SECTION 8 DISASSEMBLY AND ASSEMBLY

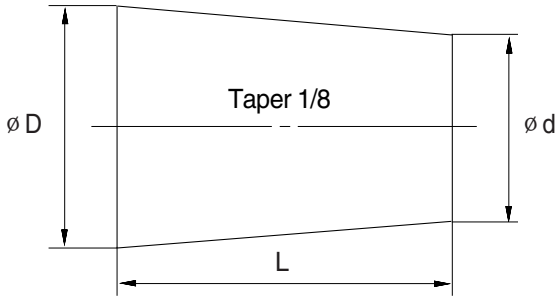
SECTION 8 DISASSEMBLY AND ASSEMBLY

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, nut	M20 × 2.5	46.4 ± 4.6	336 ± 33
2		Radiator mounting bolt	M16 × 2.0	29.7 ± 4.5	215 ± 32.5
3		Coupling mounting socket bolt	M10 × 1.5	4.6 ± 1.0	33± 7.9
4		Main pump housing mounting bolt	M10 × 1.5	4.6 ± 1.0	33 ± 7.9
5	Hydraulic system	Main pump mounting bolt	M20 × 2.5	4.4 ± 0.6	318 ± 47.7
6		Main control valve mounting nut	M12 × 1.75	12.2 ± 1.3	88.2 ± 9.4
7		Fuel tank mounting bolt	M20 × 2.5	45 ± 5.1	325 ± 36.8
8		Hydraulic oil tank mounting bolt	M20 × 2.5	45 ± 5.1	325 ± 36.8
9		Turning joint mounting bolt, nut	M16 × 2.5	29.7 ± 4.5	215 ± 32.5
10	Power train system	Swing motor mounting bolt	M20 × 2.5	58.4 ± 6.4	422 ± 46.2
11		Swing bearing upper part mounting bolt	M24 × 3.0	94.5 ± 10.5	683 ± 75.9
12		Swing bearing lower part mounting bolt	M24 × 3.0	94.5 ± 10.5	683 ± 75.9
13		Travel motor mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
14		Sprocket mounting bolt	M20 × 2.5	57.9 ± 8.7	419 ± 62.9
15	Under carriage	Carrier roller mounting bolt, nut	M16 × 1.5	31.3 ± 4.7	226 ± 33.9
16		Track roller mounting bolt	M22 × 2.5	83.2 ± 12.5	601 ± 90.4
17		Track tension cylinder mounting bolt	M16 × 2.0	76 ± 8	550 ± 58
18		Track shoe mounting bolