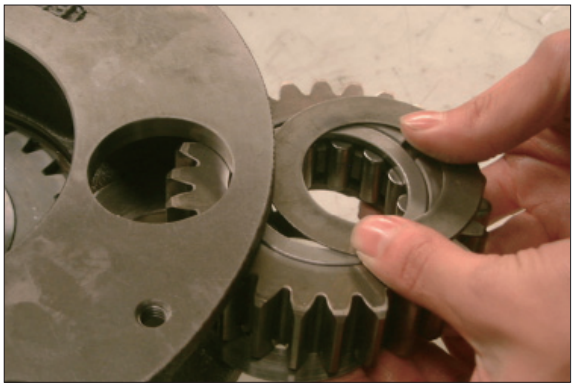
· When turning planetary gear lightly, is there any abnormal noise or eccentric clearance? Carry out check similarly to the above for carrier 3.



370078TM08

② Remove side plate (20), planetary gear 2 (13), and needle bearing (22) from carrier 2.

③ Remove thrust ring (26).



370078TM09

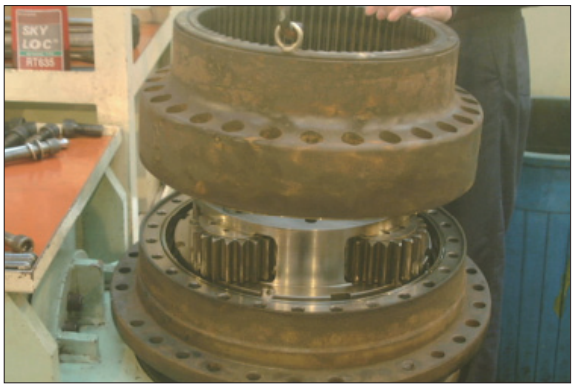
④ Remove snap ring (46), and remove carrier 2 (6) from sun gear 3 (11).

⑤ Remove thrust ring (27) from sun gear 3 (11).

370078TM10

(10) Remove socket bolt (29), and then screw two M8 eyebolts on front side of ring gear (1), lift up ring gear with crane, and remove O-ring (82) from housing (2).

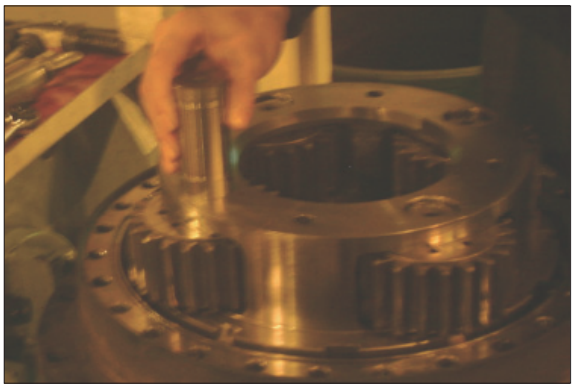
※ It is difficult to separate them, because it is assembled by LOCTITE.
In this case, if you can use wrench and pipe, it is easy to separate them.



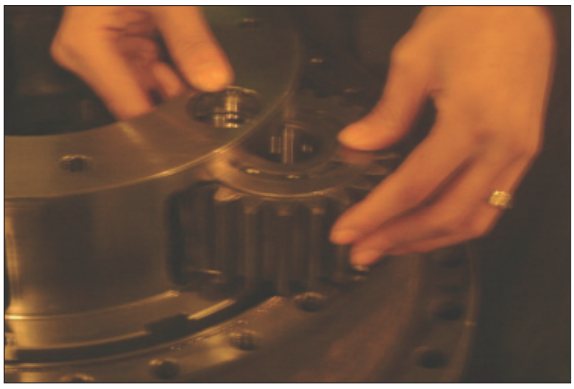
370078TM11

(11) Remove snap ring (37) and then remove pin 3 (17) from shaft casing (272).


370078TM12

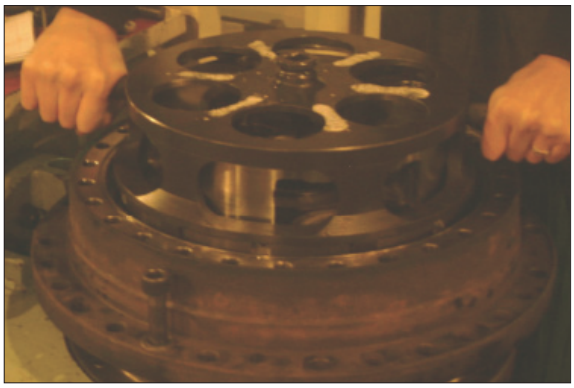

370078TM13

(12) Remove side plate (20), planetary gear 3 (14), needle cage (23), floating bushing (25) from shaft casing (272).


370078TM14

(13) Remove set screw (54) from nut ring (47), and then remove nut ring (47) from shaft casing (272).

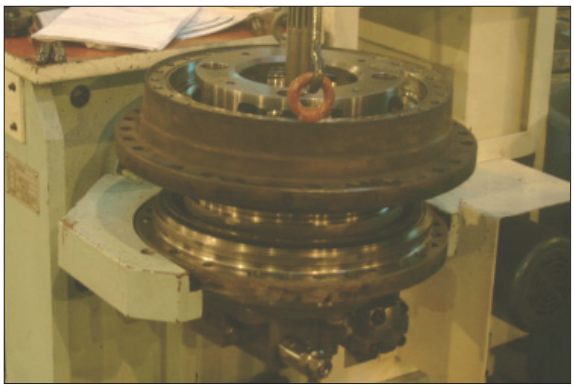
※ When disassembling nut ring, remove dust, mud, etc. from set screw hole by blasting compressed air.
And remove the nut ring by using the special tool for removing the nut ring.



370078TM15

(14) Remove housing (2), angular bearing (33), floating seal (34) from shaft casing (272).

※ Screw two M16 eye bolts on front side of housing (2).
Lift up housing (2) with crane.



370078TM17

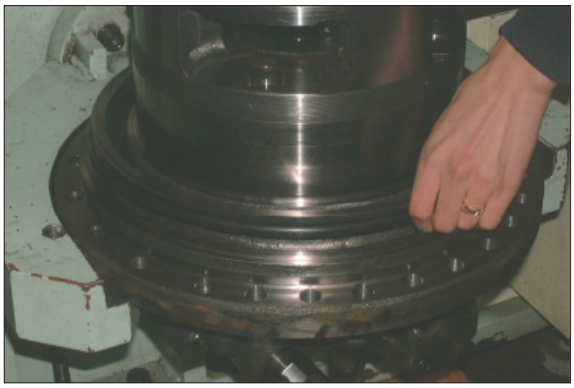
(15) Remove floating seal (34) from housing (2), paying attention to not damaging it.

※ Pay attention to O-ring and sheet faces.

370078TM18

(16) Remove floating seal (34) from casing (272), pay attention to not damaging it.

※ Pay attention to O-ring and sheet faces.



370078TM19

(17) Remove angular bearing (33) from housing (2).

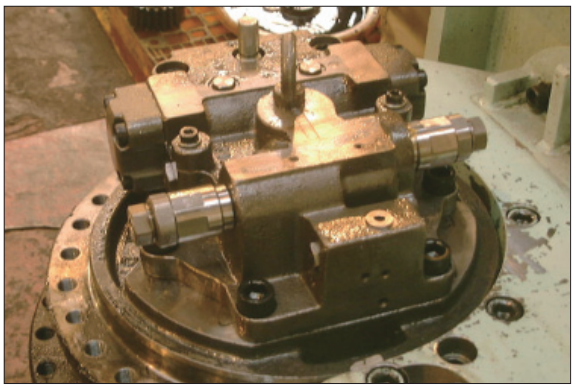
※ Bearing should be renewed once it is removed.

370078TM20

3) DISASSEMBLY OF MOTOR

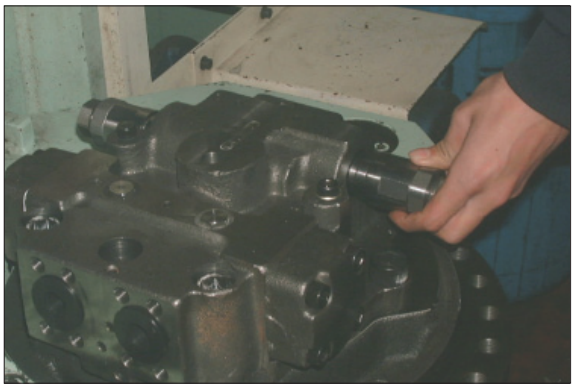
(1) Disassembling of motor main body

① Place hydraulic motor on bench with its output shaft down.

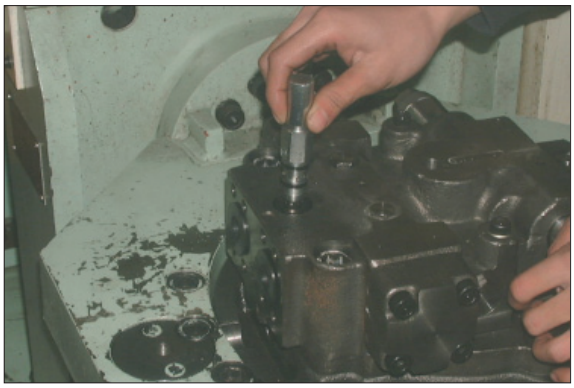


370078TM21

② Loosen relief valve (350), reducing valve (351), cover (352), plug, etc.
They are fitted to valve casing (303).

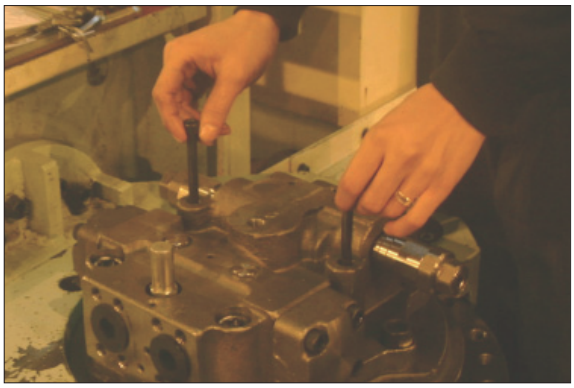


370078TM22



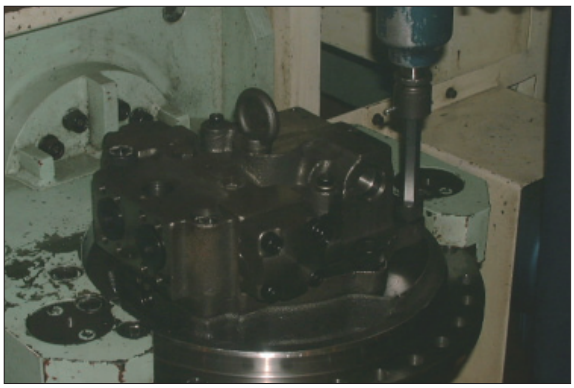
370078TM23

③ Remove plug (564) from valve casing (303). And then screw two M10×135 bolts on the holes of compelling brake release. Sub assembly (valve casing & brake piston)



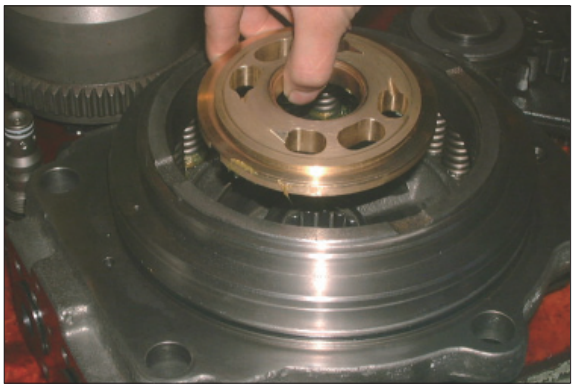
370078TM24

④ Remove socket bolts (401, 402) that assemble valve casing (303).



370078TM25

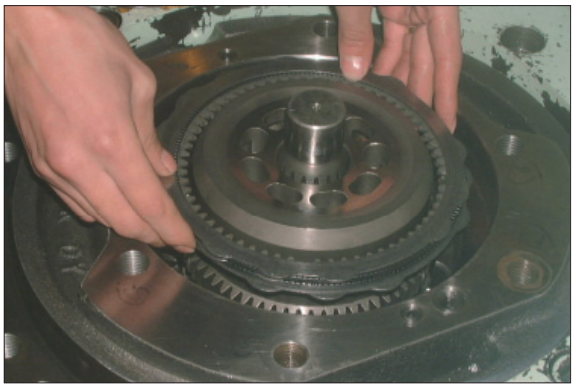
⑤ Remove the above socket bolt, and then separate valve casing sub-assembly and remove valve plate (131).



370078TM26

⑥ Pull out friction plate (742) and separation plate (741) from cylinder block (111).

※ In this case, motor should be located in horizontally.

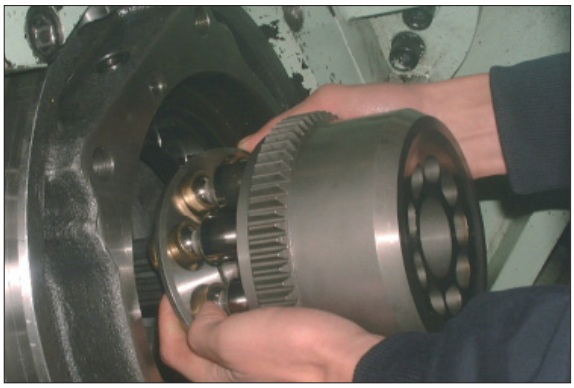


370078TM27

⑦ Pull out cylinder block and piston sub-assembly.

※ After placing the motor horizontally, take out cylinder block from casing.

※ Be careful not to damage the sliding parts of the cylinder block, spherical bushing and shoe.

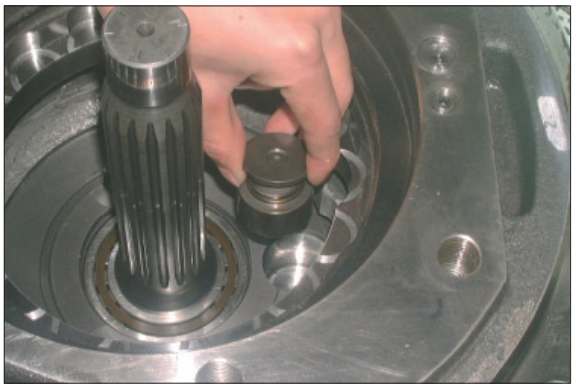


370078TM28

⑧ Remove swash plate (201).

370078TM29

⑨ Remove pivot ball (504) and tilting piston sub assembly.



370078TM30

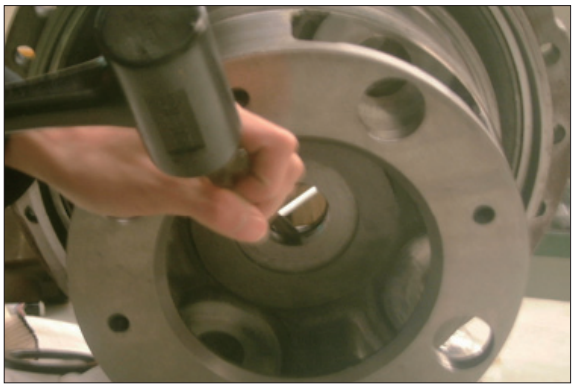
⑩ Take out snap ring (435), and then hit front side end face of shaft (101) lightly with plastic hammer or so to remove from casing (272).

※ Do not remove cylinderical roller bearing (102) as far as it remains normal.

370078TM31

⑪ Take out oil seal (491) from shaft casing (272).

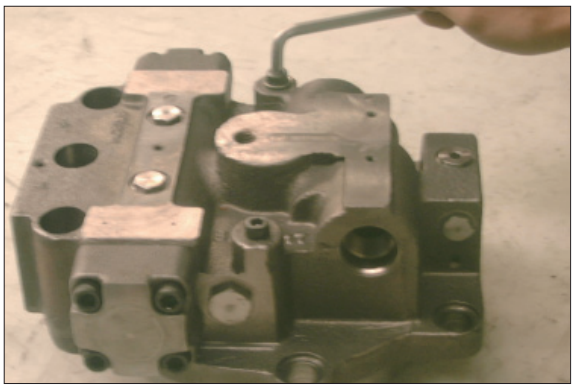
※ Do not reuse the disassembling oil seal (491).



370078TM32

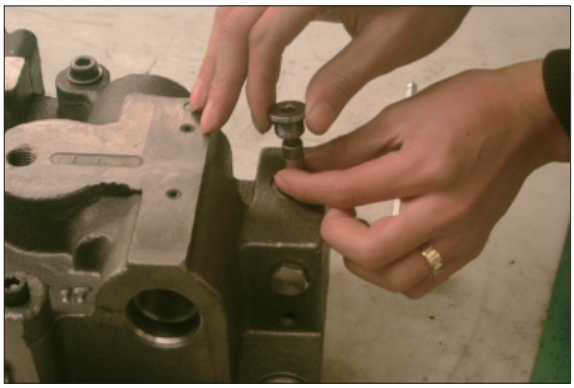
(2) Disassembling of valve casing sub-assembly

① Remove two M10×135 bolts for compelling brake release. Disassemble brake piston from valve casing.



370078TM33

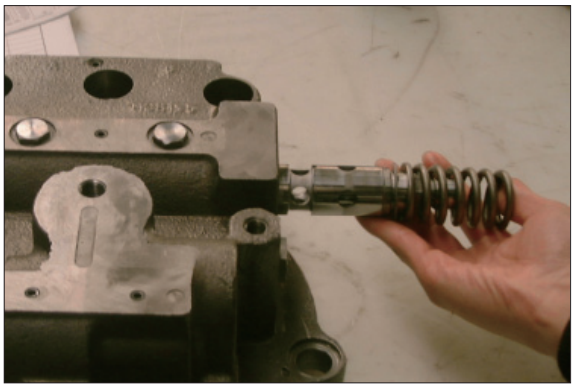
② Remove plug (571), tilting spring (533), and tilting spool (531) from valve casing.



370078TM34

③ Remove socket bolts (366), counterbalance cover (364), and counterbalance spool assembly.

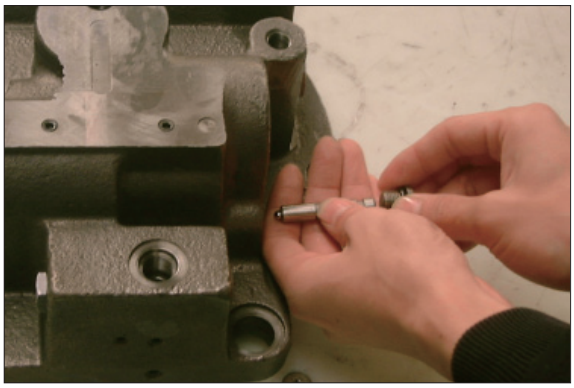
※ When any abnormality is found in counterbalance spool, counterbalance spring, etc. replace with the counter balance spool sub assembly as a set.



370078TM35

④ Remove plug (569), stopper (542), steel ball (543) and seat (541).

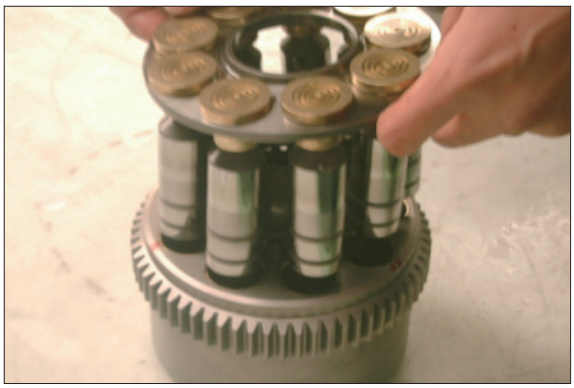
※ When no abnormality is found in displacement changeover, it is not necessary to overhaul it specifically.
And don't remove needle bearing (103) as far as it remains normal.



370078TM36

(3) Disassembling of cylinder sub-assembly

① Pull out set plate (123), piston (121), and shoe (122) sub-assembly.



370078TM37

② Remove spherical bush (113) and cylinder spring (114).
That is all of the disassembling work.
The pins (451) force-fitted to the valve casing cannot be removed.

370078TM38

5. ASSEMBLING

1) GENERAL CAUTIONS

(1) Clean each part fully with washing oil and dry it by blasting compressed air. It is better not to use waste cloths as much as possible.
However, if they are to be used, use clean ones, and pay attention to not leaving lint and so on.
Don't clean the friction plate with washing oil without fail.

(2) Use the torque wrench in tightening fitting screws and plugs to their respective torque shown in page 8-90, 8-92.

(3) When hammering is required, use the plastic hammer and try to hit parts lightly.

(4) Similarly to the disassembling procedures, the numeral in parentheses following each part name indicates its item number shown in the attached assembly drawings.

2) ASSEMBLY OF MOTOR

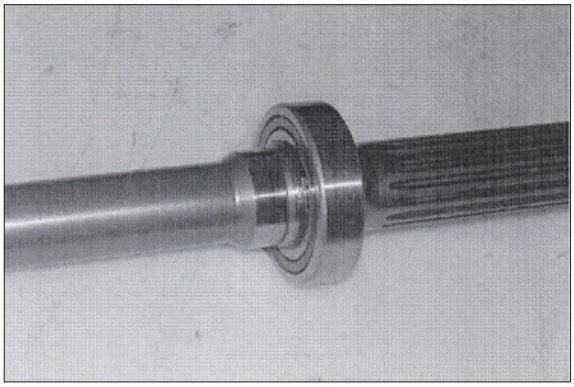
(1) Assembling driving shaft sub-assembly

① Put roller bearing (102) on drive shaft (101), and assemble snap ring (107) by using the plier.

※ Roller bearing is press fit by the heat to drive shaft.

※ Pay attention to not damaging oil seal sliding area of driving shaft.

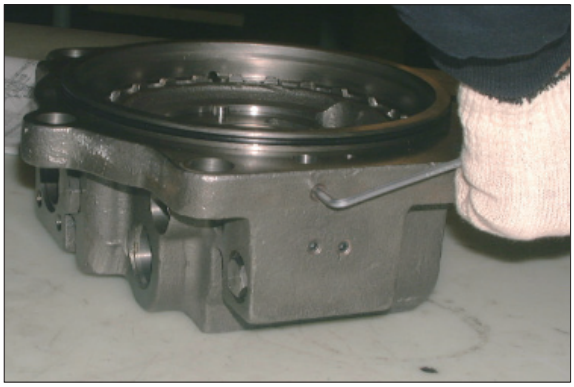
※ Pay attention to not fitting snap ring the other way around.



370078TM39

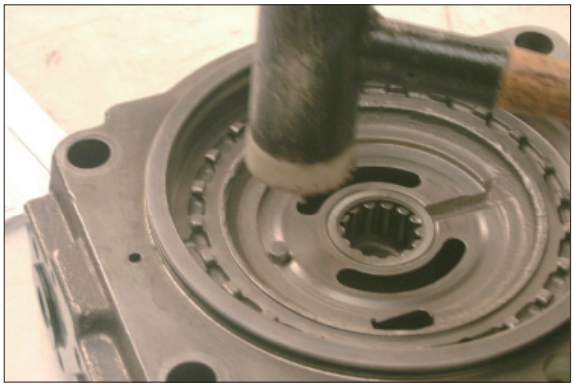
(2) Assembling of valve casing sub-assembly

① Tighten plugs (461, 564) into valve casing (303) with specified torque.
- Plug(461) : 0.9 kgf · m (6.5 lbf · ft)
- Plug(564) : 2.2 kgf · m (15.9 lbf · ft)



370078TM40

② Interference-fit pin (451).



370078TM41

③ Interference-fit needle bearing (103).

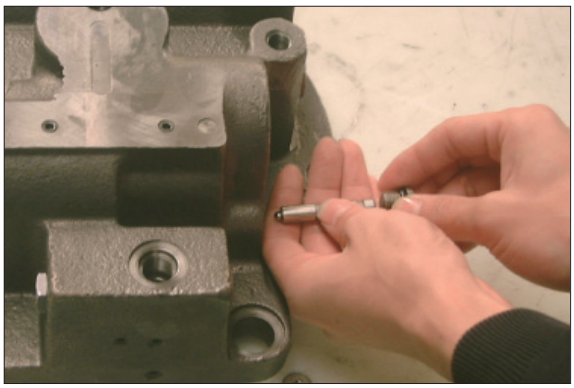
※ It is necessary when needle bearing was disassembled from the valve casing.

370078TM42

④ Assemble seat (541), steel ball (543), stopper (542) and RO plug (569) in the order named.

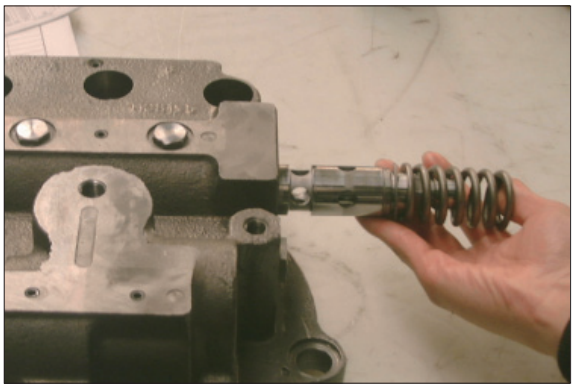
· Tightening torque : 3.7 kgf · m (26.8 lbf · ft)

※ Pay attention to not assembling seat and stopper the other way around.



370078TM43

⑤ Assemble counterbalance spool (360), washer (361), spring (362) in the order named.

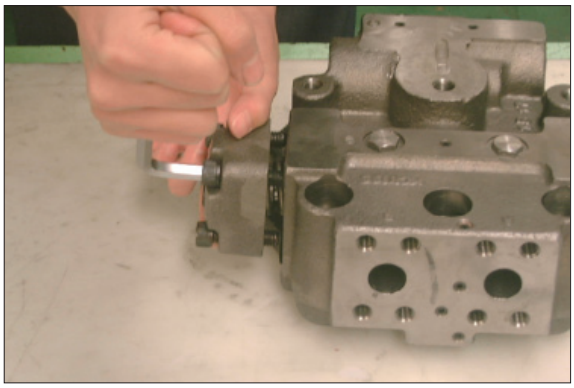


370078TM44

⑥ Fit counterbalance cover (364) by tightening socket bolt (366).

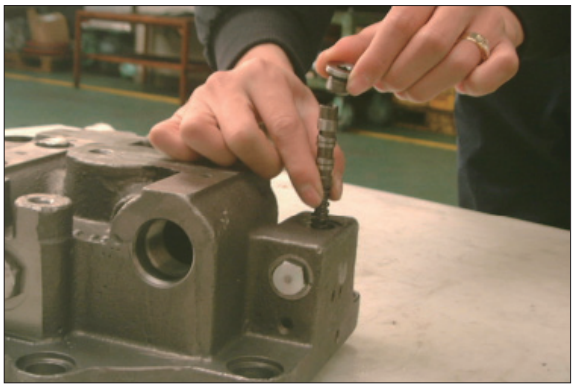
· Tightening torque : 10 kgf · m (72.3 lbf · ft)

※ Confirm that O-ring (365) has been inserted in cover.



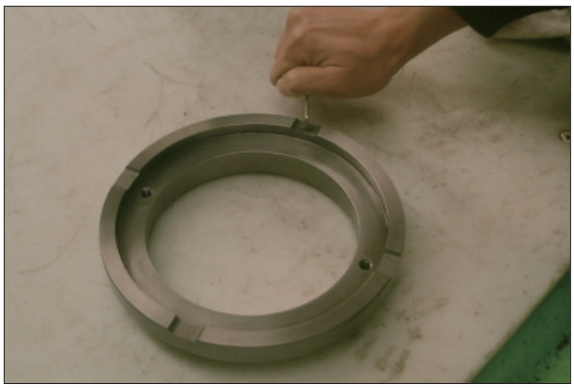
370078TM45

⑦ Assemble tilting spool (531), tilting spring (533) and plug (571) in the order named.
· Tightening torque : 7.5 kgf · m (54.2 lbf · ft)



370078TM46

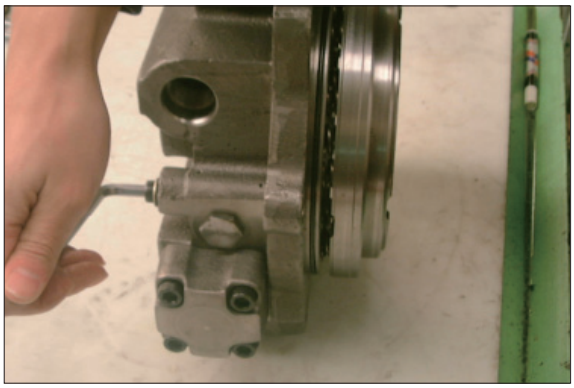
⑧ Assemble orifice (703) and tighten them into brake piston (702) to specified torque.
· Tightening torque : 0.35 kgf · m (2.5 lbf · ft)



370078TM47

⑨ Assemble brake spring (705) in brake piston (702). And then screw two M10×135 bolts on the holes for compelling brake release.
Sub-assembly (valve casing & brake piston)

※ After finishing assembly, two M10×135 bolts will be removed.



370078TM48

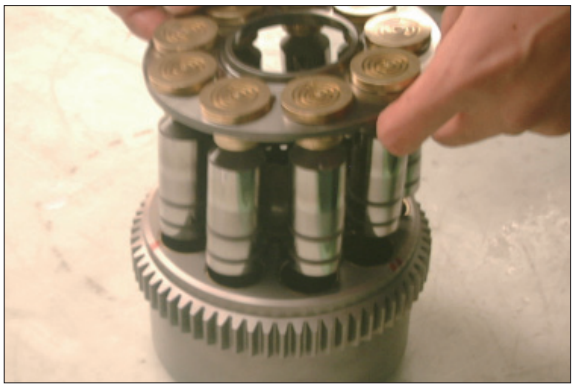
(3) Assembling of cylinder sub-assembly

① Fit cylinder spring (114) and spherical bush (113) to cylinder block (111).

※ Match spline phase of cylinder block (111) to that of spherical bush.

370078TM49

② Put piston (121), shoe (122) sub-assembly in set plate (123) and then assemble them to cylinder block (111).



370078TM50

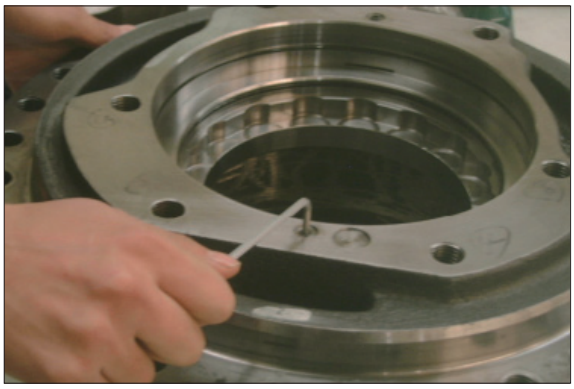
(4) Assembling of motor main body

① Tighten plug (461) and orifice (545, 546) into shaft casing (272) to specified torque.

· Plug (461) : 0.9 kgf · m (6.5 lbf · ft)

· Plug (545, 546) : 0.7 kgf · m (5.1 lbf · ft)

370078TM51



370078TM51A

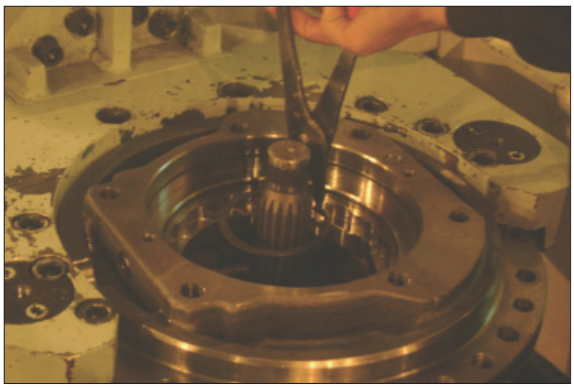
② Interference-fit oil seal (491) into shaft casing (272) by special tool.

370078TM52

③ Interference-fit the shaft sub-assembly. And then assemble snap ring (435).

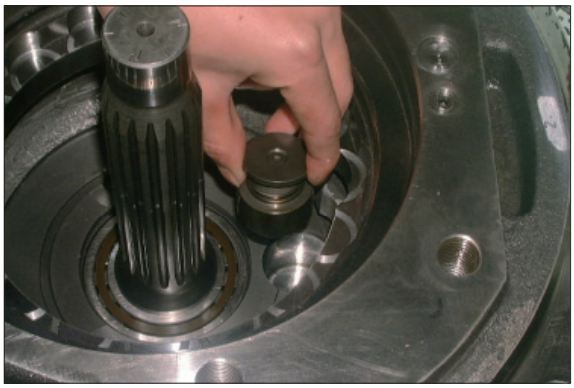
※ Interference-fit outer race of cylindrical roller bearing (102) by hitting lightly with hammer, utilizing key.

370078TM53

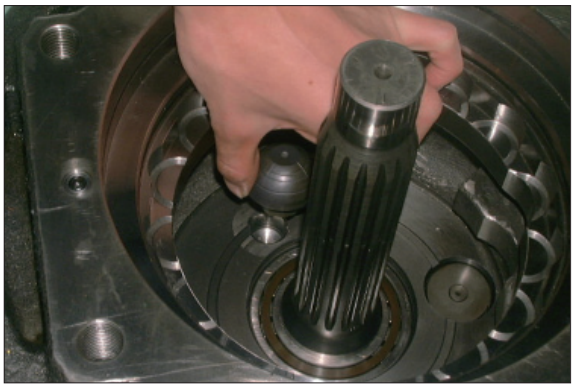


370078TM54A

④ Assemble tilting piston sub-assembly and pivot ball (504) into shaft casing (272).



370078TM54



370078TM54A

⑤ Assemble swash plate (201) onto pivot ball (504).

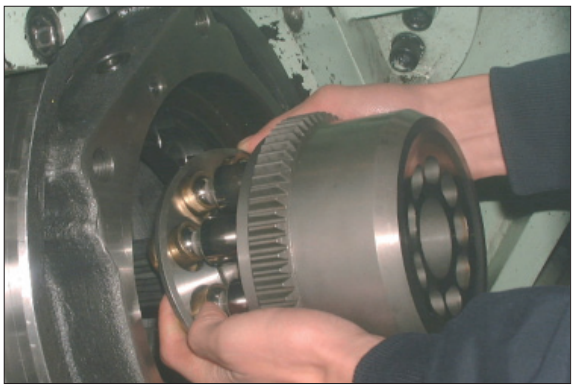
※ Apply grease on sliding area of swash plate rear surface.

※ Confirm with finger tips of both hands if swash plate moves smoothly.

370078TM55

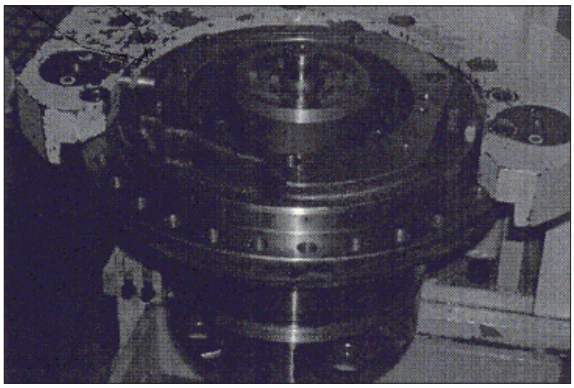
⑥ Change position of shaft casing (272) from vertical one to horizontal one.
And then mount cylinder block sub-assembly.

※ Pay attention to not dropping swash plate.



370078TM56

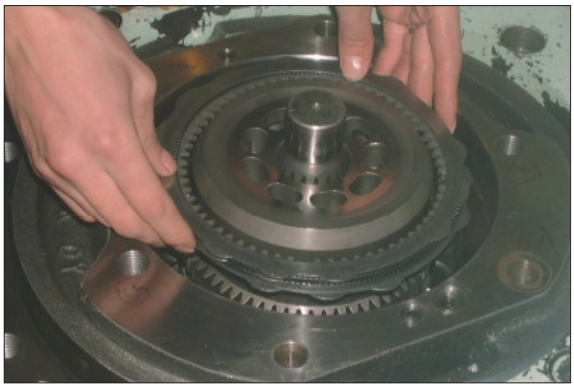
⑦ Change position of shaft casing (272) from horizontal one to vertical one.



370078TM57

⑧ Fit separation plate (741) and friction plate (742) into cylinder block (111).

※ Mate hole of separation plate each other.

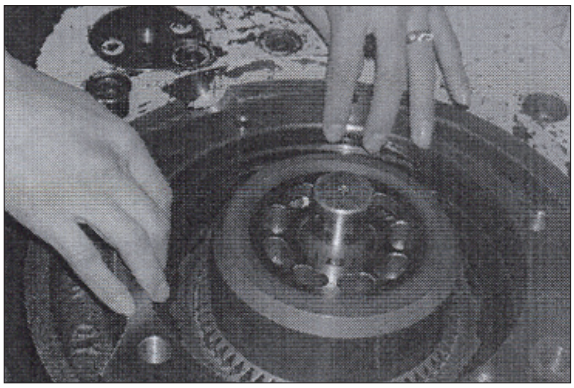


370078TM27

⑨ Assemble O-ring (707, 708) into shaft casing (272).

※ Do not reuse the disassembling O-ring (707, 708).

※ Coat the O-ring with grease.
(O-ring can be protected by grease)



370078TM59

⑩ Fit valve plate (131) to valve casing (303) sub-assembly. Assemble them to casing, and then tighten them with socket bolt (401, 402).

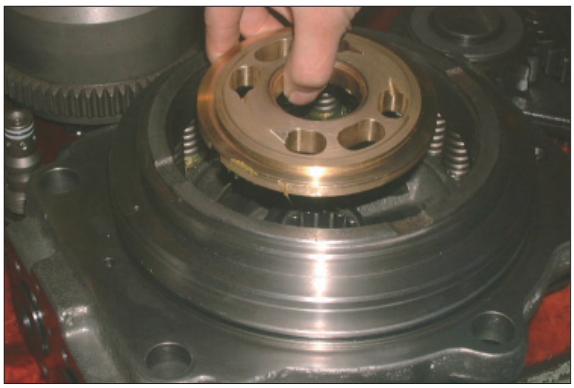
· Socket bolt (401, 402) Tightening torque : 44 kgf · m (318 lbf · ft)

※ Apply grease on valve plate rear surface and pay attention to not dropping valve plate.

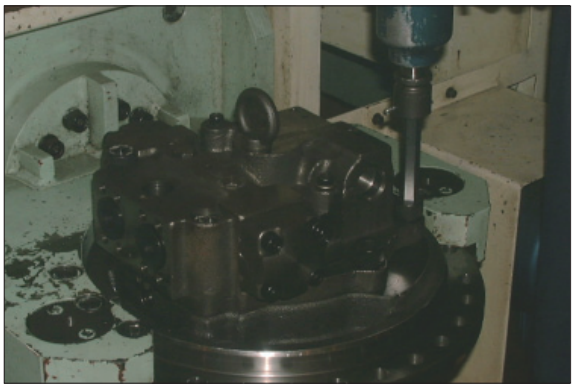
※ Use guide bolt.

※ Apply grease on roller of needle bearing and pay attention to easy to assemble with driving shaft.

※ Use crane in assembling valve casing to shaft casing.



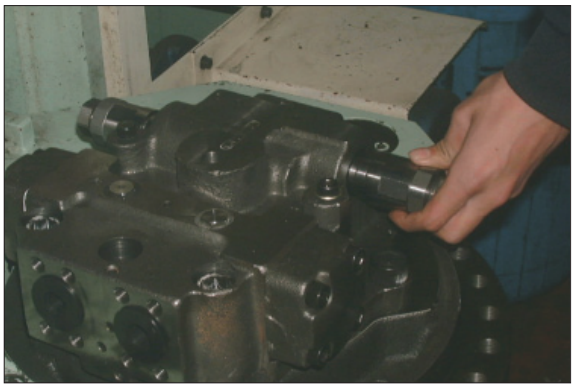
370078TM60



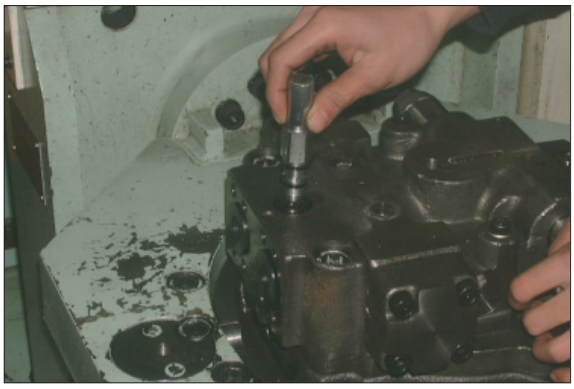
370078TM60A

⑪ Tighten to specified torque plugs, relief valve (350), reducing valve (351), etc. fitted to valve casing sub-assembly.

· Tightening torque :
- Relief valve (350) : 18 kgf · m (130 lbf · ft)
- Reducing valve (351) : 4.5 kgf · m (32.5 lbf · ft)

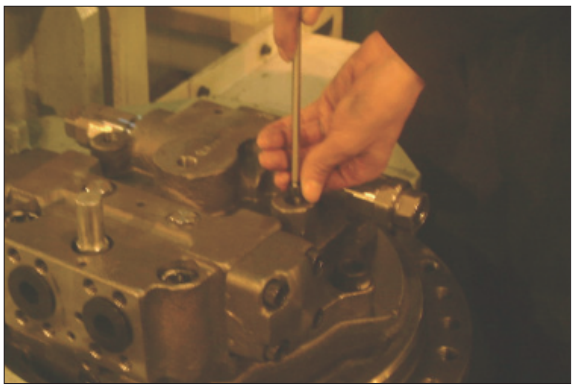


370078TM61



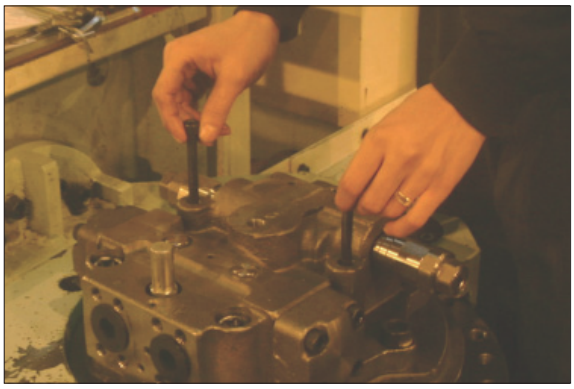
370078TM61A

⑫ Mount cover (352).



370078TM63

⑬ Disassemble two M10×135 bolts on the holes for compelling brake release.
And then assemble plug (564).
· Tightening torque : 2.2 kgf · m (15.9 lbf · ft)



370078TM24

3) ASSEMBLY OF REDUCTION GEAR

(1) Place housing (2) with its front side up, and fit angular bearings (33) with their back faces mated.

※ Fit angular bearings one by one with press or key hammer.

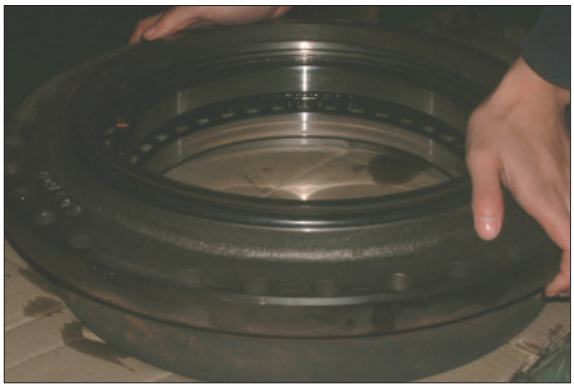
※ When housing is to be reused, remove screw lock of its tapped holes with M16 tap.

370078TM64

(2) Fit O-ring to floating seal (34) without twisting it, and then to housing (2).

※ Apply grease to O-ring thinly.

※ Do not reuse the disassembling O-ring.



370078TM65

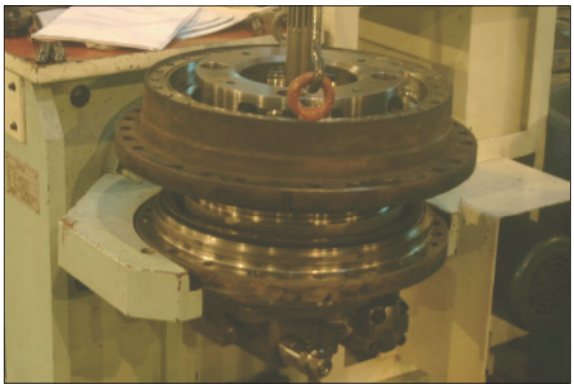
(3) Similarly, fit floating seal to shaft casing (272) of hydraulic motor.

※ Do not reuse the disassembling O-ring.

370078TM66

(4) Lift up housing sub-assembly with its floating seal side down, and put inner diameter of angular bearing on outer diameter of shaft casing.

※ Pay attention to not damaging sliding faces of floating seal.



370078TM67

(5) Assemble shim (35) to nut ring (47).

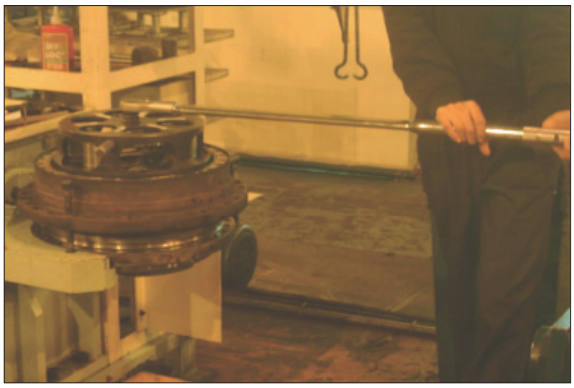
※ Apply grease between shim and nut ring.

370078TM68

(6) Insert nut ring assembled shim to shaft casing, and then tighten it to specified torque, utilizing special tool.

※ After tighten it to maximum torque and then disassemble, and then tighten it to specified torque.

· Tightening torque : 60 kgf · m (434 lbf · ft)



370078TM70

(7) After assemble set screw (54) affixed LOCTITE, and punch at hole to lock it. Pay attention to not be lifted nut ring (47).

※ Screw the set screw, until upper side of set screw is lower than tilting side of nut ring.

· Loctite specifications : Three bond 1373B

· Tightening torque : 1 kgf · m (7.2 lbf · ft)

370078TM71

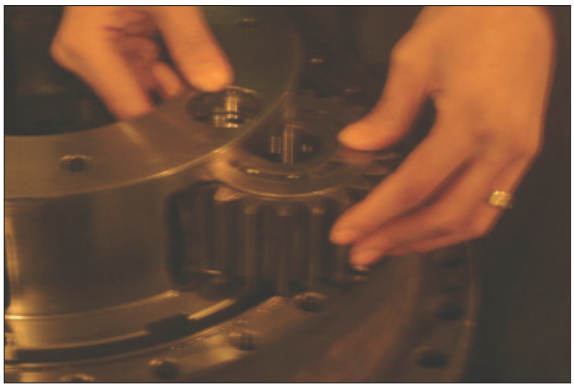
(8) Assemble thrust ring (27) into shaft casing (272).

※ Pay attention to not assembling thrust ring (27) the other way around. (Oil groove is located upside.)

370078TM72

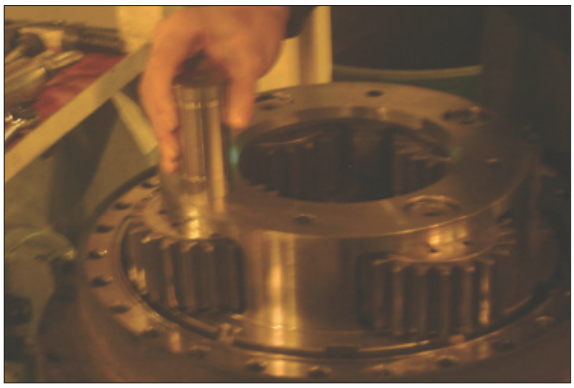
(9) Put needle cage (23) into inside of planetary gears 3 (14), and insert them into shaft casing, holding them between side plates (20).

※ Mate pin hole of shaft casing with center of planetary gear.



370078TM73

(10) Insert pin 3 (17) into shaft casing, and then assemble snap ring (37).



370078TM74

370078TM74A

(11) Assemble O-ring (82) to housing (2), and then assemble ring gear (1).
Pay attention to its meshing planetary gear 3 (14) and ring gear (1), utilizing crane.

※ Applying grease to O-ring thinly.
※ Do not reuse the disassembling O-ring.

370078TM75

(12) Assemble ring gear (1) and housing (29).
(Screw socket bolt (29), and tighten it to specified torque, with torque wrench.)
· Tightening torque : 30 kgf · m (217 lbf · ft)
· Loctite specifications : #636

370078TM76

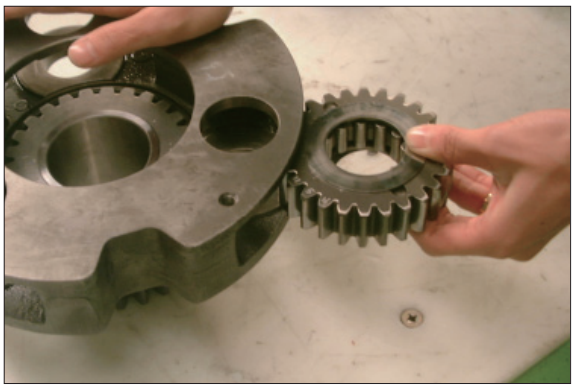
(13) Assembling carrier 2 sub-assembly

① Assemble carrier 2 (6) to sun gear 3 (11), and fit clip (46).

② Place carrier 2 with sun gear 3 up.

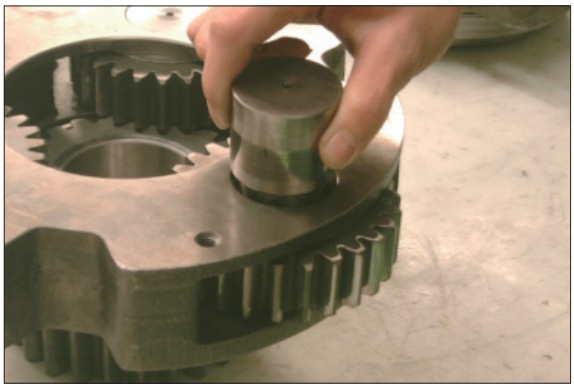
370078TM77

③ Put needle cage (22) into inside of planetary gear 2 (13), and insert them into carrier 2, holding them between side plates (19).



370078TM78

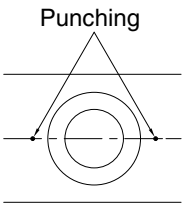
④ Insert pins 2 (16) into carrier 2.

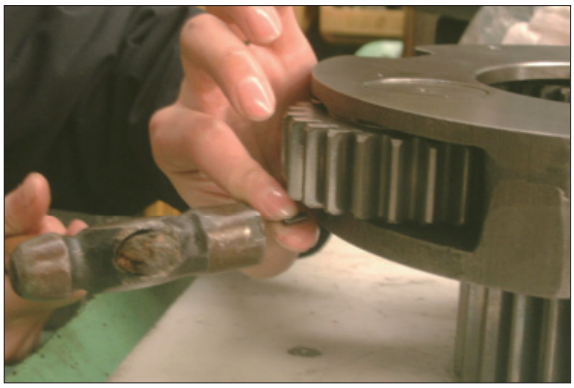


370078TM78A

⑤ Insert spring pin (36) into pin holes of carrier 2 and pin 2, and punch at two points as figure to lock it.

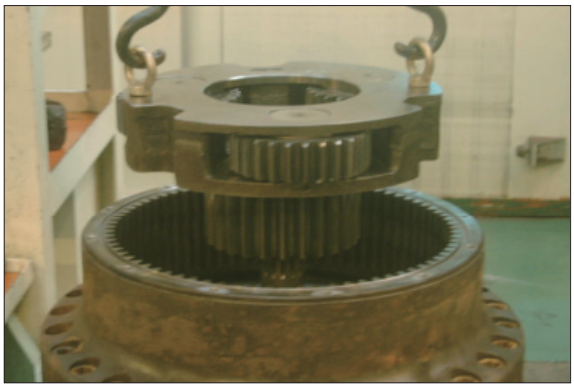
※ Mate pin hole of carrier 2 with center of planetary gear.





370078TM79

(14) Screw two M10 eyebolts into carrier 2 sub-assembly, and assemble it with crane, paying attention to its meshing with planetary gear 2 and ring gear.

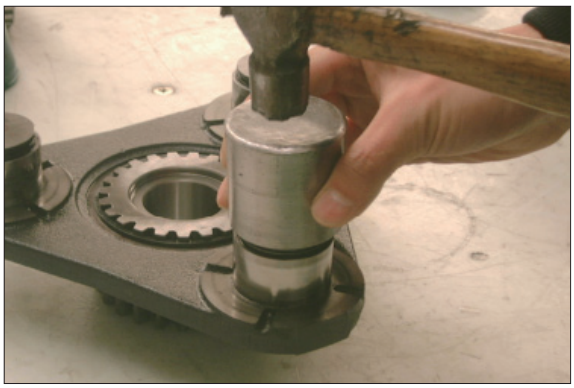


370078TM80

(15) Assembling of carrier 1 sub-assembly

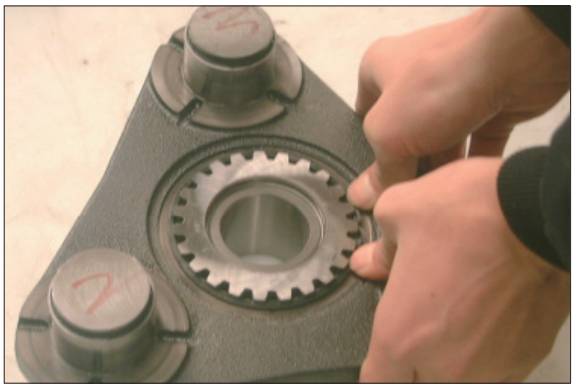
① Interference-fit inner ring (24) to carrier 1 (5).

※ Inner ring is press-fit by the heat to carrier 1 (5).



370078TM81

② Assemble carrier 1 (5) to sun gear 2 (10), and fit clip (45).



370078TM82

③ Assemble thrust ring (26) to sun gear 2 (10).

※ Pay attention to not assembling thrust ring (26) the other way around.
(Oil groove is located upside.)

370078TM83

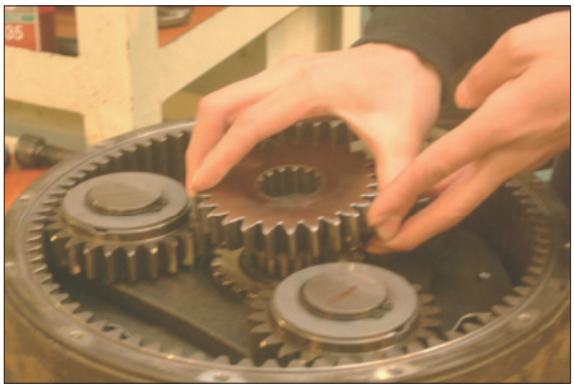
④ Put needle cage (21) into inside of planetary gear 1 (12), and assemble them, holding them between side plates (18). Then fit snap ring (44) on them.

370078TM84

(16) Assemble carrier 1 (5) sub-assembly to ring gear (1).
Paying attention to its meshing with carrier 1 sub-assembly and ring gear (1).

370078TM85

(17) Assemble sun gear 1 (9) to drive shaft (101) paying attention to its meshing with sungear and drive shaft (101).

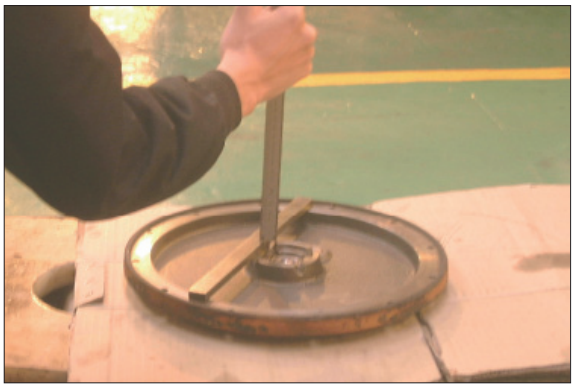


370078TM86

(18) Measure height "A" from sun gear 1 end face to ring gear (1) mating face with straight edge and depth gage.

370078TM87

(19) Measure height "B" from side cover (4) mating face to center hold bottom with straight edge and depth gage.



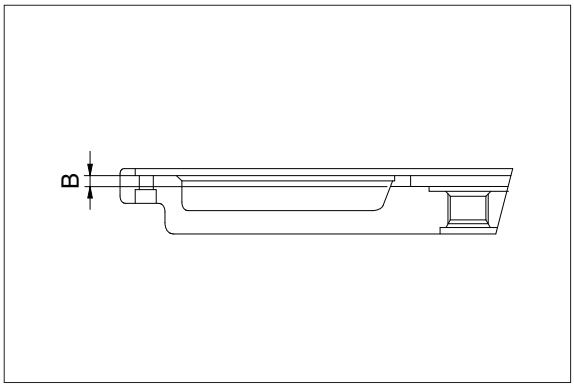
370078TM88

(20) Obtain optimum thickness with the following formula.

1.5~2.0 = (B+A)

- (Thickness of thrust ring + thickness of washer)

※ Keep axial clearance between sun gear and washer 1.5~2.0 mm.



370078TM89

(21) Place washer (53) of above-selected thickness and thrust ring (26) to center of side cover (4).

※ Pay attention to not assembling thrust ring (26) the other way around and punch it (Oil groove is located upside)

370078TM90

(22) Assemble O-ring (81) into ring gear.

And degrease and dry mating faces of side cover & ring gear. Then lift side cover(4) up, and place it on ring gear.

And tighten socket bolt (30) to specified torque to fix side cover.

· Tightening torque : 3.5 kgf · m (25.3 lbf · ft)

370078TM91

(23) Tighten plug (32) to specified torque at side cover (4).
· Tightening torque : 11.0 kgf · m (79.6 lbf · ft)

That is all of the assembling work. After fitting the motor this reduction gear, supply oil until overflows from the level gauge.

370078TM92

4) CHECKING FACTS AFTER ASSEMBLY

(1) Air test of reduction gear

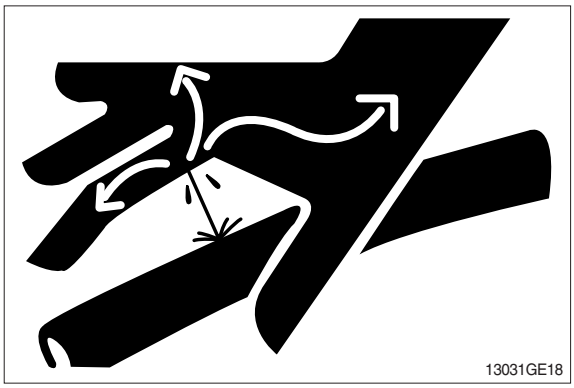
Disassemble plug (32) of reduction gear part.
When compressed air(0.3 kgf/cm^2) is inserted that in water during the 2 minutes, it should be not happened air bubble.
· Gear oil : 5.5 ℓ / 1.5 U.S. gal (SAE 85W-140, API GL-5 or better)

(2) Air test of hydraulic motor

One port should be opened, the others port should be closed.
When compressed air (3 kgf/cm^2) is inserted opened port in water during the 2 minutes, it should be not happened air bubble.
· Working fluid : 1.5 liter (0.33 U.S. gal)

GROUP 7 RCV LEVER

1. REMOVAL AND INSTALL



1) REMOVAL

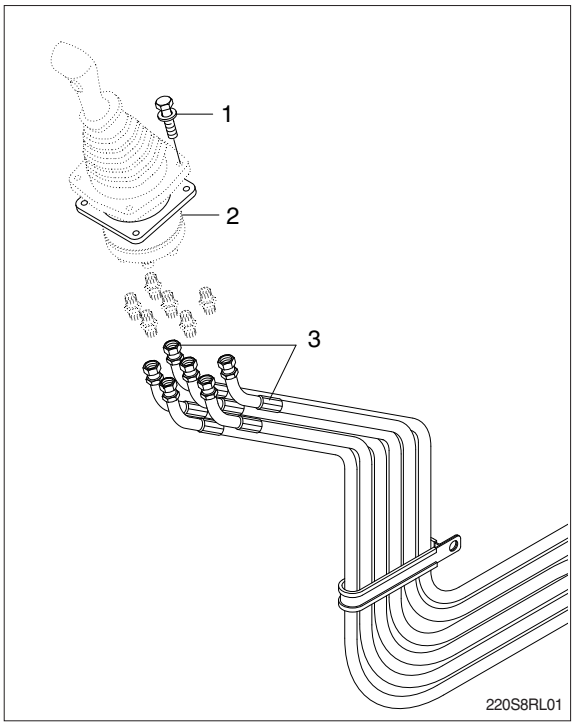
(1) Lower the work equipment to the ground and stop the engine.

(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).
Tightening torque : 1.05 ± 0.2 kgf · m
(7.6 ± 1.45 lbf · ft)



(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.

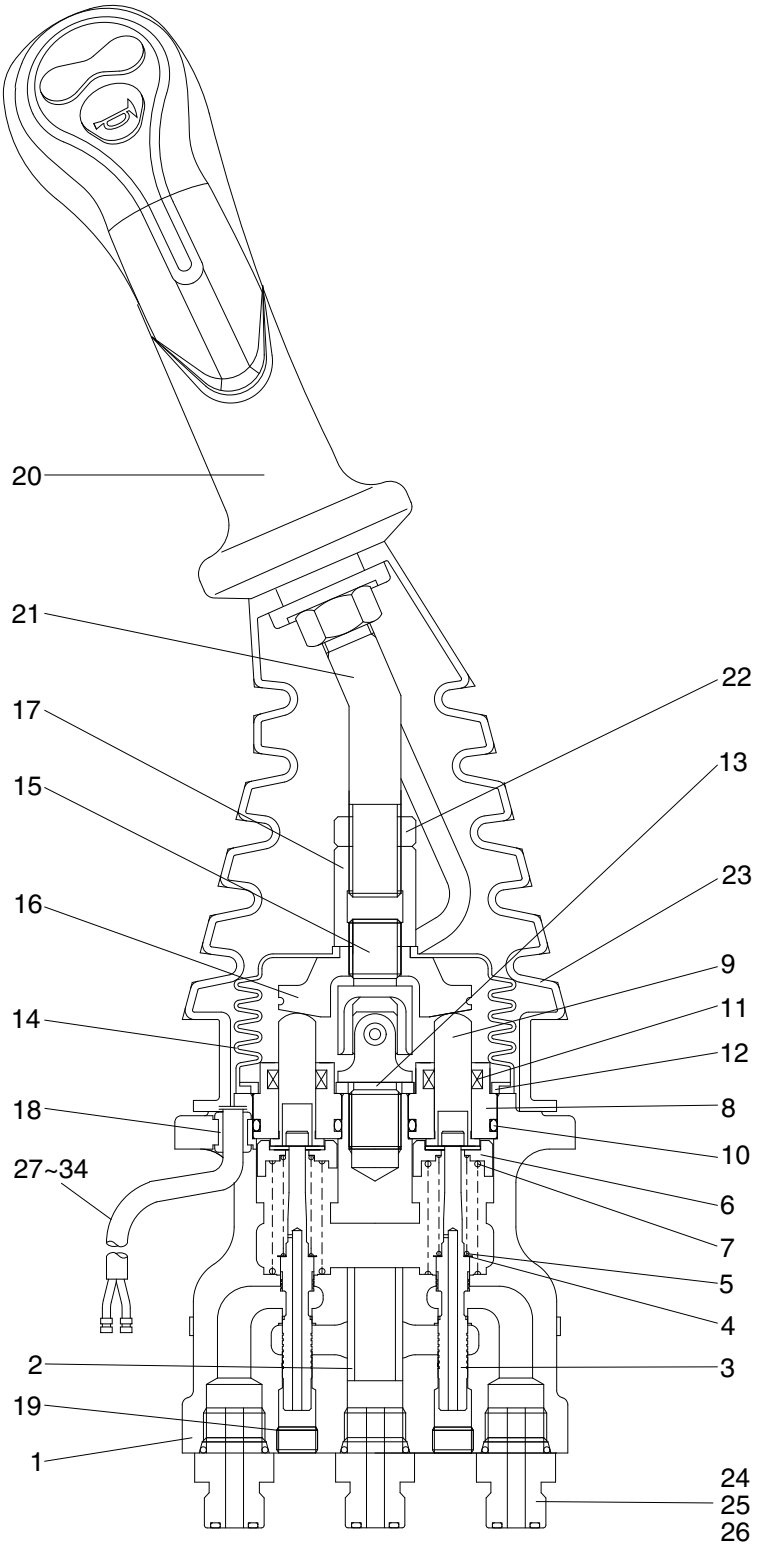
2) INSTALL

(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

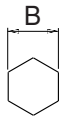


210S2RL06

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

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

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

(2) Tightening torque

Part name	Item	Size	Torque	
			kgf · m	lbf · ft
Joint	15	M14	3.8	27.5
Swash plate	16	M14	7.0±0.40	50.6±2.9
Adjusting nut	17	M14	7.0±0.40	50.6±2.9
Lock nut	22	M14	5.0±0.35	36.2±2.5

3) DISASSEMBLY

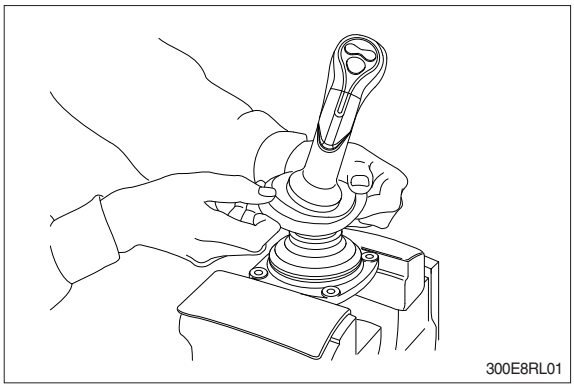
※ Procedures are based on the type M1.

(1) Clean pilot valve with kerosene.

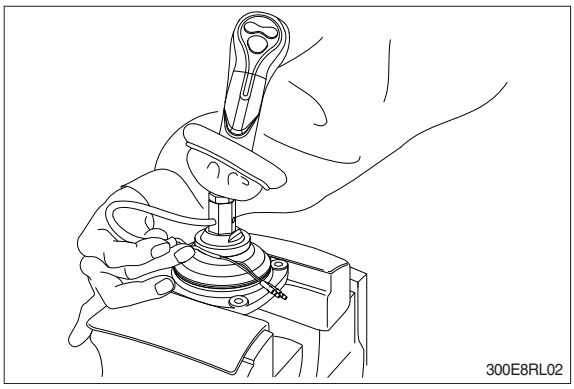
※ Put blind plugs into all ports

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

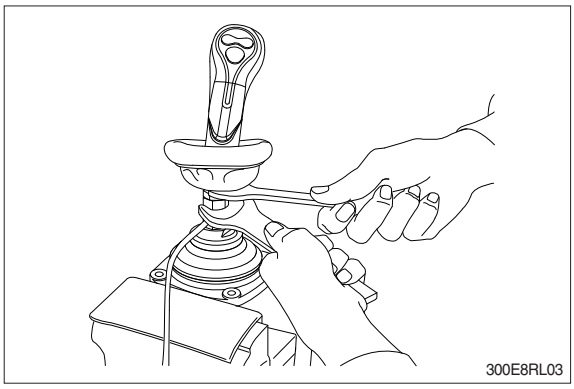
(3) Remove end of boot (23) from case (1) and take it out upwards.



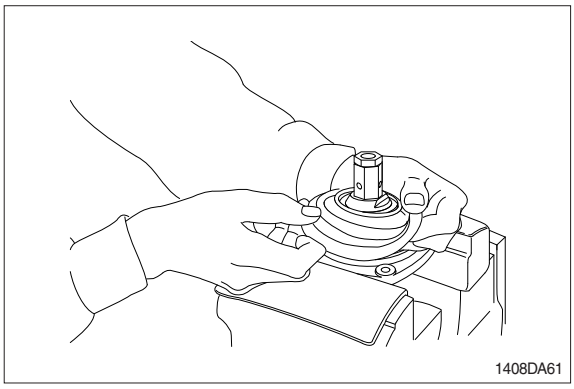
※ For valve with switch, remove cord also through hole of casing.



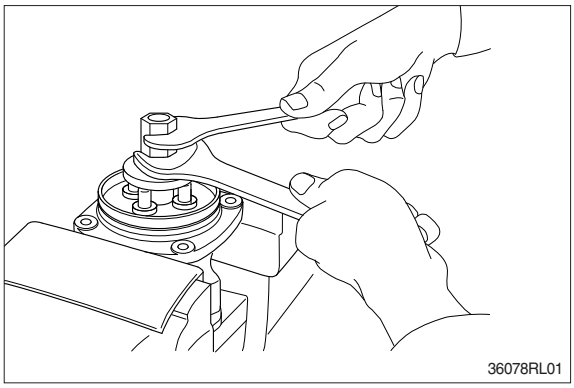
(4) Loosen lock nut (22) and adjusting nut (17) with spanners on them respectively, and take out handle section as one body.

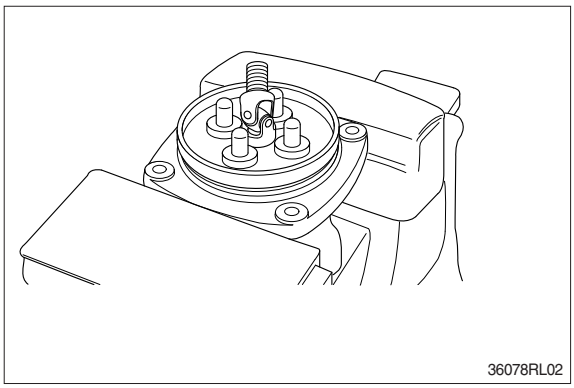


(5) Remove the boot (14).



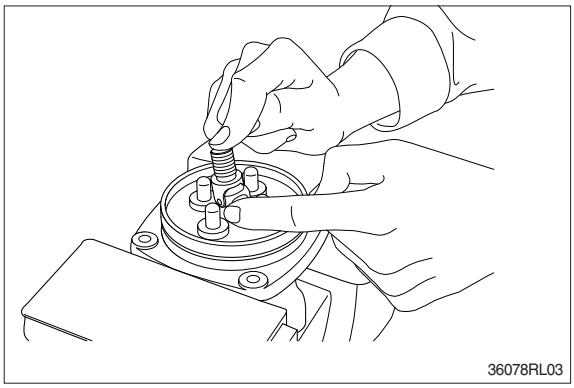
(6) Loosen adjusting nut (17) and swash plate (16) with spanners on them respectively, and remove them.

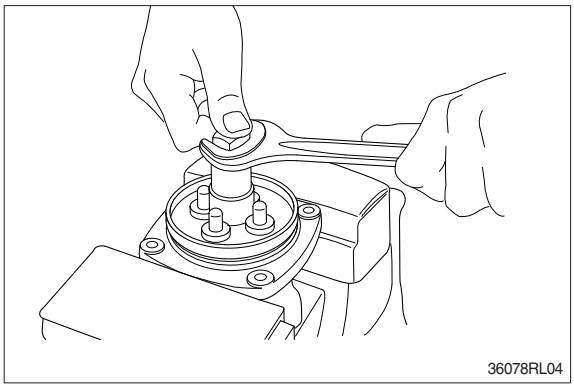




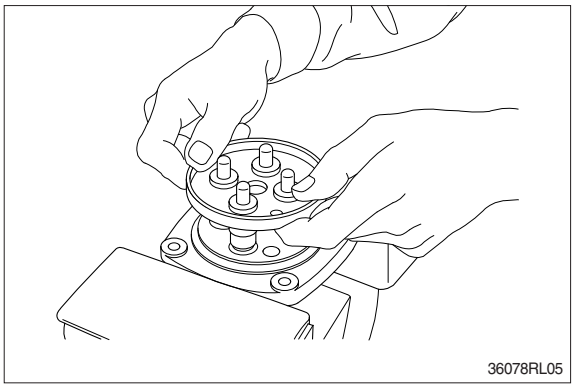
(7) Turn joint anticlockwise to loosen it, utilizing jig (Special tool).

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





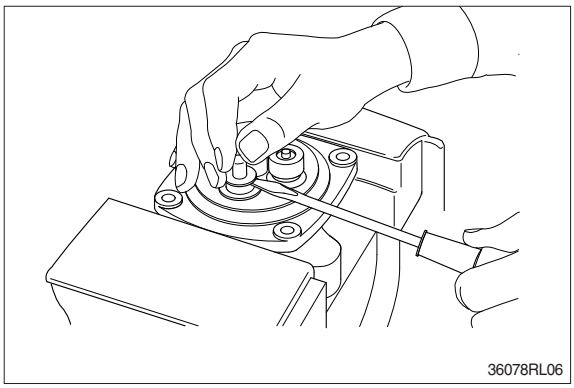
(8) Remove plate (12).



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

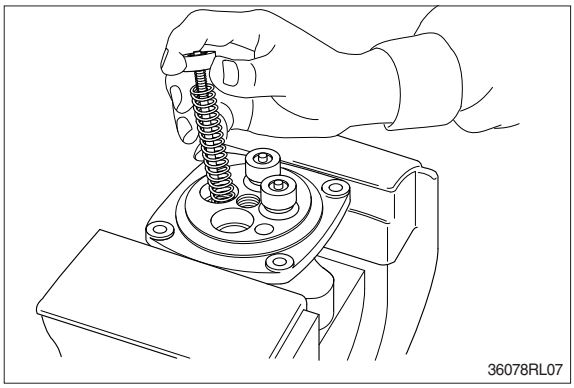
※ Take it out with minus screwdriver.
Take it out, utilizing external periphery groove of plug and paying attention not to damage it by partial loading.

※ During taking out, plug may jump up due to return spring (7) force.
Pay attention to this.



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

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

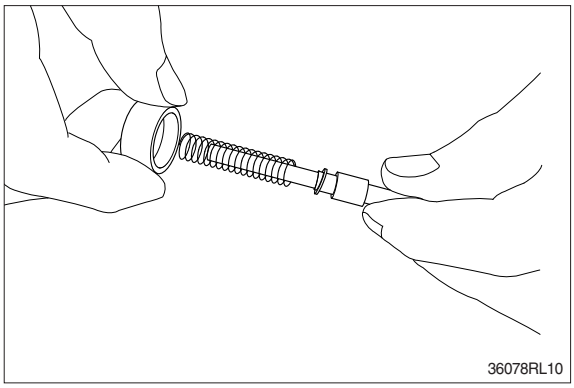


(11) Separate spool (3), spring seat (6), spring (5) and shim (4) individually.

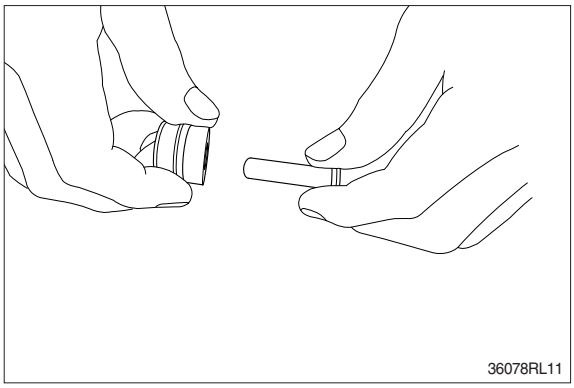
※ Pay attention not to damage spool surface.

※ Record original position of spring seat (6).

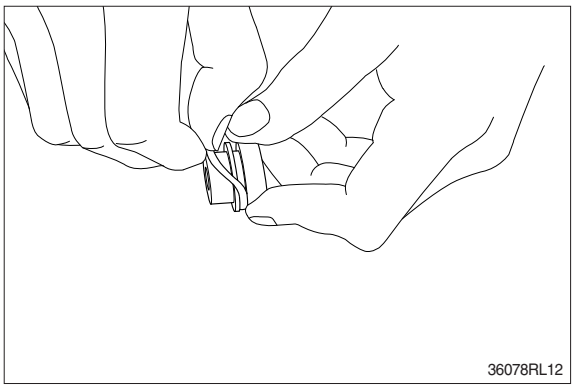
※ Until being assembled, they should be handled as one subassembly group.

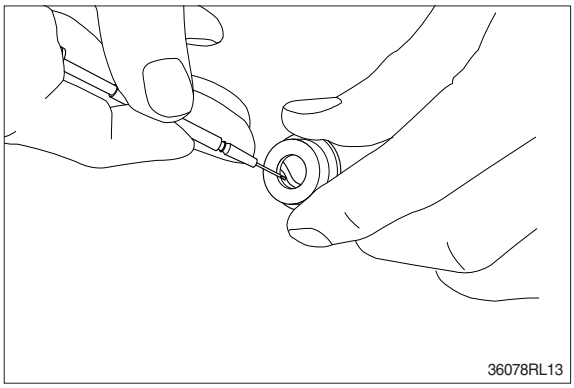


(12) Take push rod (9) out of plug (8).

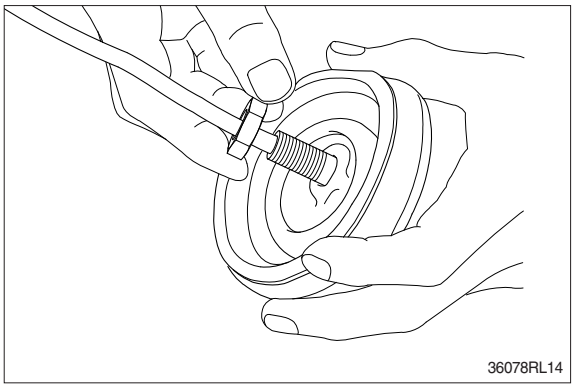


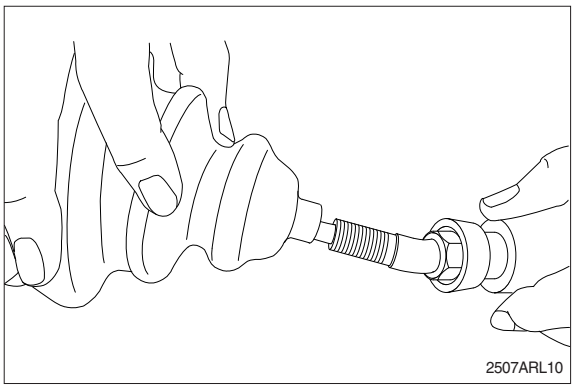
(13) Remove O-ring (10) and seal (11) from plug (8).
Use small minus screwdriver or so on to remove this seal.





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





(15) Cleaning of parts

① Put all parts in rough cleaning vessel filled with kerosene and clean them (rough cleaning).

※ If dirty part is cleaned with kerosene just after putting it in vessel, it may be damaged. Leave it in kerosene for a while to loosen dust and dirty oil.

※ If this kerosene is polluted, parts will be damaged and functions of reassembled valve will be degraded.
Therefore, control cleanliness of kerosene fully.

② Put parts in final cleaning vessel filled with kerosene, turning it slowly to clean them even to their insides (finish cleaning).

※ Do not dry parts with compressed air, since they will be damaged and/or rusted by dust and moisture in air.

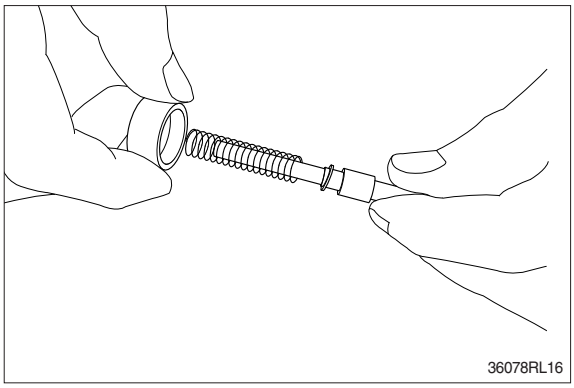
(16) Rust prevention of parts

Apply rust-preventives to all parts.

※ If left as they after being cleaned, they will be rusted and will not display their functions fully after being reassembled.

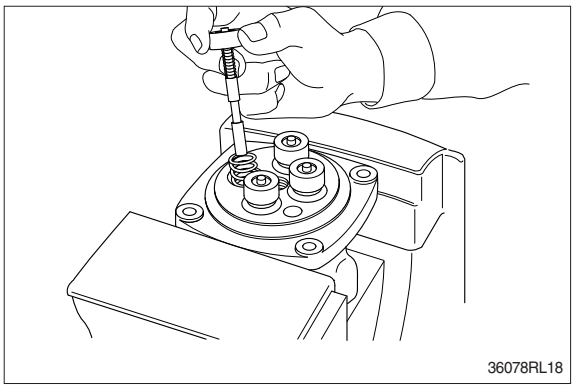
4) ASSEMBLY

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

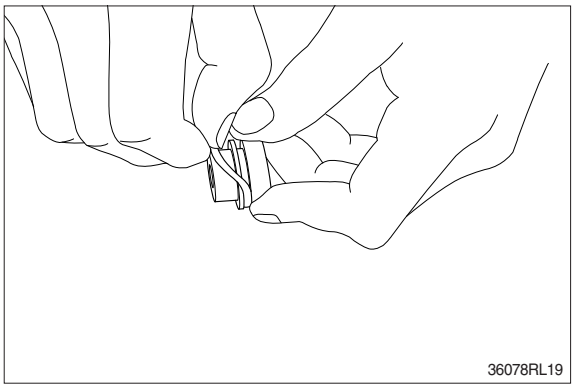


(2) Assemble spring (7) into casing (1). Assemble reducing valve subassembly into casing.

※ Assemble them to their original positions.

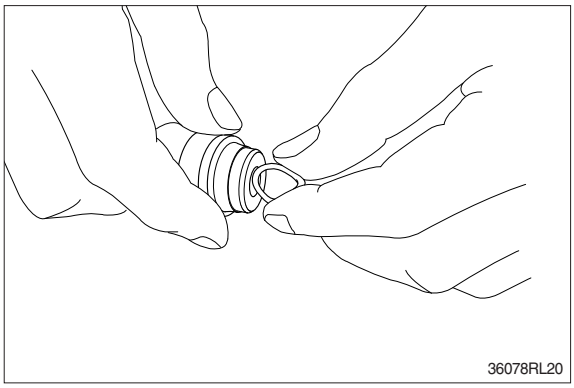


(3) Assemble O-ring (10) onto plug (8).



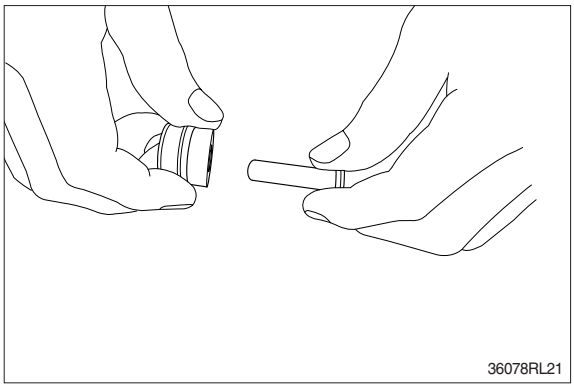
(4) Assemble seal (11) to plug (8).

※ Assemble seal in such lip direction as shown below.



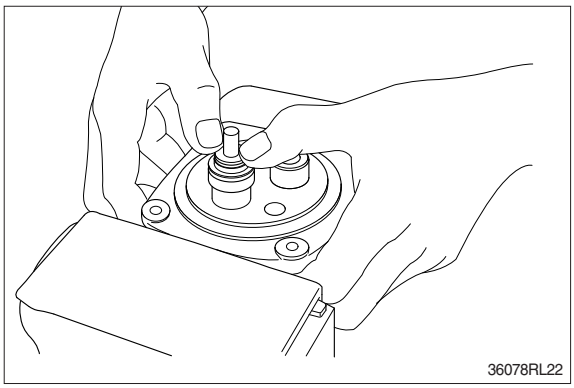
(5) Assemble push rod (9) to plug (8).

※ Apply working oil on push-rod surface.

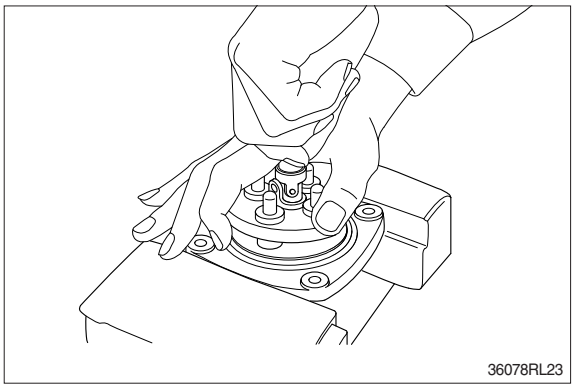


(6) Assemble plug subassembly to casing.

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

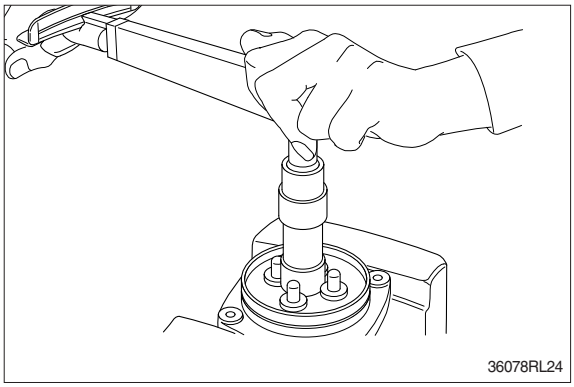


(7) When return spring is strong in force, assemble 4 sets at the same time, utilizing plate (12), and tighten joint (15) temporarily.



(8) Fit plate (12).

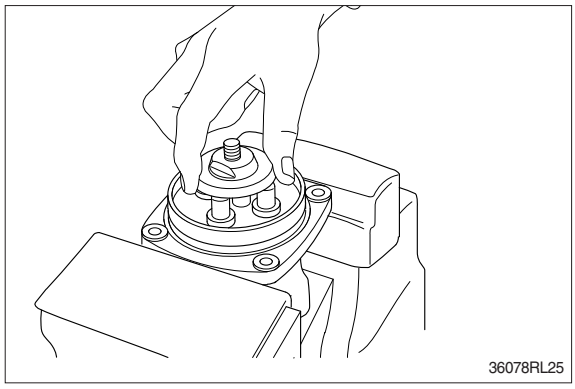
(9) Tighten joint (15) with the specified torque to casing, utilizing jig.



(10) Assemble swash plate (16) to joint (15).

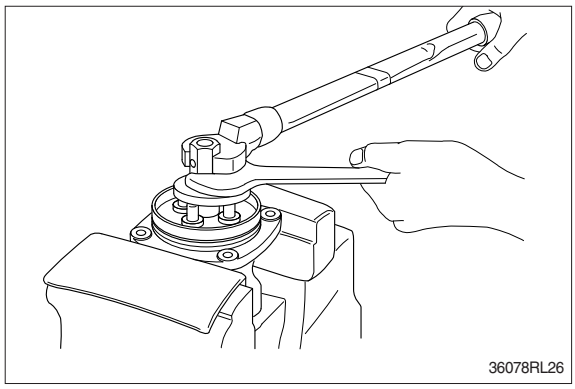
※ Screw it to position that it contacts with 4 push rods evenly.

※ Do not screw it over.

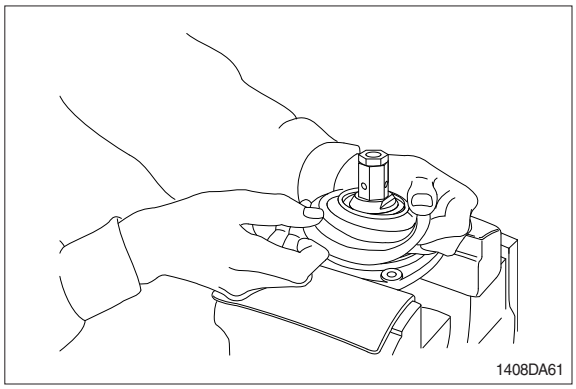


(11) Assemble adjusting nut (17), apply spanner to width across flat of plate (16) to fix it, and tighten adjusting nut to the specified torque.

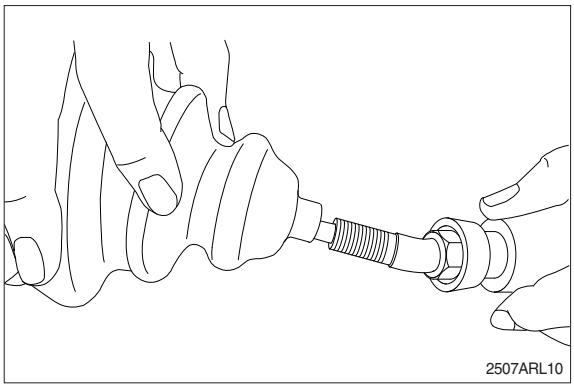
※ During tightening, do not change position of disk.

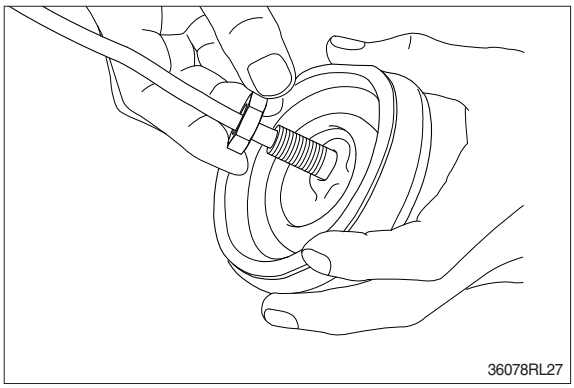


(12) Fit boot (14) to plate.

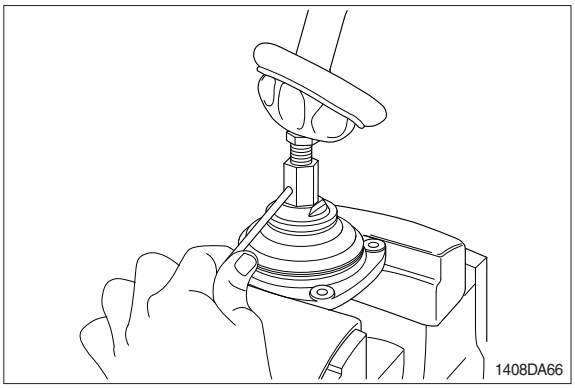


(13) Fit boot (23) and lock nut (22), and handle subassembly is assembled completely.



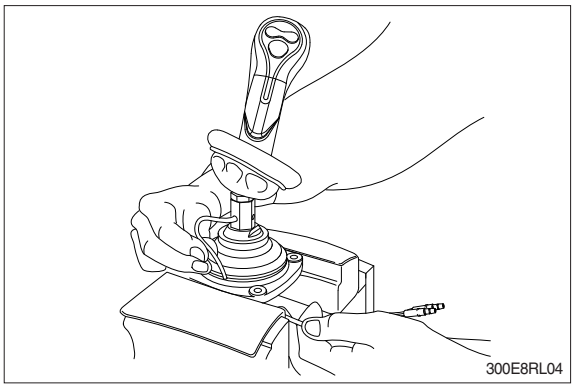


(14) Pull out cord and tube through adjusting nut hole provided in direction 60 ° to 120 ° from casing hole.

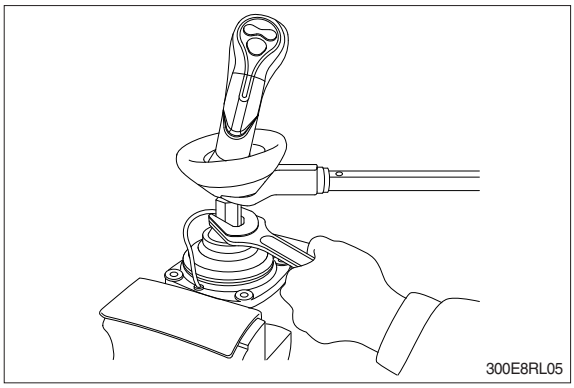


(15) Assemble bushing (18) to plate and pass cord and tube through it.

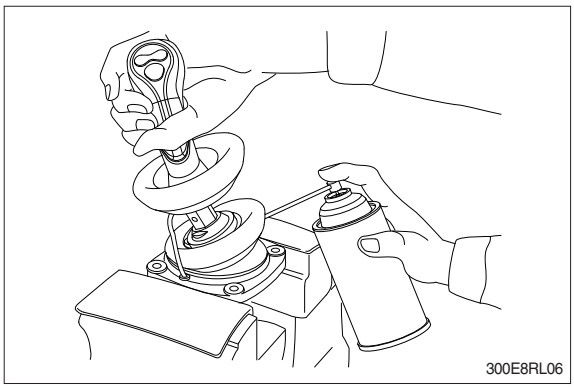
※ Provide margin necessary to operation.



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

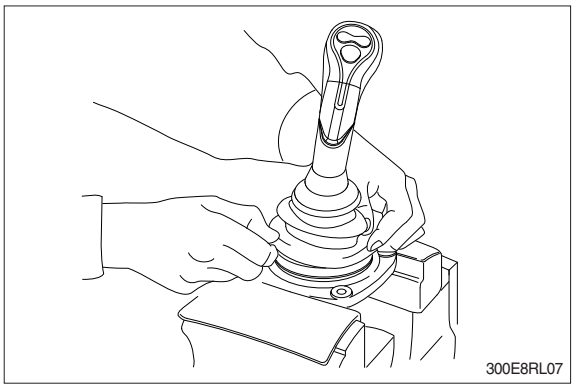


(17) Apply grease to rotating section of joint and contacting faces of disk and push rod.



(18) Assemble lower end of bellows to casing.

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



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.

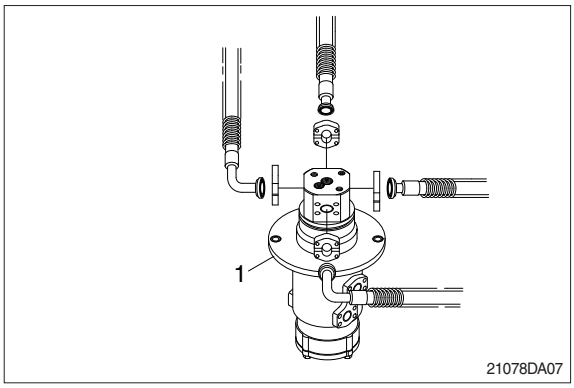
※ When pipes and hoses are disconnected, the oil inside the piping will flow out, so catch it in oil pan.

(4) Disconnect all hoses.

(5) Sling the turning joint assembly (1) and remove the mounting bolt (2).
Weight : 37 kg (82 lb)
Tightening torque : 12.8±3.0 kgf · m
(92.6±21.7 lbf · ft)

(6) Remove the turning joint assembly.

※ When removing the turning joint, check that all the hoses have been disconnected.



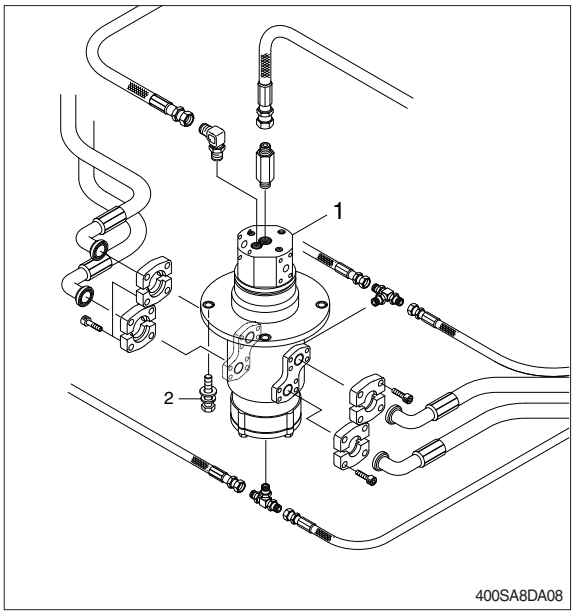
2) INSTALL

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

※ Take care of turning joint direction.

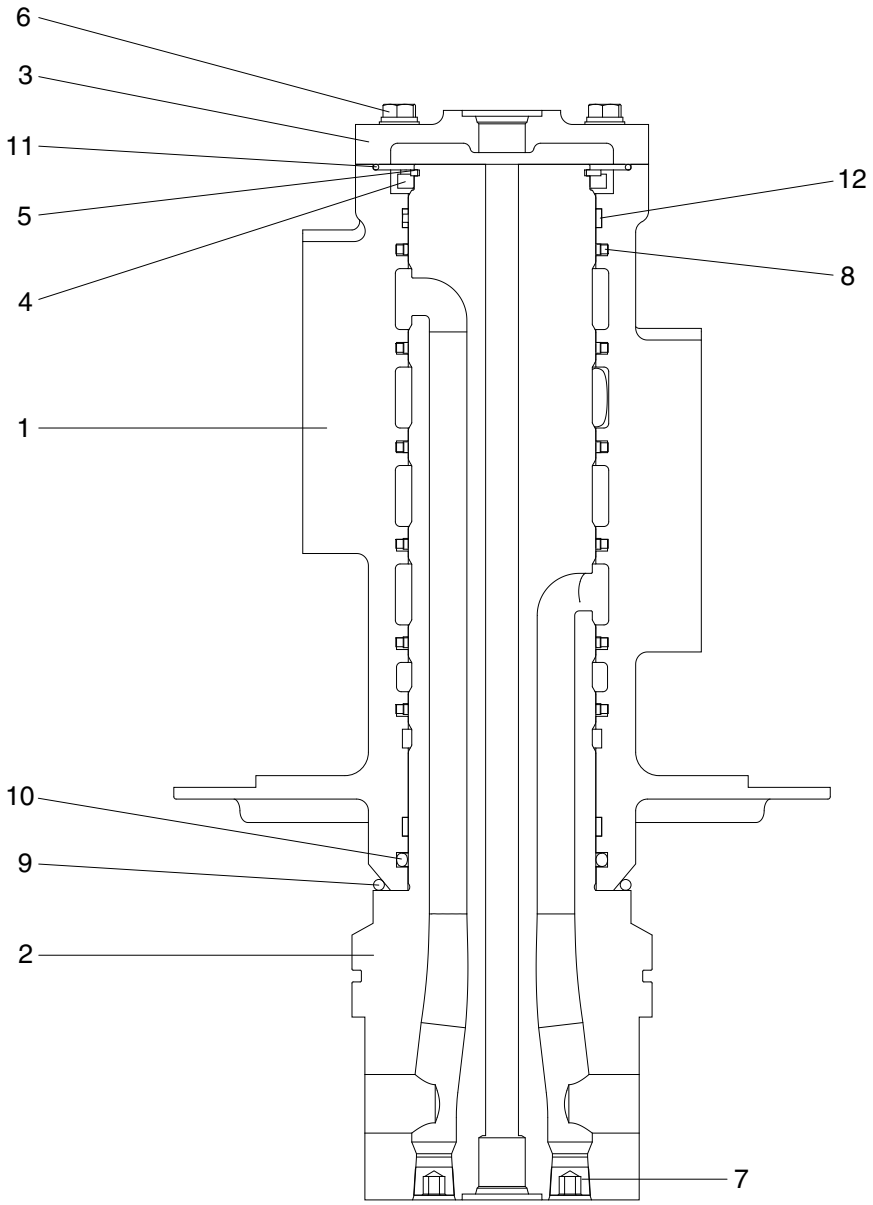
※ Assemble hoses to their original positions.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

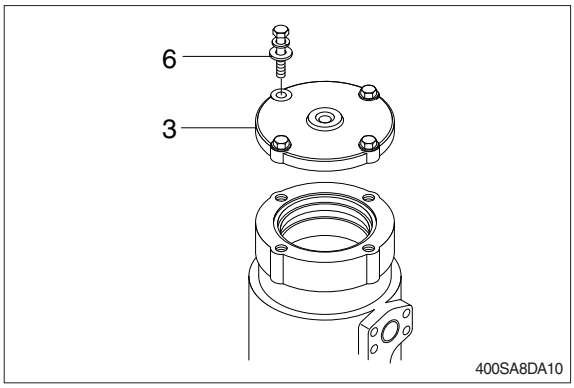


1	Hub	5	Retainer ring	9	O-ring
2	Shaft	6	Bolt with washer	10	O-ring
3	Cover	7	Socket plug	11	O-ring
4	Ring	8	Slipper seal	12	Wear ring

2) DISASSEMBLY

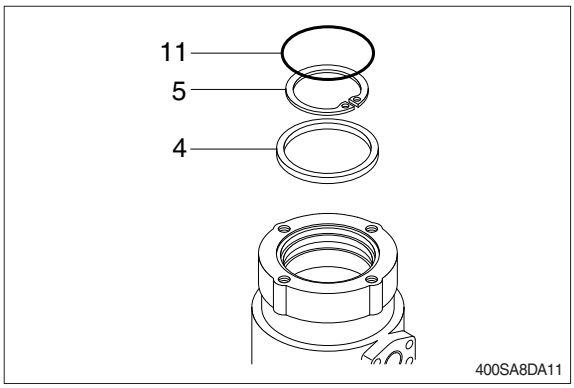
※ Before the disassembly, clean the turning joint.

(1) Remove bolts (6) and cover (3).



(2) Remove O-ring (11).

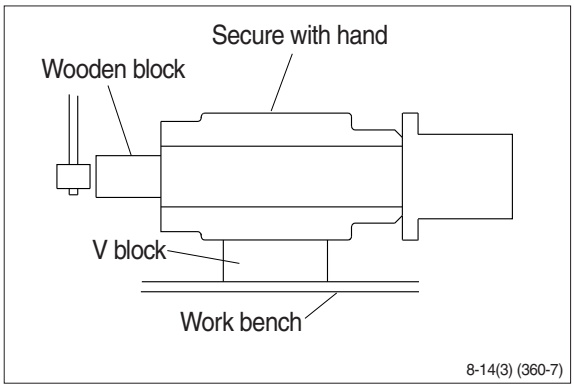
(3) Remove retainer ring (5) and ring (4).



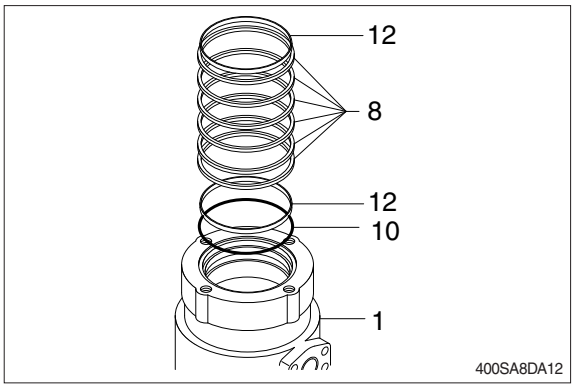
(4) Place hub (1) on a V-block and by using a wood buffer at the shaft end, hit out shaft (2) to about 1/2 from the body with a hammer.

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

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



(5) Remove six slipper seals (8) and O-ring (10), two wear ring (12) from hub (1).

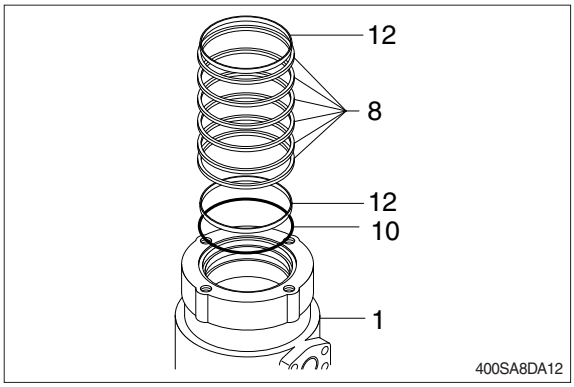


3) ASSEMBLY

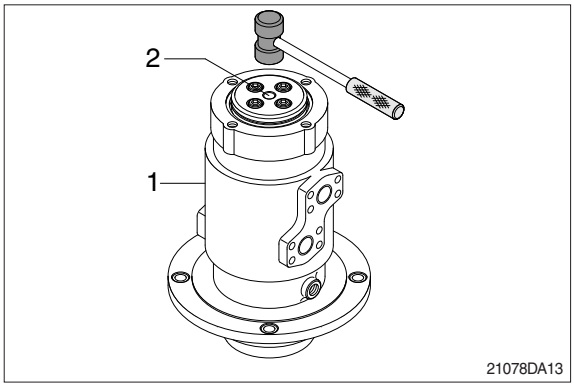
※ Clean all parts.
※ As a general rule, replace oil seals and O-ring.
※ Coat the sliding surfaces of all parts with engine oil or grease before installing.

(1) Fix seven slipper seal (8) and O-ring (10), two wear ring (12) to hub (1).

(2) Fit O-ring (9) to shaft (2).

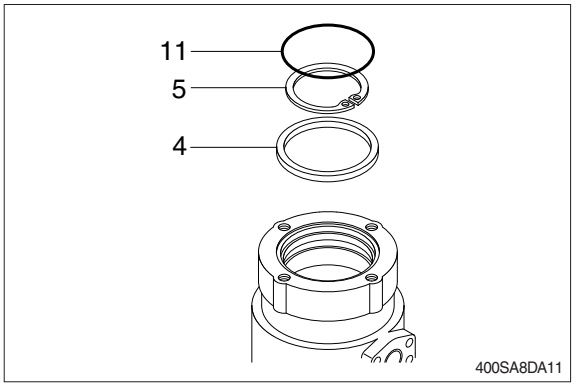


(3) Set shaft (2) on block, tap hub (1) with a plastic hammer to install.

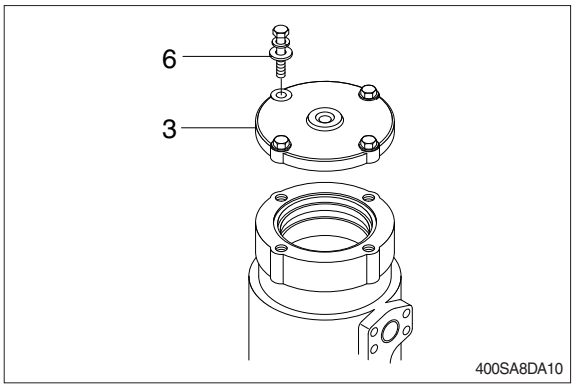


(4) Fit ring (4) and retainer ring (5) to shaft (2).

(5) Fit O-ring (11) to hub (1).



(7) Install cover (3) to body (1) and tighten bolts (6).
Torque : 2.5±0.3 kgf · m
(18.1±2.2 lbf · ft)



1. REMOVAL AND INSTALL

1) BUCKET CYLINDER

(1) Removal

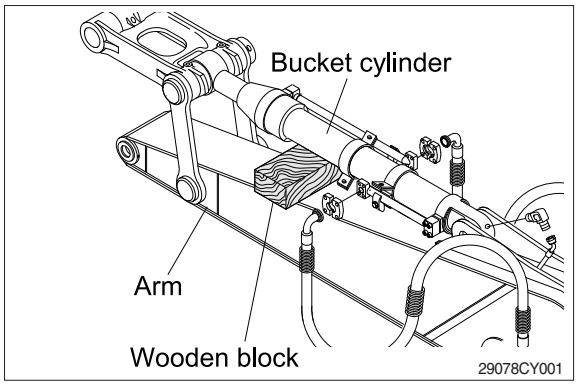
※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

※ 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.

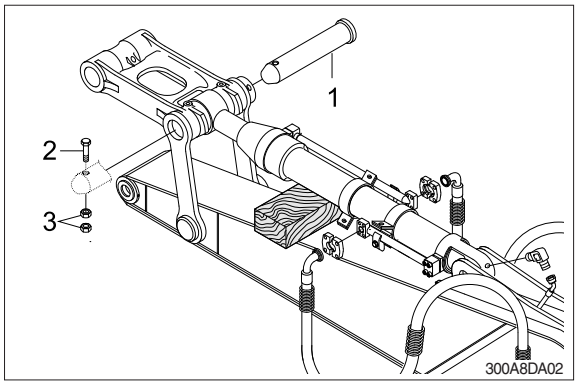
① Set block between bucket cylinder and arm.



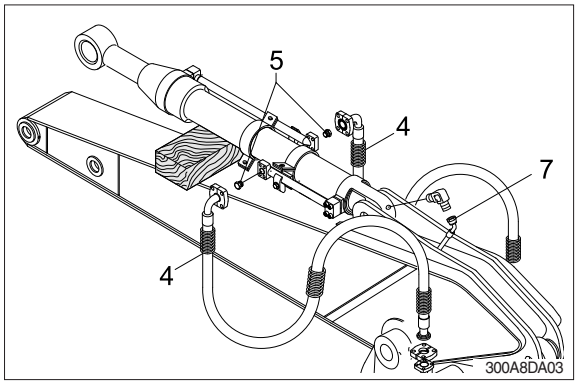
② Remove bolt (2), nut (3) and pull out pin (1).

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

· Tightening torque : 57.9 ± 8.7 kgf·m
(419 ± 62.9 lbf·ft)



③ Disconnect bucket cylinder hoses (4), grease line hose (7) and put plugs (5) on cylinder pipe.

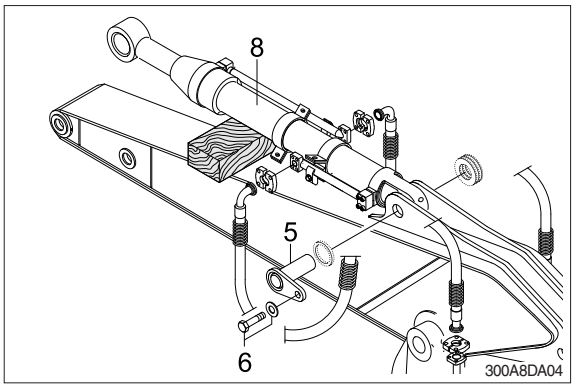


④ Sling bucket cylinder assembly (8) and remove bolt (6) then pull out pin (5).

⑤ Remove bucket cylinder assembly (8).

· Weight : 309 kg (681 lb)

· Tightening torque : 57.9 ± 8.7 kgf·m (419 ± 62.9 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

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

※ 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.

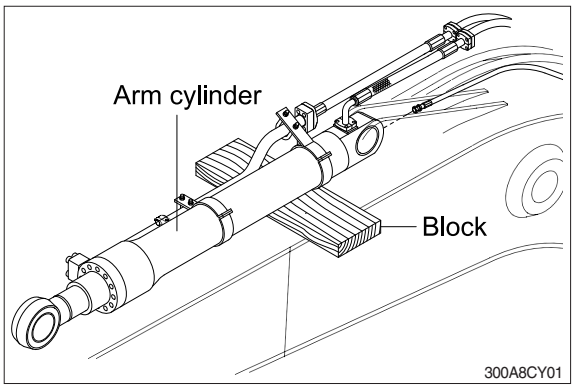
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

⚠ **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.

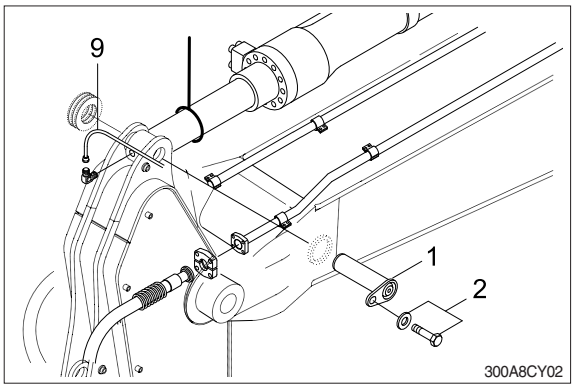


② Disconnect grease line hose (9).

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

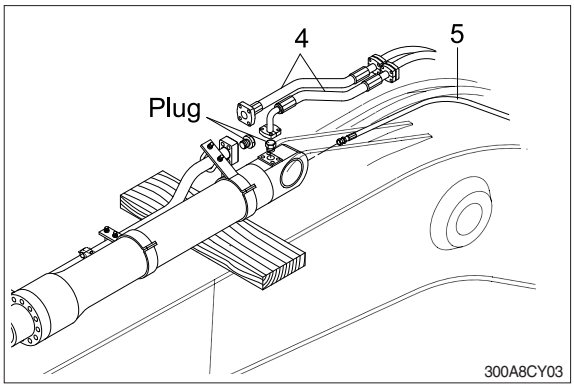
※ Tie the rod with wire to prevent it from coming out.

· Tightening torque : 57.9 ± 8.7 kgf·m (419 ± 62.9 lbf·ft)



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

⑤ Disconnect greasing pipings (5).

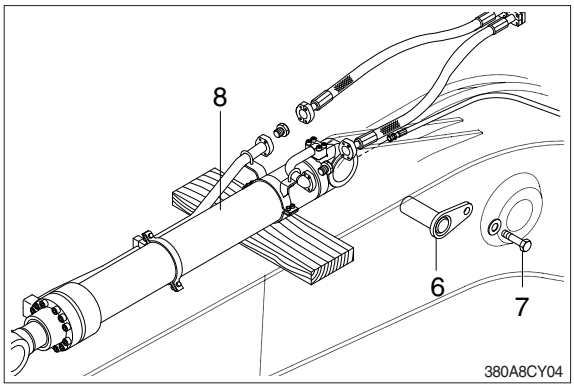


⑥ Sling arm assembly (8) and remove bolt (7) then pull out pin (6).

⑦ Remove arm cylinder assembly (8).

· Weight : 447 kg (985 lb)

· Tightening torque : 57.9 ± 8.7 kgf·m (419 ± 62.9 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

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

※ Bleed the air from the arm cylinder.

※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

3) BOOM CYLINDER

(1) Removal

※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.

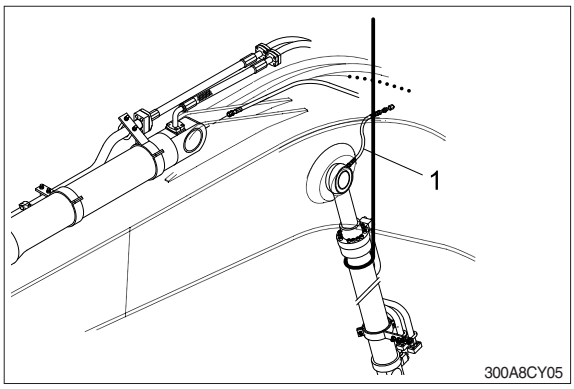
※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

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

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

① Disconnect greasing hoses (1).

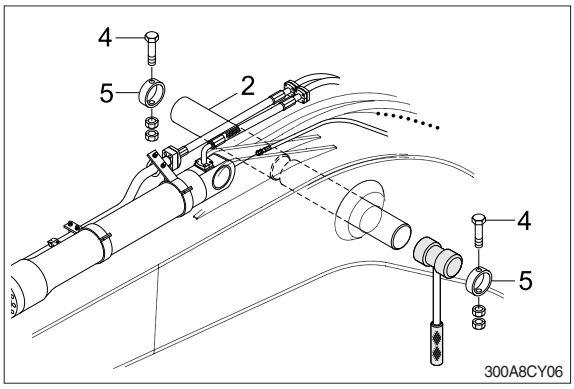
② Sling boom cylinder assembly.



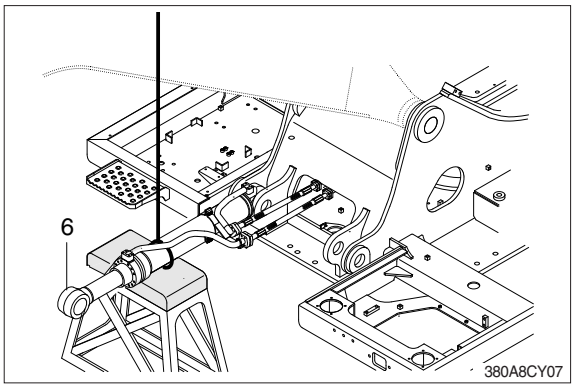
③ Remove bolt (4), pin stopper (5) and pull out pin (2).

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

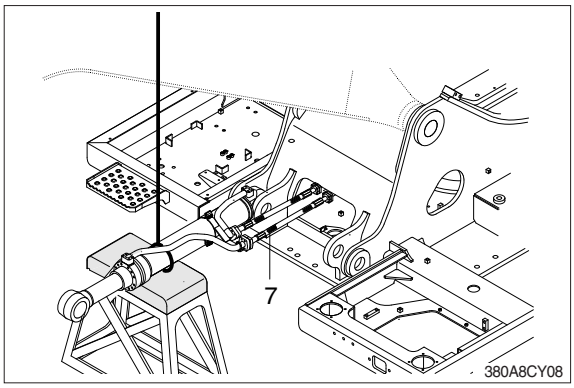
· Tightening torque : 100 ± 15 kgf·m (723 ± 108 lbf·ft)



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



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

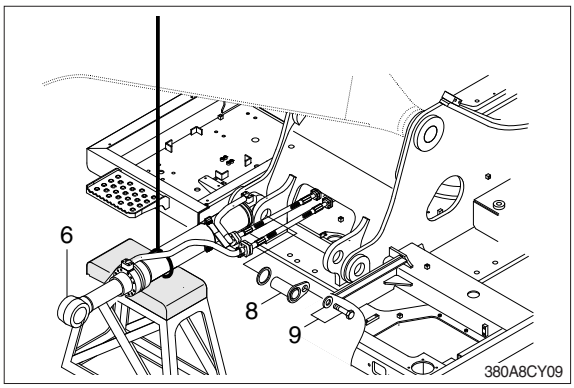


⑥ Remove bolt (9) and pull out pin (8).

⑦ Remove boom cylinder assembly (6).

· Weight : 397 kg (787 lb)

· Tightening torque : 57.9 ± 8.7 kgf·m (419 ± 62.9 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

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

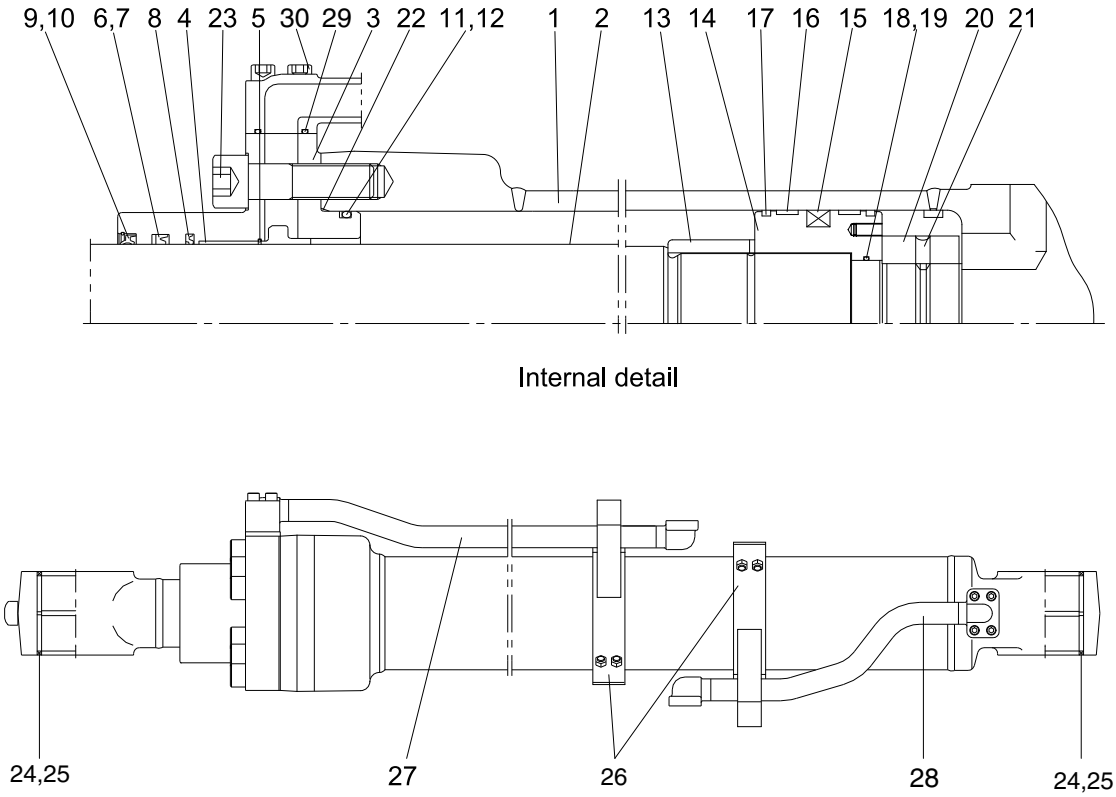
※ Bleed the air from the boom cylinder.

※ Conformed the hydraulic oil level and check the hydraulic oil leak or not.

2. DISASSEMBLY AND ASSEMBLY

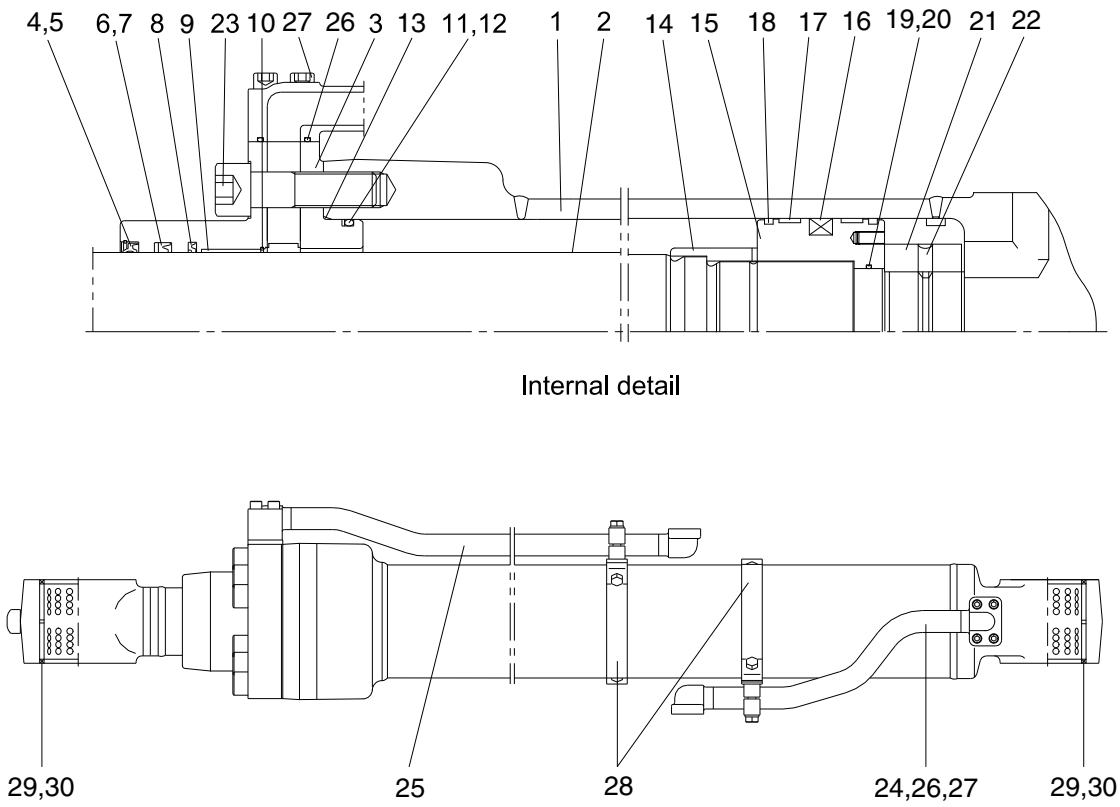
1) STRUCTURE

(1) Bucket cylinder (CHANGZHOU)



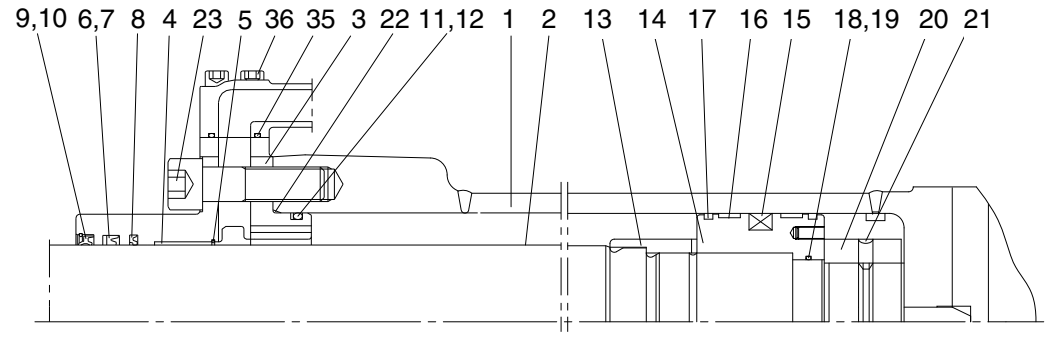
1	Tube assembly	11	O-ring	21	Set screw
2	Rod assembly	12	Back up ring	22	O-ring
3	Gland	13	Cushion ring	23	Hexagon socket head bolt
4	DD2 bushing	14	Piston	24	Dimple bushing
5	Snap ring	15	Piston seal	25	Dust seal
6	Rod seal	16	Wear ring	26	Band assembly
7	Back up ring	17	Dust ring	27	Pipe assembly-R
8	Buffer ring	18	O-ring	28	Pipe assembly-B
9	Dust wiper	19	Back up ring	29	O-ring
10	Snap ring	20	Lock nut	30	Hexagon socket head bolt

Bucket cylinder (SHPAC)

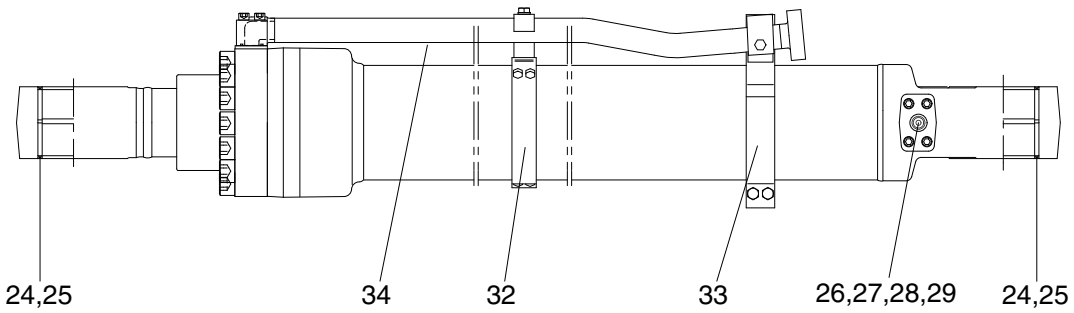


1	Tube assembly	11	O-ring	21	Lock nut
2	Rod assembly	12	Back up ring	22	Hexagon socket set screw
3	Gland	13	O-ring	23	Hexagon socket head bolt
4	Dust wiper	14	Cushion ring	24	Pipe assembly-B
5	Retaining ring	15	Piston	25	Pipe assembly-R
6	Rod seal	16	Piston seal	26	O-ring
7	Back up ring	17	Wear ring	27	Hexagon socket head bolt
8	Buffer ring	18	Dust ring	28	Band assembly
9	Dry bearing	19	O-ring	29	Dimple bushing
10	Retaining ring	20	Back up ring	30	Dust seal

(2) Arm cylinder (CHANGZHOU)



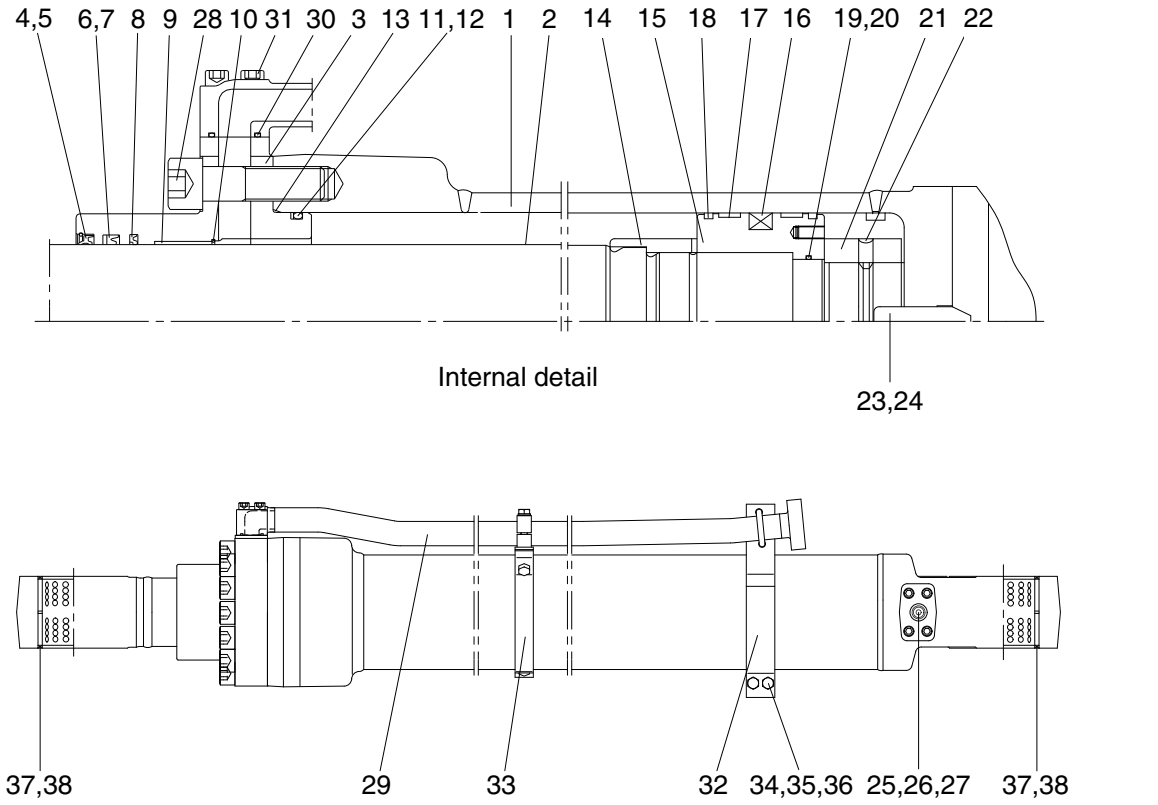
Internal detail



3BQA-50130CGG

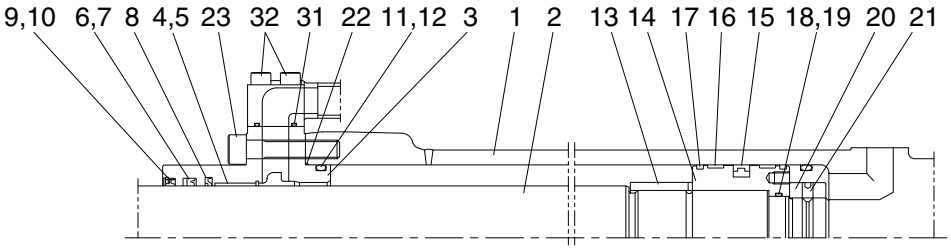
1	Tube assembly	13	Cushion ring	25	Dust seal
2	Rod assembly	14	Piston	26	Check valve
3	Gland	15	Piston seal	27	Coil spring
4	DU bushing	16	Wear ring	28	O-ring
5	Snap ring	17	Dust ring	29	Plug
6	Rod seal	18	O-ring	32	Band assembly (R)
7	Back up ring	19	Back up ring	33	Band assembly (B)
8	Buffer ring	20	Lock nut	34	Pipe assembly (R)
9	Dust wiper	21	Set screw	35	O-ring
10	Snap ring	22	O-ring	36	Hexagon socket head bolt
11	O-ring	23	Hexagon socket head bolt		
12	Back up ring	24	Dimple bushing		

Arm cylinder (SHPAC)

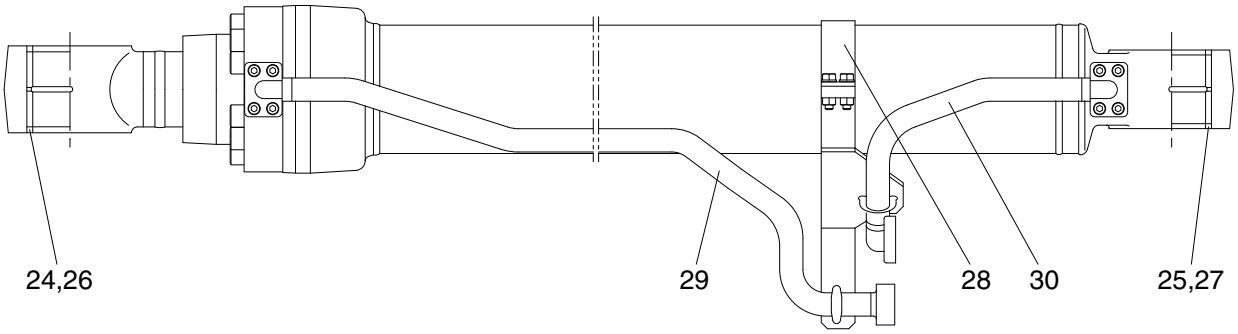


1	Tube assembly	14	Cushion ring	27	Hexagon plug
2	Rod assembly	15	Piston	28	Hexagon socket head bolt
3	Gland	16	Piston seal	29	Pipe assembly-R
4	Dust wiper	17	Wear ring	30	O-ring
5	Retaining ring	18	Dust ring	31	Hexagon socket head bolt
6	Rod seal	19	O-ring	32	Band assembly-B
7	Back up ring	20	Back up ring	33	Band assembly-R
8	Buffer ring	21	Lock nut	34	U-bolt
9	Dry bearing	22	Hexagon socket set screw	35	Hexagon nut
10	Retaining ring	23	Cushion plunger	36	Spring washer
11	O-ring	24	Stop ring	37	Dimple bushing
12	Back up ring	25	Check valve	38	Dust seal
13	O-ring	26	Coil spring		

(3) Boom cylinder (CHANGZHOU)



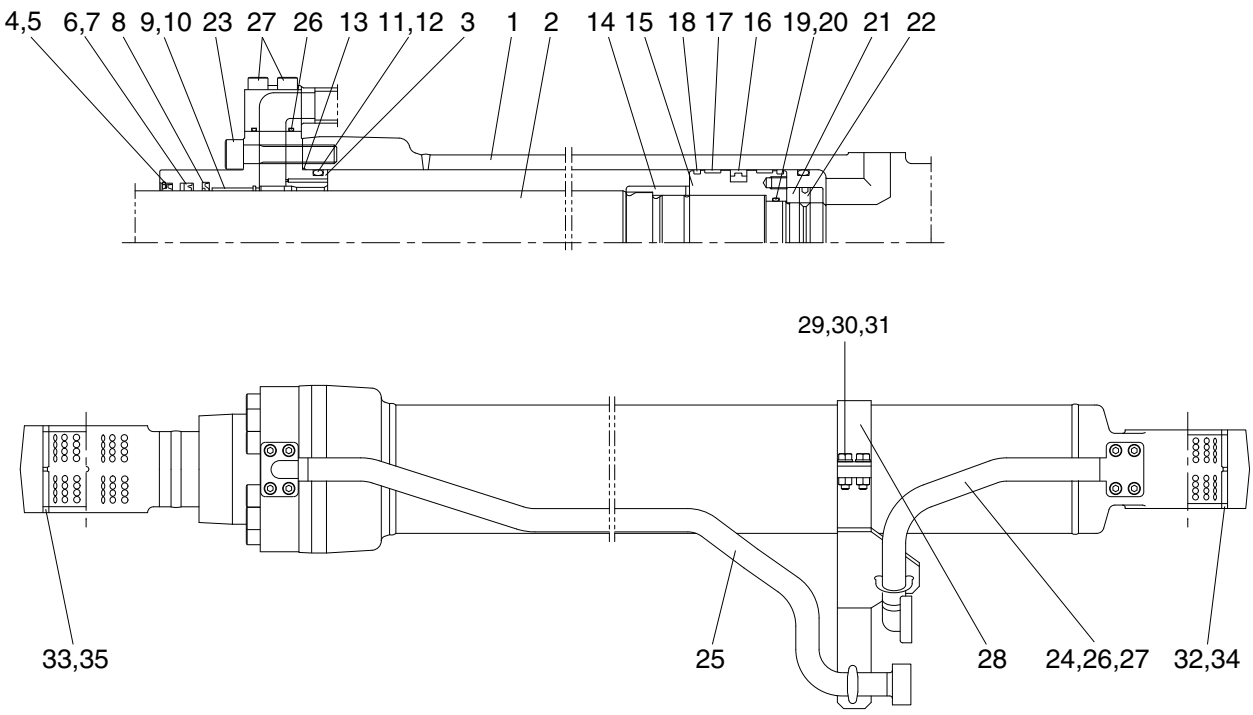
Internal detail



HCQA-50110GG

1	Tube assembly	12	Back up ring	23	Hexagon socket head bolt
2	Rod assembly	13	Cushion ring	24	Pin bushing
3	Gland	14	Piston	25	Pin bushing
4	DU bushing	15	Piston seal	26	Dust seal
5	Snap ring	16	Wear ring	27	Dust seal
6	Rod seal	17	Dust ring	28	Band assembly
7	Back up ring	18	O-ring	29	Pipe assembly (R)
8	Buffer ring	19	Back up ring	30	Pipe assembly (B)
9	Dust wiper	20	Lock nut	31	O-ring
10	Snap ring	21	Set screw	32	Hexagon socket head bolt
11	O-ring	22	O-ring		

Boom cylinder (SHPAC)

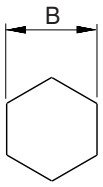


3BQA-50110GG

1	Tube assembly	13	O-ring	25	Pipe assembly-R
2	Rod assembly	14	Cushion ring	26	O-ring
3	Gland	15	Piston	27	Hexagon socket head bolt
4	Dust wiper	16	Piston seal	28	Band assembly
5	Retaining ring	17	Wear ring	29	U-bolt
6	Rod seal	18	Dust ring	30	Hexagon nut
7	Back up ring	19	O-ring	31	Spring washer
8	Buffer ring	20	Back up ring	32	Dimple bushing
9	Dry bearing	22	Lock nut	33	Dimple bushing
10	Retaining ring	22	Hexagon socket set screw	34	Dust seal
11	O-ring	23	Hexagon socket head bolt	35	Dust seal
12	Back up ring	24	Pipe assembly-B		

2) TOOLS AND TIGHTENING TORQUE

(1) Tools

Tools		Remark
Allen wrench	6	
	8	
	10	
	12	
	14	
	17	
Spanner	7	
	8	
(-) 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
Socket head bolt	Bucket cylinder	23★1★3 23★1★4	M20 M20	46.0±5.0 52.2±5.2	333±36.2 378±37.6
		30★3 27★4	M12 M12	9.4±1.0 11.3±1.1	68.0±7.2 81.7±8.0
	Boom cylinder	23★1★3 23★1★4	M22 M22	63.0±6.0 69.4±6.9	456±45.6 502±49.9
		32★3 27★4	M12 M12	9.4±1.0 11.3±1.1	68.0±7.2 81.7±8.0
	Arm cylinder	23★1★3 28★1★4	M22 M22	63.0±6.0 69.4±6.9	456±43.4 502±49.9
		36★3 31★4	M12 M12	9.4±1.0 11.3±1.1	68.0±7.2 81.7±8.0

★1 : Apply loctite #243 on the thread of bolt.
★3 : CHANGZHOU
★4 : SHPAC

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Lock nut	Bucket cylinder	20★3 21★4	- M82	100±10.0 100±10.0	723±72.3 723±72.3
	Boom cylinder	20★3 21★4	- M80	150±15.0 150±15.0	1085±108 1085±108
	Arm cylinder	20★3 21★4	- M90	200±20.0 150±15.0	1447±145 1085±108
Piston	Bucket cylinder	14★3 15★4	- M95	150±15.0 150±15.0	1085±108 1085±108
	Boom cylinder	14★3 15★4	- M100	200±20.0 200±20.0	1447±145 1447±145
	Arm cylinder	14★3 15★4	- M110	200±20.0 200±20.0	1447±145 1447±145
Set screw	Bucket cylinder	21★3 22★4	M10 M10	5.4±0.5 2.5±0.3	39.1±3.6 18.1±2.2
	Boom cylinder	21★3 22★4	M10 M10	5.4±0.5 2.5±0.3	39.1±3.6 18.1±2.2
	Arm cylinder	21★3 22★4	M10 M10	5.4±0.5 2.5±0.3	39.1±3.6 18.1±2.2

★1 : Apply loctite #243 on the thread of bolt.

★3 : CHANGZHOU

★4 : SHPAC

3) DISASSEMBLY

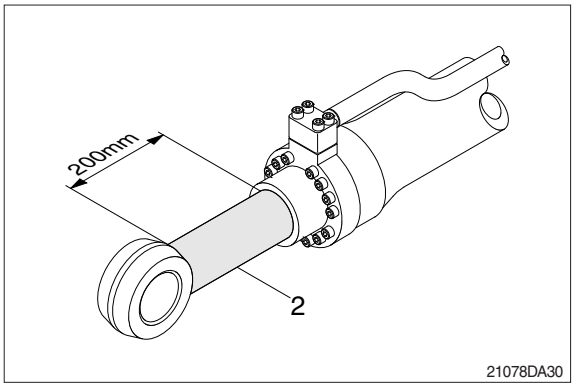
(1) Remove cylinder head and piston rod

※ Procedures are based on the bucket cylinder (CHANGZHOU type).

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

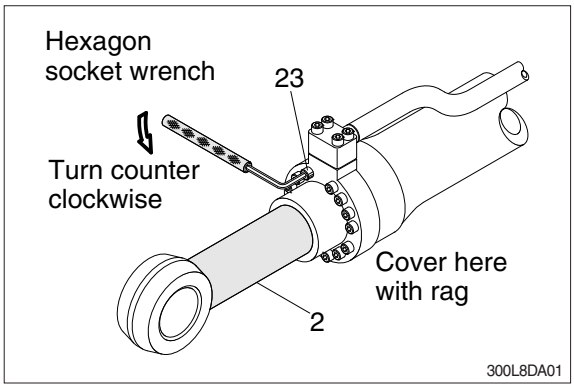
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

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



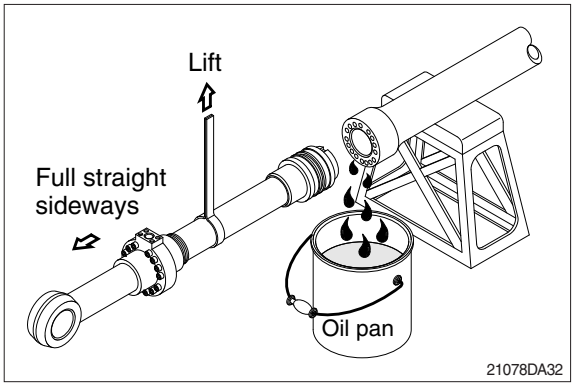
③ Loosen and remove socket bolts (23) of the gland in sequence.

※ 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).

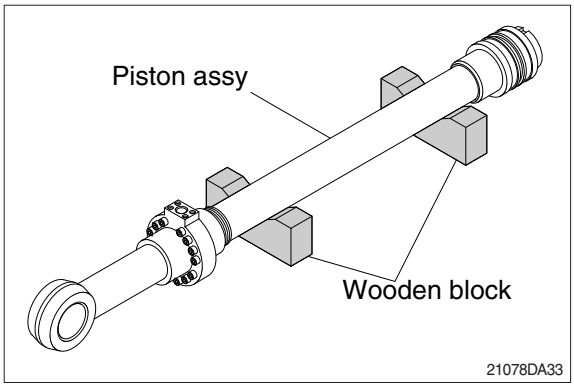
※ Since the rod assembly is heavy in this case, lift the tip of the rod assembly (2) with a crane or some means and draw it out. However, when rod assembly (2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



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.

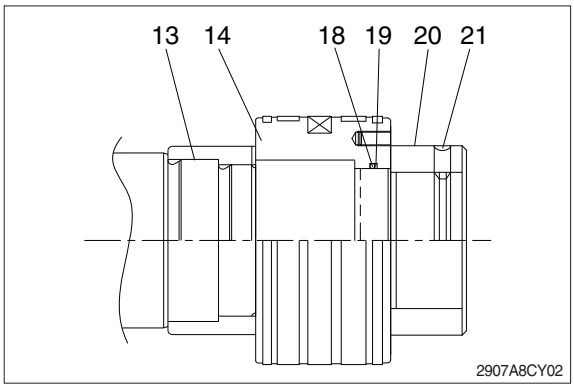


(2) Remove piston and cylinder head

① Remove set screw (21).

※ Since set screw (21) and lock nut (20) is tightened to a high torque, use a hydraulic and power wrench that utilizers a hydraulic cylinder, to remove the set screw (21) lock nut (20).

② Remove piston assembly (14), back up ring (19), and O-ring (18).

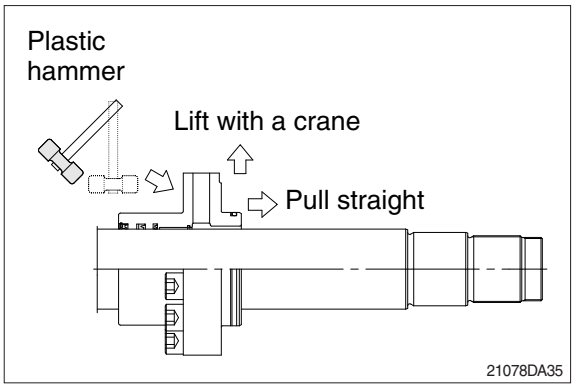


③ Remove the cylinder head assembly from rod assembly (2).

※ 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 bushing (4) and packing (5,6,7,8,9,10) by the threads of rod assembly (2).

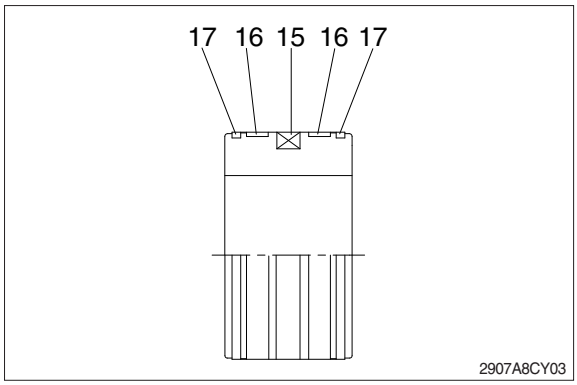


(3) Disassemble the piston assembly

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

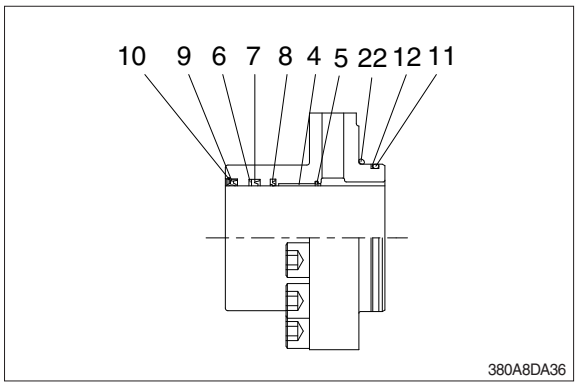
① Remove back up ring (12) and O-ring (11) and O-ring (22).

② Remove snap ring (10), dust wiper (9).

③ Remove back up ring (7), rod seal (6) and buffer ring (8).

※ Exercise care in this operation not to damage the grooves.

※ Do not remove seal and ring, if does not damaged.

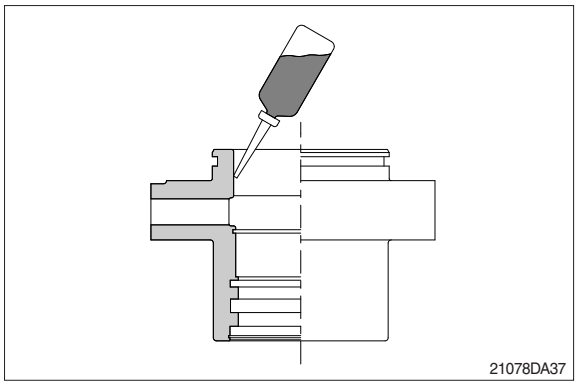


3) ASSEMBLY

(1) Assemble cylinder head assembly

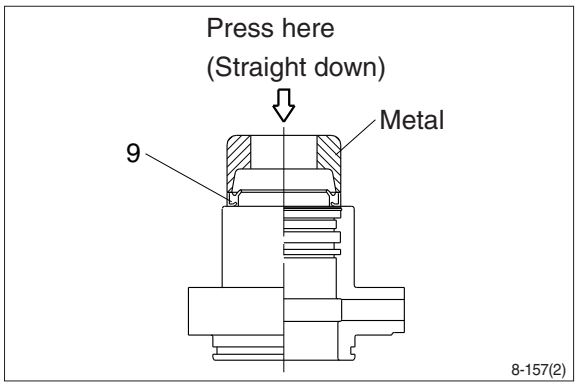
※ Check for scratches or rough surfaces if found smooth with an oil stone.

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



② Coat dust wiper (9) with grease and fit dust wiper (9) to the bottom of the hole of dust seal.
At this time, press a pad metal to the metal ring of dust seal.

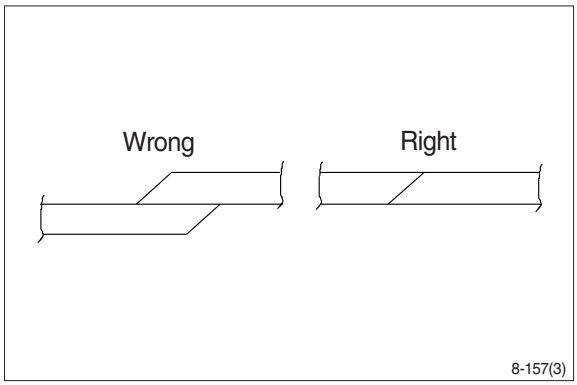
③ Fit snap ring (10) to the stop face.



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

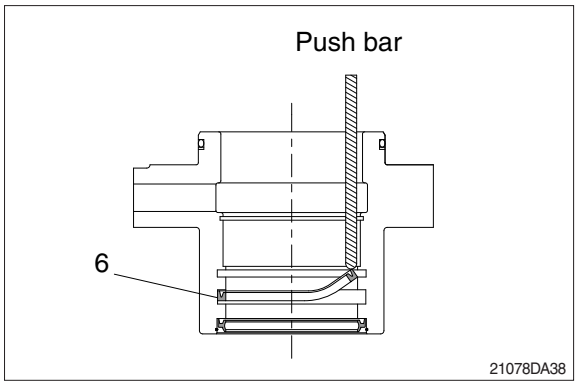
※ Coat each packing with hydraulic oil before fitting it.

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



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

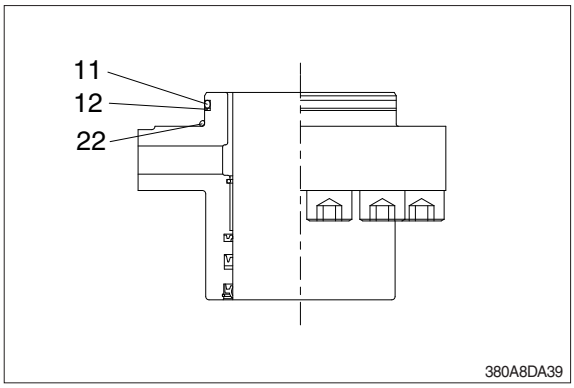
※ Fitting rod seal (6) upside down may damage its lip. Therefore check the correct direction that is shown in fig.



⑤ Fit back up ring (12) to gland (3).

※ Put the backup ring in the warm water of 30~50˚C.

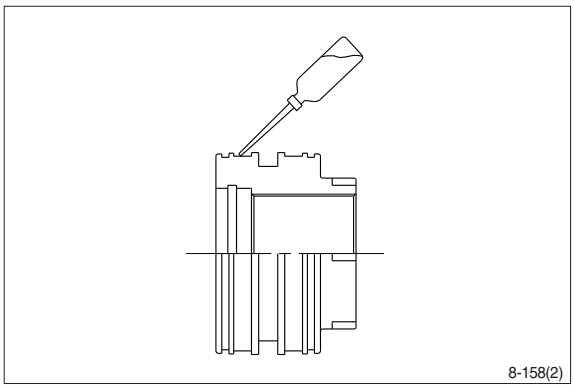
⑥ Fit O-ring (11) and O-ring (22) to gland (3).



(2) Assemble piston assembly

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

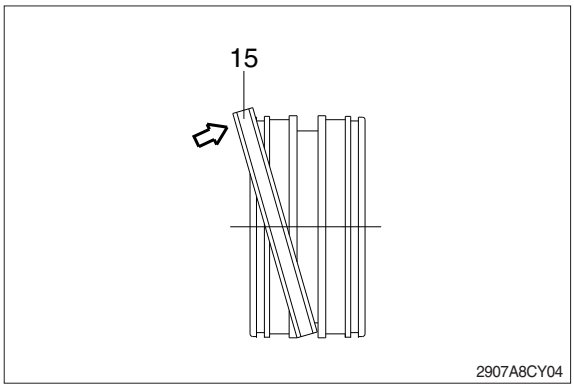
① Coat the outer face of piston (14) with hydraulic oil.



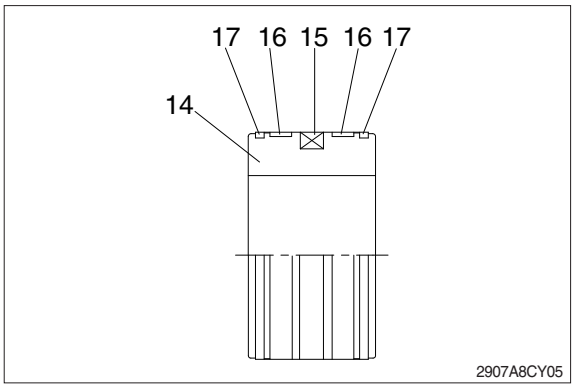
② Fit piston seal (15) to piston.

※ 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).

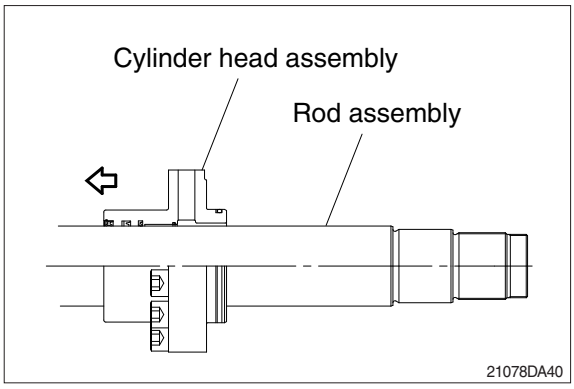


(3) Install piston and cylinder head

① Fix the rod assembly to the work bench.

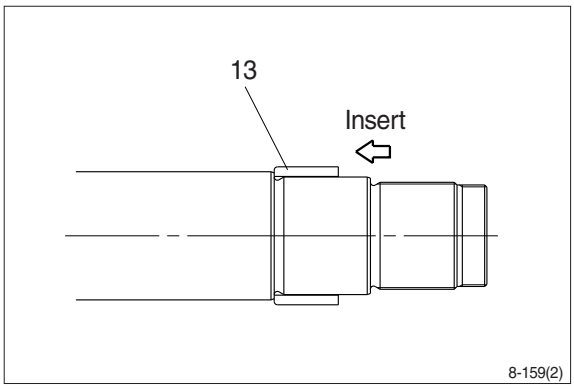
② Apply hydraulic oil to the outer surface of rod assembly (2), the inner surface of piston and cylinder head.

③ Insert cylinder head assembly to rod assembly.



④ Insert cushion ring (13) to rod assembly.

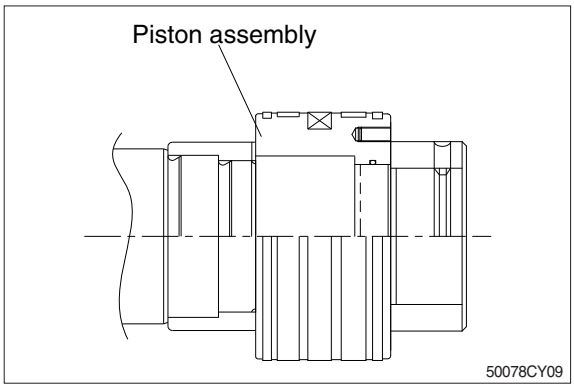
※ Note that cushion ring (13) has a direction in which it should be fitted.



⑤ Fit piston assembly to rod assembly.

· Tightening torque : 150±15.0 kgf · m (1085±108 lbf · ft)

※ Refer to page 8-138.



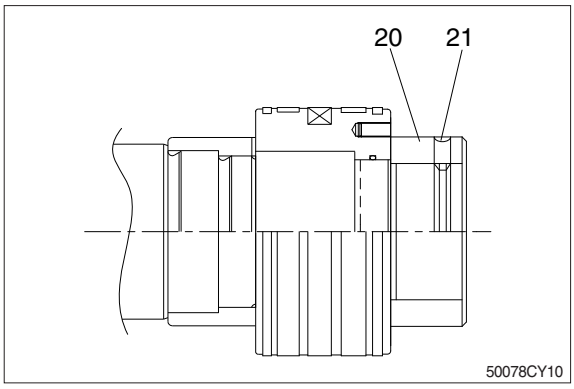
⑥ Fit lock nut (20) and tighten the screw (21).

· Tightening torque :

Item 20 : 100±10.0 kgf·m (723±72.3 lbf·ft)

Item 21 : 5.4±0.5 kgf·m (39.1±3.6 lbf·ft)

※ Refer to page 8-138.



(3) Overall assemble

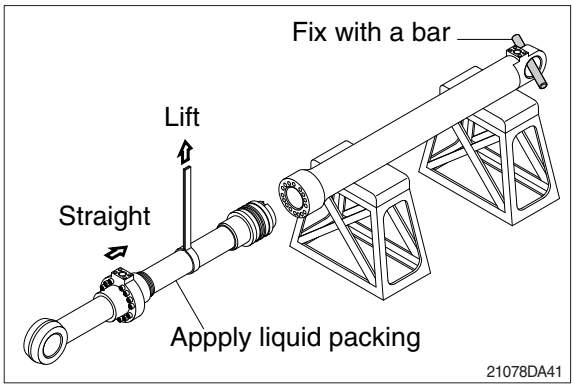
① Place a V-block on a rigid work bench. Mount the tube assembly (1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.

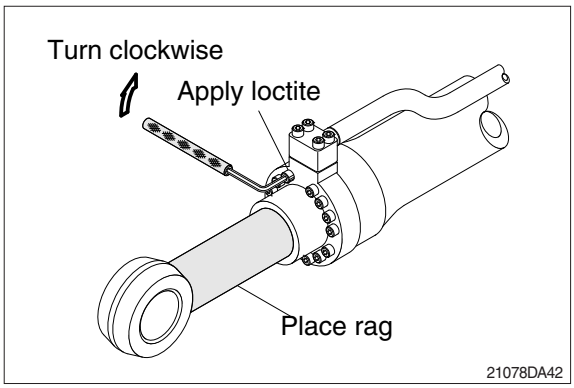
② Insert the rod assembly in to the tube assembly, while lifting and moving the rod assembly with a crane.

※ 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.

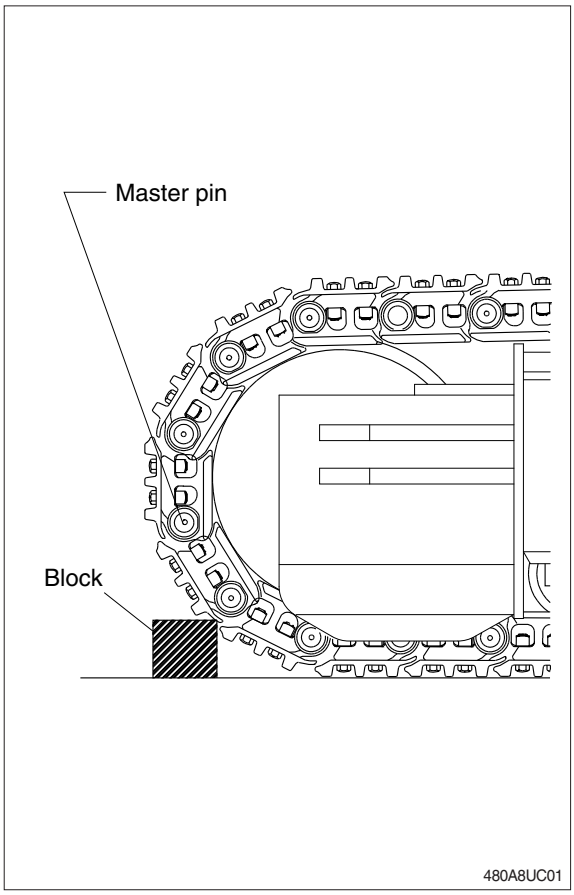




1. TRACK LINK

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.

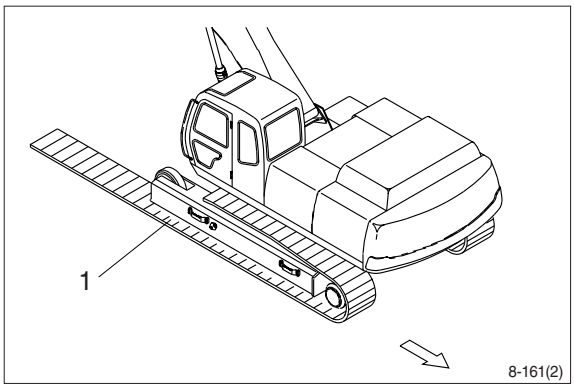
※ Unscrew the grease nipple after release the tension by pushing the poppet only when necessarily required.
Grease leaking hole is not existing. So, while unscrew the grease nipple, grease is not leaking until the grease nipple is completely coming out. If the tension is not released in advance, the grease nipple can be suddenly popped out by pressurized grease.

(3) Push out master pin by using a suitable tool.

(4) Move the machine slowly in reverse, and lay out track link assembly (1).

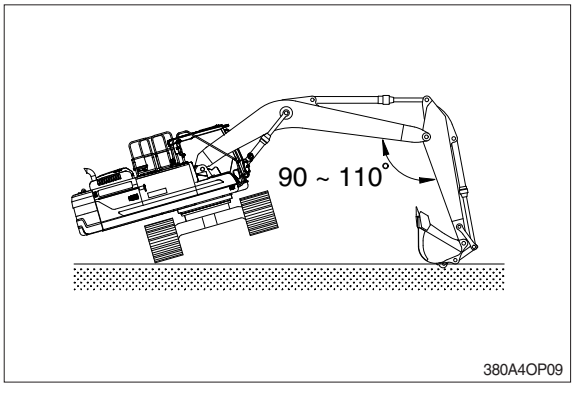
※ Jack up the machine and put wooden block under the machine.

※ Don't get close to the sprocket side as the track shoe plate may fall down on your feet.



2) INSTALL

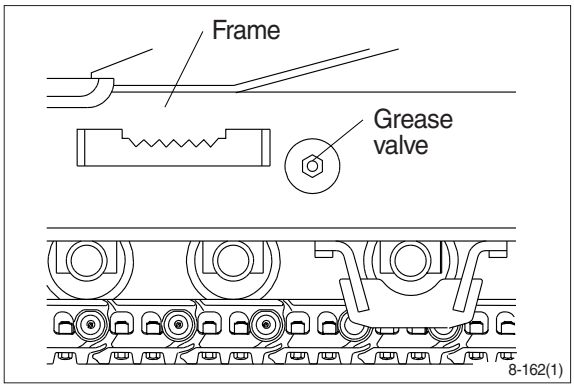
(1) Carry out installation in the reverse order to removal.
Adjust the tension of the track link.



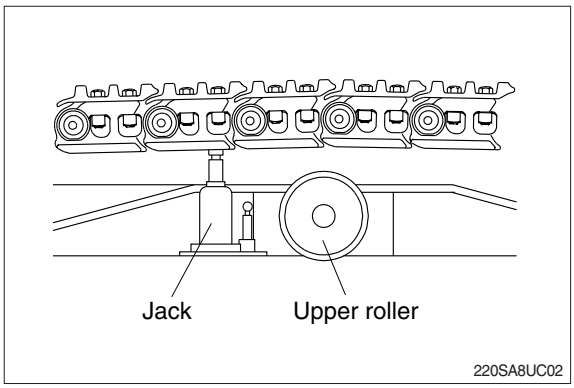
2. UPPER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.

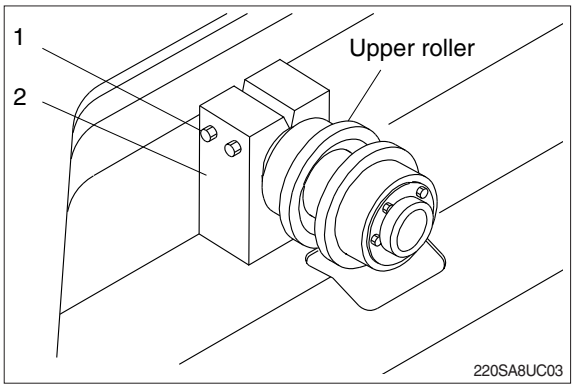


(2) Jack up the track link height enough to permit upper roller removal.



(3) Loosen the lock nut (1).

(4) Open bracket (2) with a screwdriver, push out from inside, and remove upper roller assembly.
- Weight
  General : 80 kg (176 lb)
- Tightening torque : 29.7±3.0 kgf·m
  (215±21.7 lbf·ft)



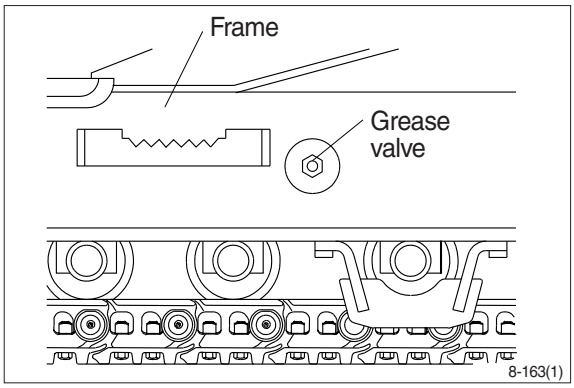
2) INSTALL

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

3. LOWER ROLLER

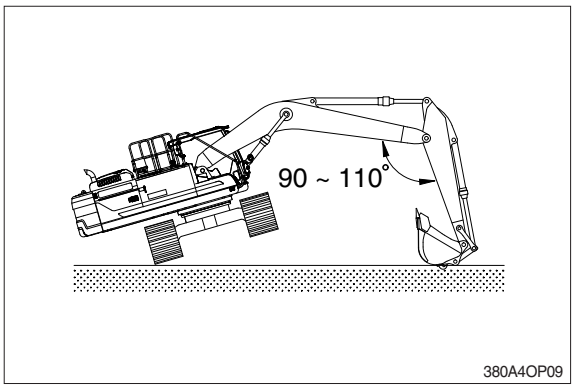
1) REMOVAL

(1) Loosen tension of the track link.



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

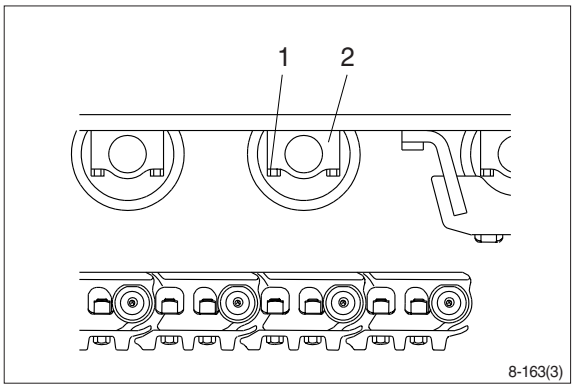
※ After jack up the machine, set a block under the unit.



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

· Weight : 79.5 kg (175 lb)

· Tightening torque : 100±10.0 kgf·m (723±72.3 lbf·ft)



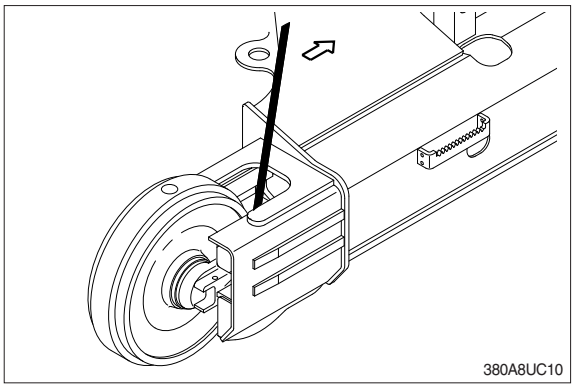
2) INSTALL

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

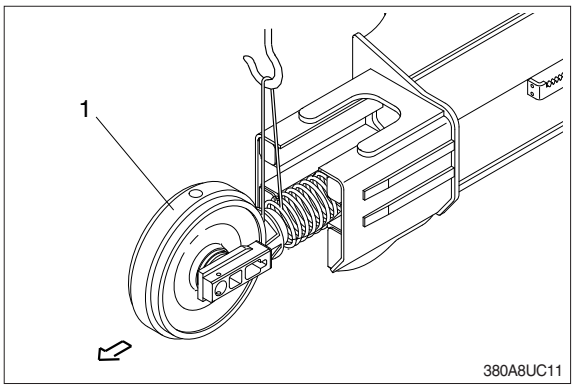
4. IDLER AND RECOIL SPRING

1) REMOVAL

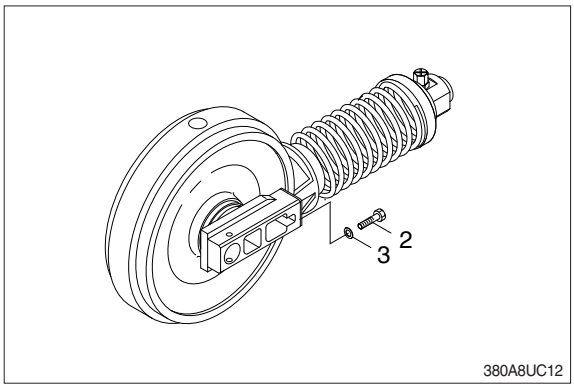
(1) Remove the track link.
For detail, see **removal of track link.**



(2) Sling the recoil spring (1) and pull out idler and recoil spring assembly from track frame, using a pry.
· Weight : 489 kg (1078 lb)



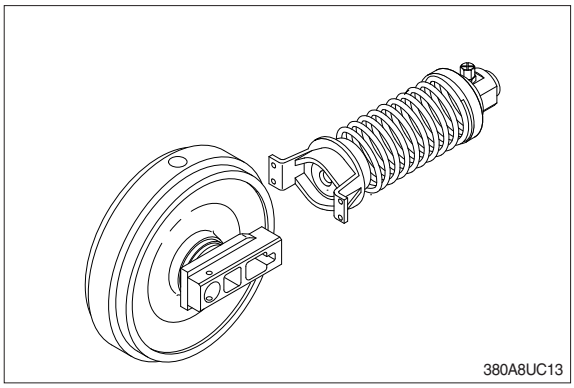
(3) Remove the bolts (2), washers (3) and separate idler from recoil spring.
· Tightening torque : 29.7±4.5 kgf·m
(215±32.5 lbf·ft)



2) INSTALL

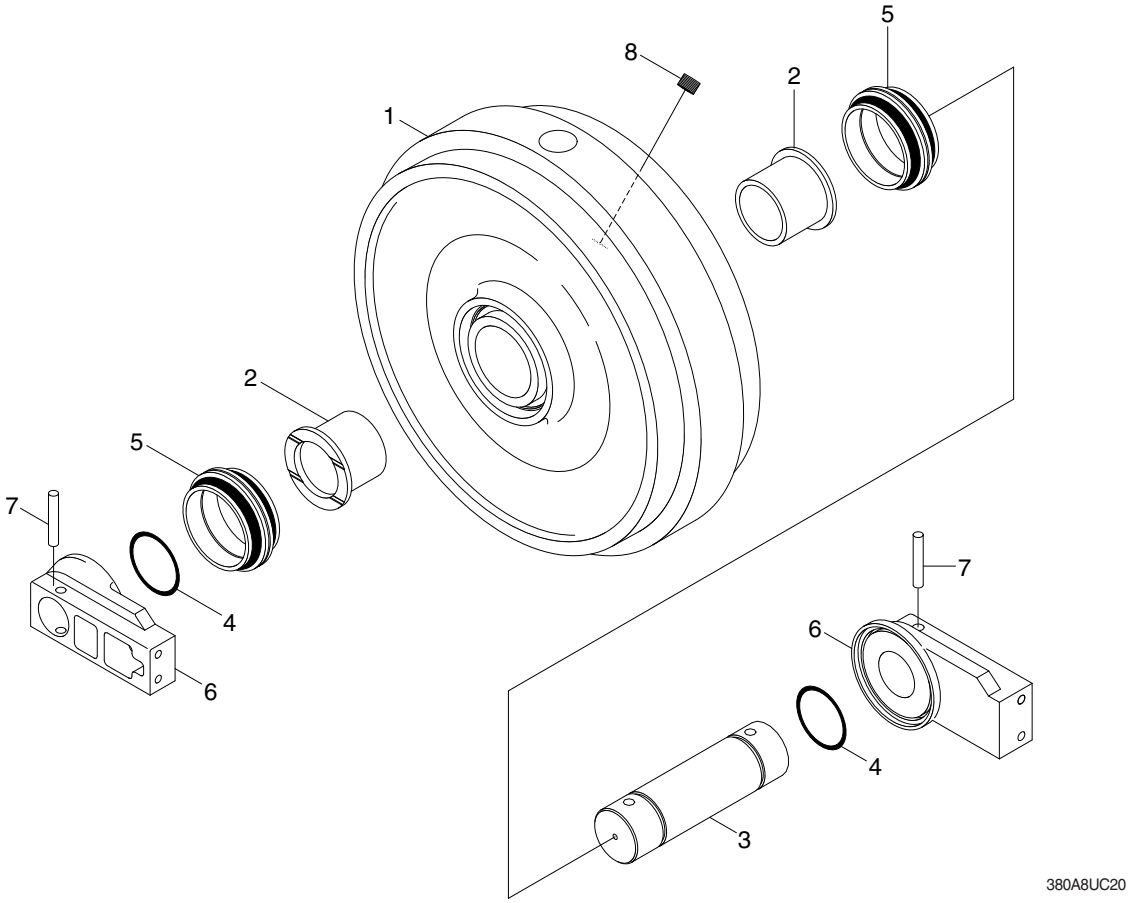
(1) Carry out installation in the reverse order to removal.

※ Make sure that the boss on the end face of the recoil cylinder rod is in the hole of the track frame.



3) DISASSEMBLY AND ASSEMBLY OF IDLER

(1) Structure

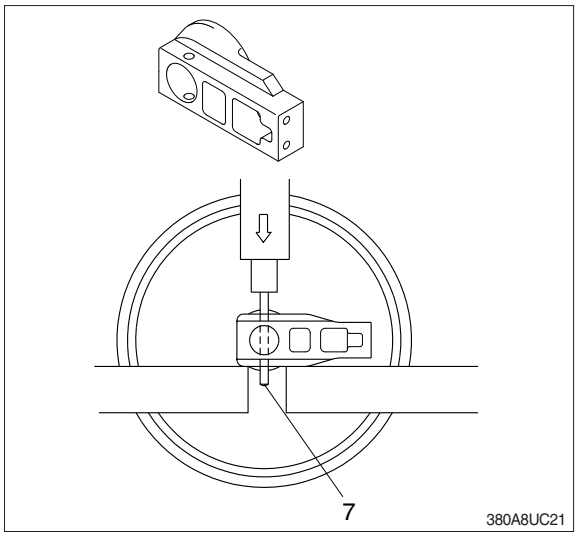


1	Shell	4	O-ring	7	Spring pin
2	Bushing	5	Seal assembly	8	Plug
3	Shaft	6	Bracket		

(2) Disassembly

① Remove plug and drain oil.

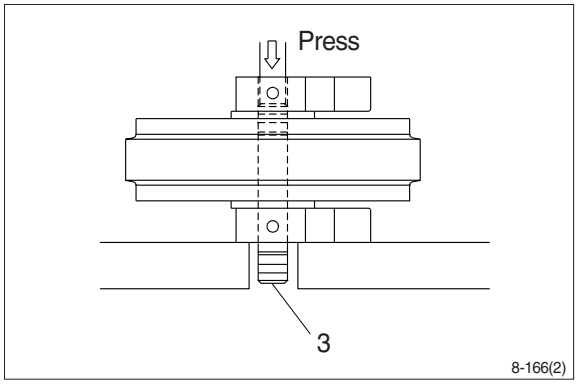
② Draw out the spring pin (7), using a press.



③ Pull out the shaft (2) with a press.

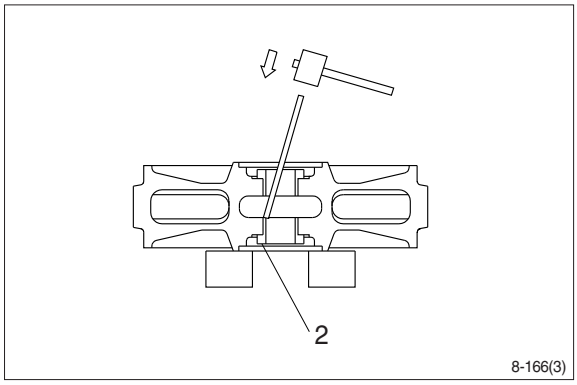
④ Remove seal (5) from shell (1) and bracket (6).

⑤ Remove O-ring (4) from shaft.



⑥ Remove the bushing (2) from idler, using a special tool.

※ Only remove bushing if replacement is necessity.

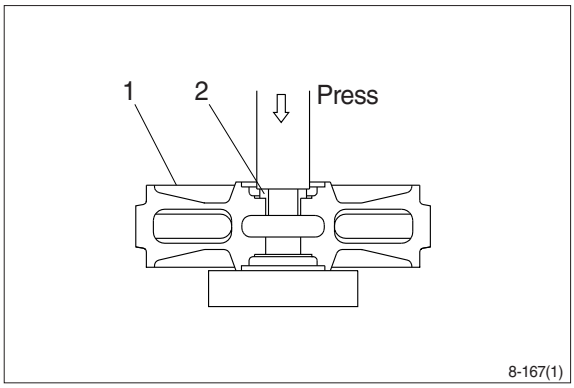


(3) Assembly

※ Before assembly, clean the parts.

※ Coat the sliding surfaces of all parts with oil.

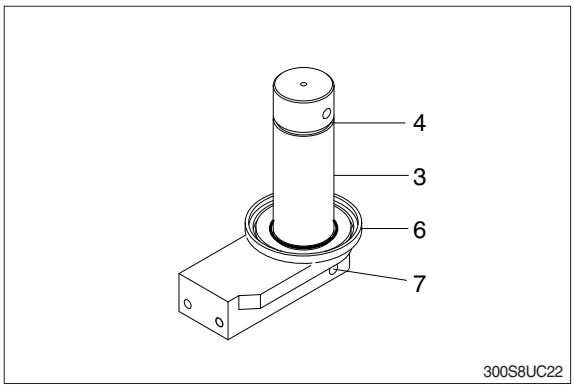
① Cool up bushing (2) fully by some dry ice and press it into shell (1).
Do not press it at the normal temperature, or not knock in with a hammer even after the cooling.



8-167(1)

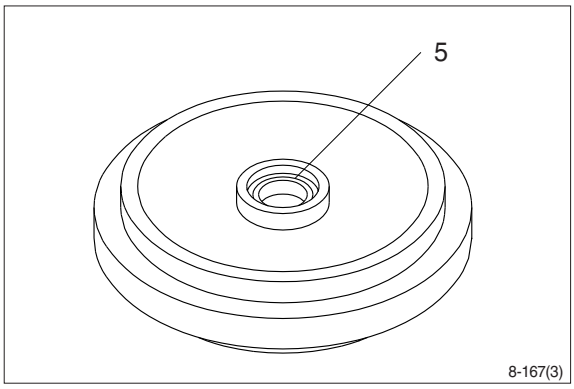
② Coat O-ring (4) with grease thinly, and install it to shaft (3).

③ Insert shaft (3) into bracket (6) and drive in the spring pin (7).



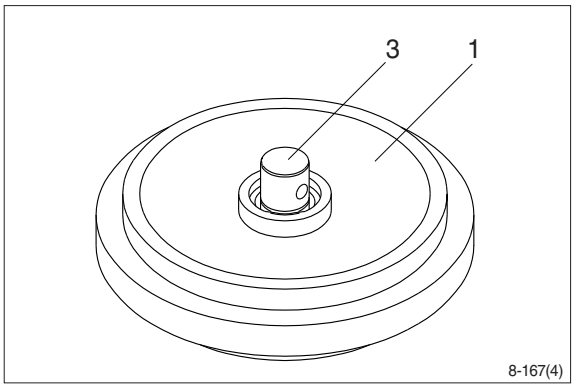
300S8UC22

④ Install seal (5) to shell (1) and bracket (6).



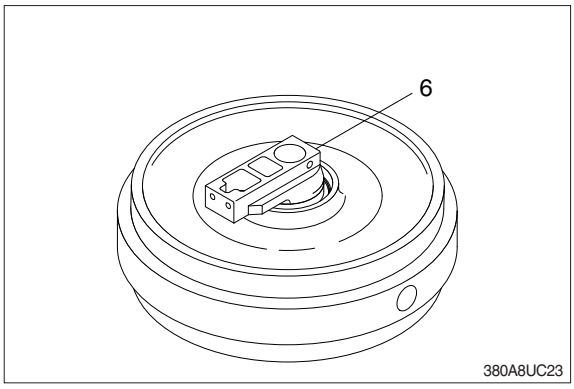
8-167(3)

⑤ Install shaft (3) to shell (1).

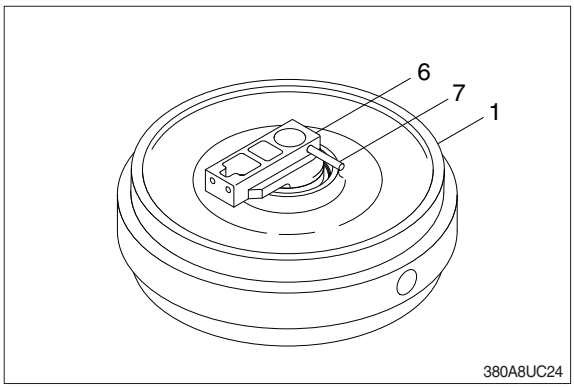


8-167(4)

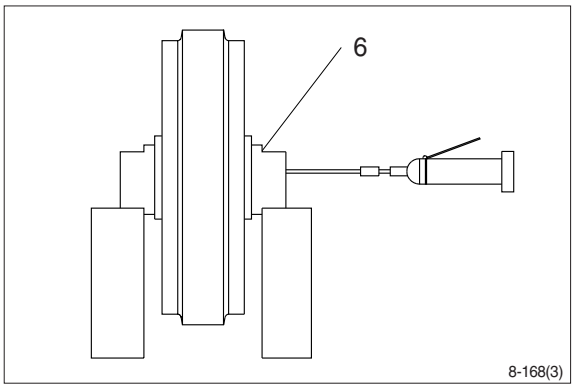
⑥ Install bracket (6) attached with seal (5).



⑦ Knock in the spring pin (7) with a hammer.

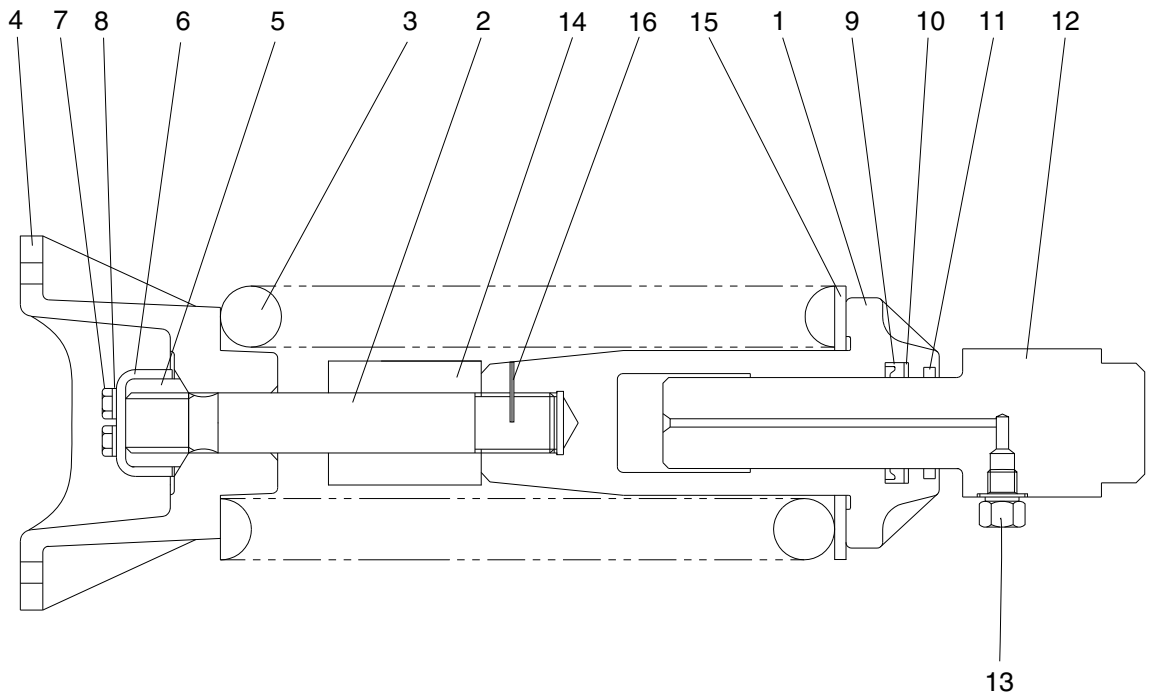


⑧ Lay bracket (6) on its side.
Supply engine oil to the specified level, and tighten plug.



4) DISASSEMBLY AND ASSEMBLY OF RECOIL SPRING

(1) Structure



81QA-14015

1	Body	7	Bolt	13	Grease valve
2	Tie bar	8	Spring washer	14	Stopper tube
3	Spring	9	Rod packing	15	Spacer
4	Bracket	10	Back up ring	16	Spring pin
5	Lock nut	11	Dust seal		
6	Lock plate	12	Adjust rod		

(2) Disassembly

※ The illustrations are base on the type 1.

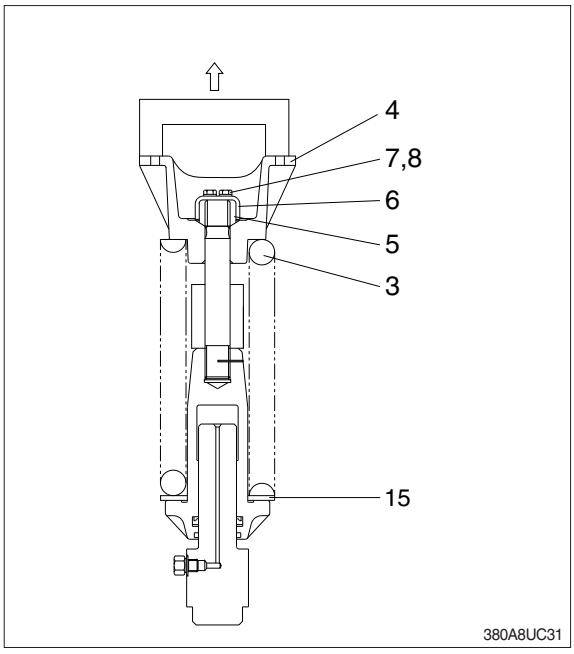
① Apply pressure on spring (3) with a press.

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

② Remove bolt (7), spring washer (8) and lock plate (6).

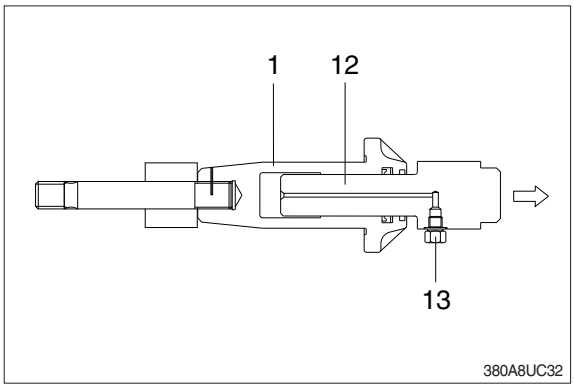
③ Remove lock nut (5).
Take enough notice so that the press which pushes down the spring, should not be slipped out in its operation.

④ Lighten the press load slowly and remove bracket (4), spring (3) and spacer (15).

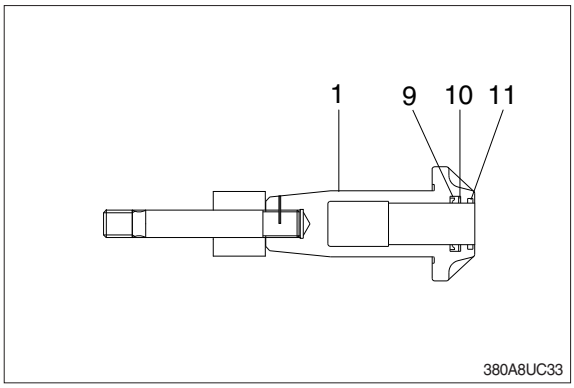


⑤ Remove rod (12) from body (1).

⑥ Remove grease valve (13) from rod (12).



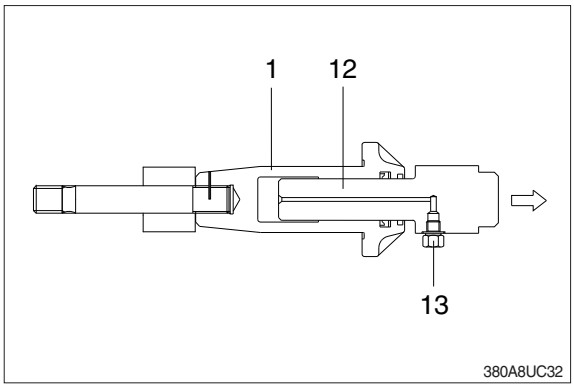
⑦ Remove rod seal (9), back up ring (10) and dust seal (11).



(3) Assembly

① Install dust seal (11), back up ring (10) and rod seal (9) to body (1).

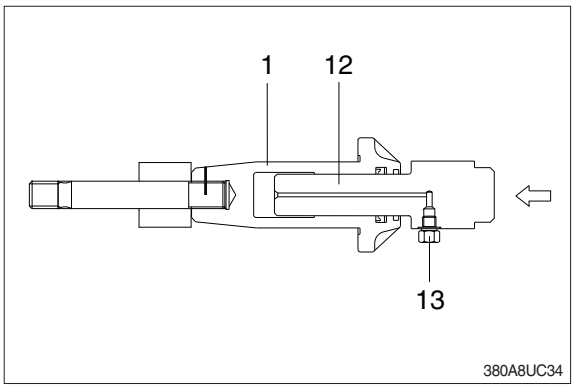
※ When installing dust seal (11) and rod seal (9), take full care so as not to damage the lip.



② Pour grease into body (1), then push in rod (12) by hand.
After take grease out of grease valve mounting hole, let air out.

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

③ Fit grease valve (13) to rod (12).
· Tightening torque : 13.0±1.0 kgf · m
(94±7.2 lbf · ft)

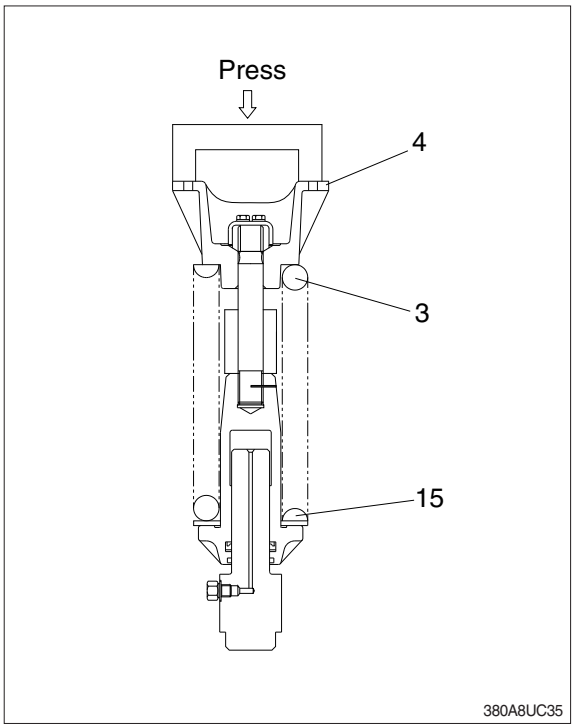


④ Install spacer (15), spring (3) and bracket (4) to body (1).

⑤ Apply pressure to spring (3) with a press and tighten lock nut (5).
· Spring set load
24500 kg (54010 lb)

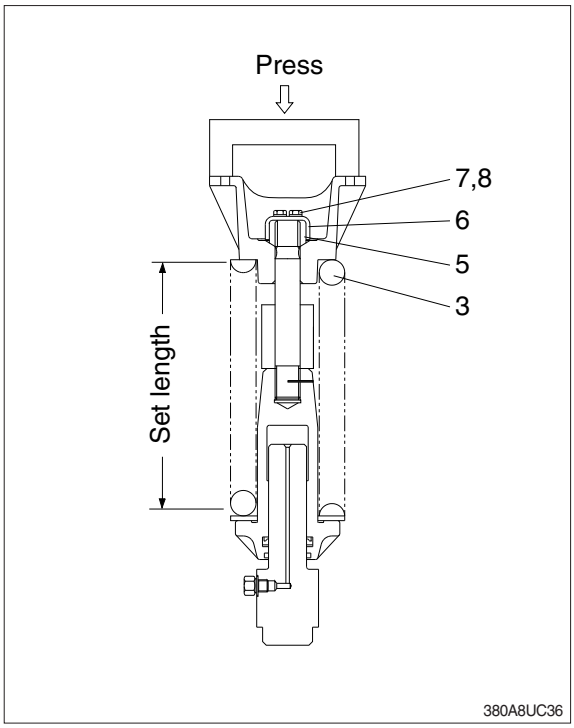
※ Apply sealant before assembling.

※ During the operation, pay attention specially to prevent the press from slipping out.

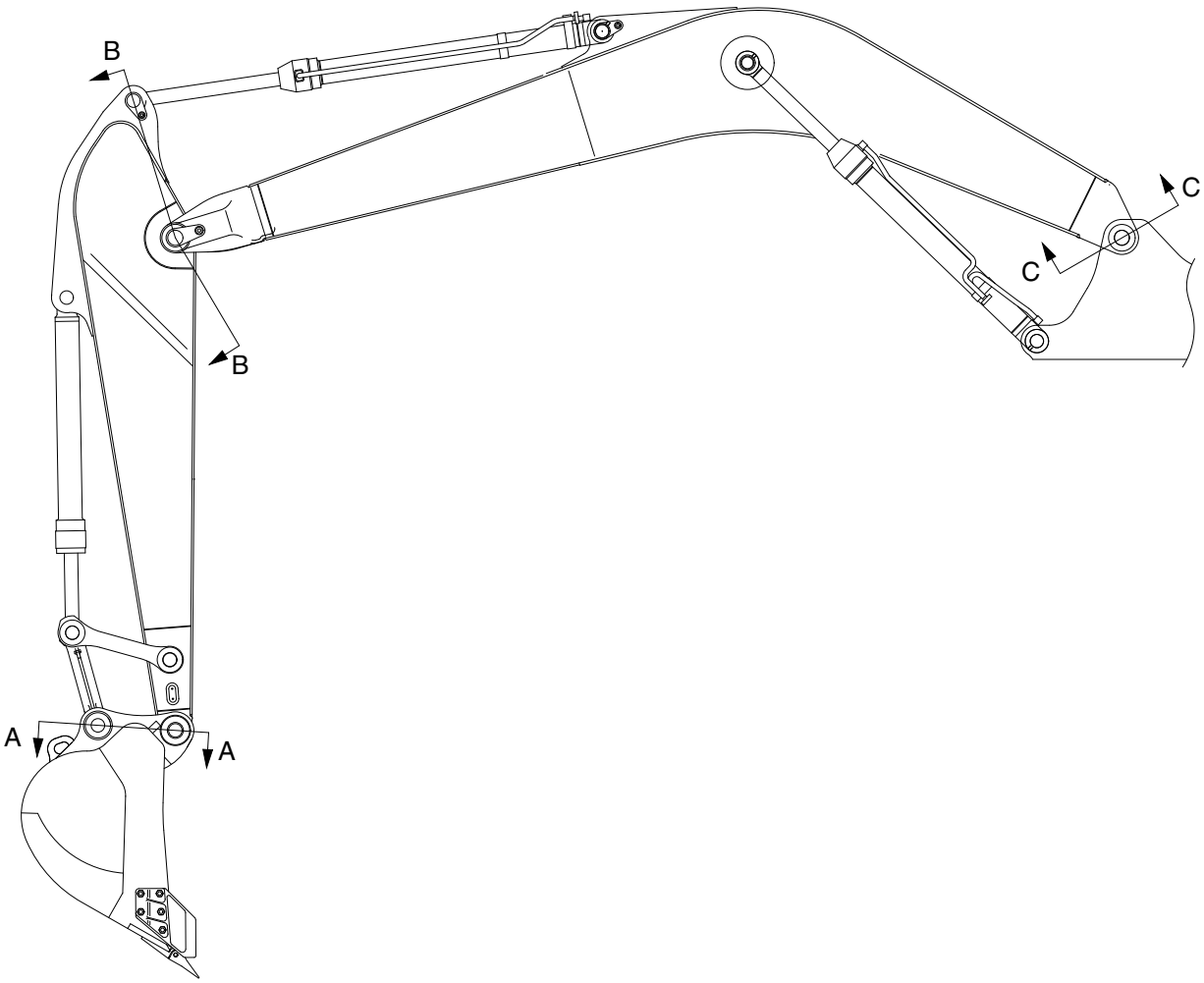


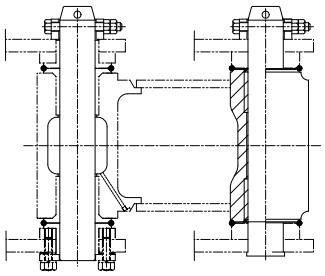
⑥ Lighten the press load and confirm the set length of spring (3).
·Set length : 610±1.5 mm

⑦ After the setting of spring (3), install lock plate (6), spring washer (8) and bolt (7).
·Tightening torque : 13.3±2.7 kgf·m
(96.2±19.5 lbf·ft)

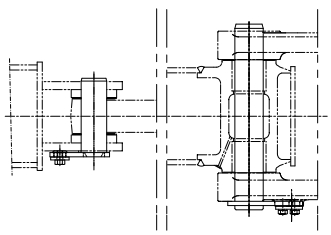


1. STRUCTURE

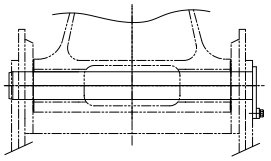




SECTION A



SECTION B



SECTION C

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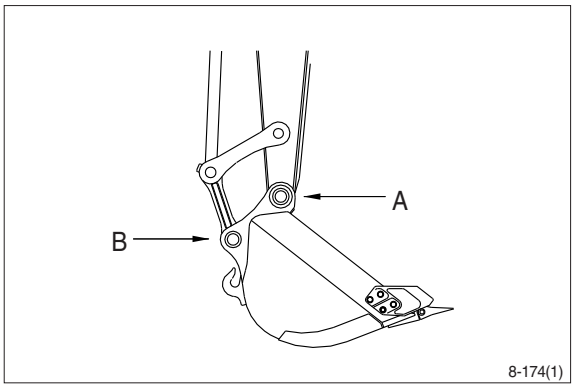
2. REMOVAL AND INSTALL

1) BUCKET ASSEMBLY

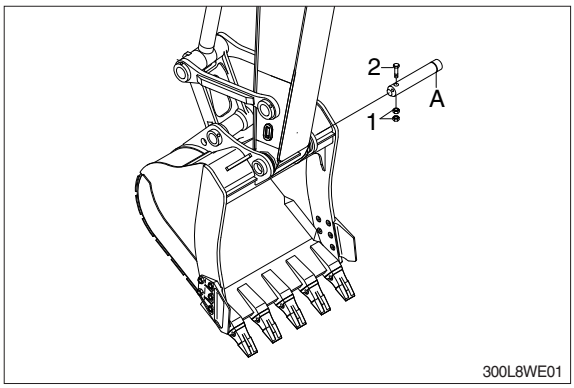
(1) Removal

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



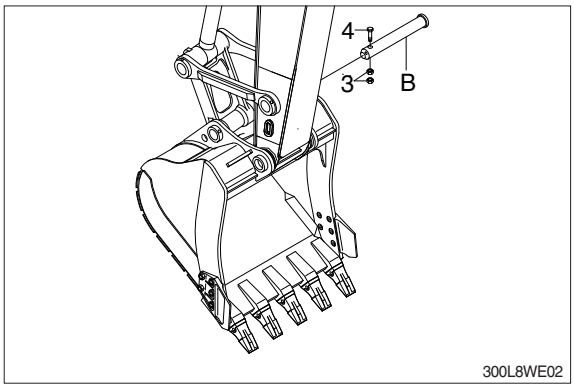
② Remove nut (1), bolt (2) and draw out the pin (A).

· Tightening torque : 57.9±8.7 kgf·m
(419±62.9 lbf·ft)



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

· Tightening torque : 57.9±8.7 kgf·m
(419±62.9 lbf·ft)

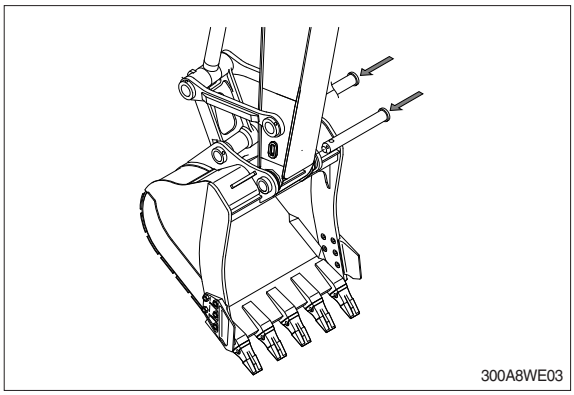


(2) Install

① Carry out installation in the reverse order to removal.

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

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



2) ARM ASSEMBLY

(1) Removal

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

⚠ **Escaping fluid under pressure can penetrated 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.**

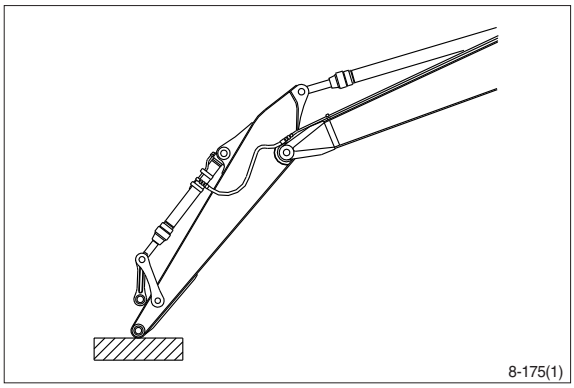
③ Sling arm cylinder assembly, remove spring, pin stopper and pull out pin.

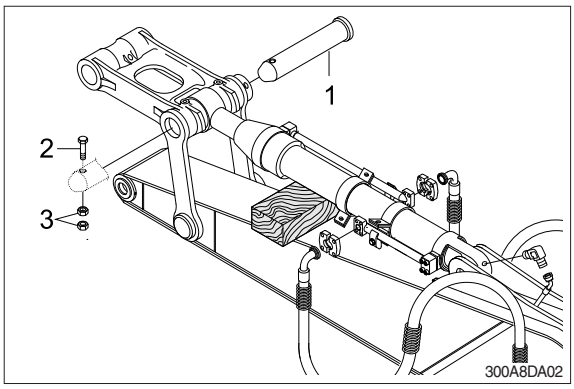
※ Tie the rod with wire to prevent it from coming out.

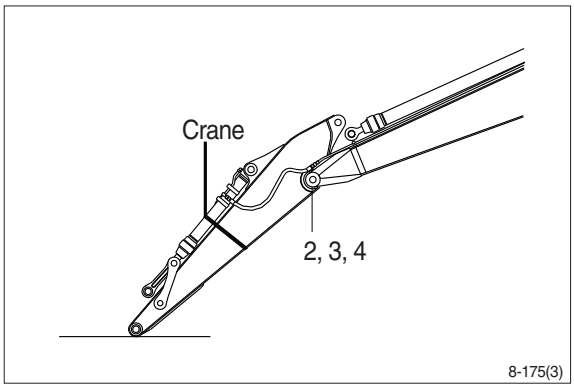
④ For details, see r**emoval of arm cylinder assembly.**
Place a wooden block under the cylinder and bring the cylinder down to it.

⑤ Remove bolt (2), plate (3) and pull out the pin (4) then remove the arm assembly.
- Weight : 2000 kg (4410 lb)
- Tightening torque (2) : 57.9±8.7 kgf·m (419±62.9 lbf·ft)

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







(2) Install

① Carry out installation in the reverse order to removal.
When lifting the arm assembly, always lift the center of gravity.

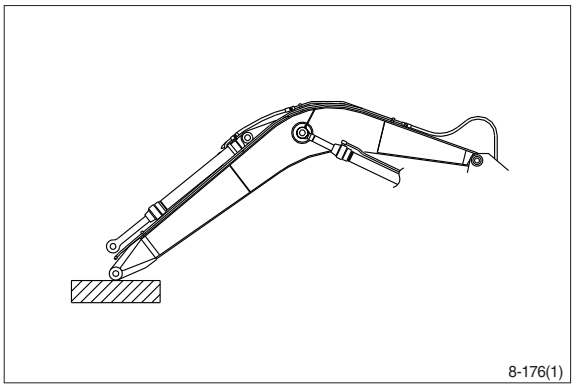
※ Bleed the air from the cylinder.

3) BOOM CYLINDER

(1) Removal

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

② Remove boom cylinder assembly from boom.
For details, see **removal of arm cylinder assembly.**

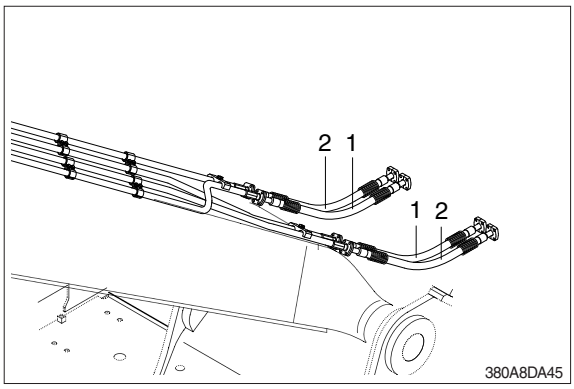


③ Disconnect head lamp wiring.

④ Disconnect bucket cylinder hose (2) and arm cylinder hose (1).

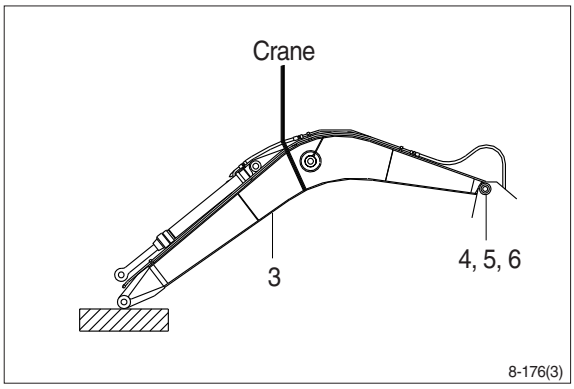
※ When the hose are disconnected, oil may spurt out.

⑤ Sling boom assembly (3).



⑥ Remove bolt (4), plate (5) and pull out the pin (6) then remove boom assembly.
· Weight : 3750 kg (8270 lb)

※ When lifting the boom assembly always lift the center of gravity.
· Tightening torque : 57.9±6.0 kgf·m
(419±43.4 lbf·ft)



(2) Install

① Carry out installation in the reverse order to removal.

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

※ Bleed the air from the cylinder.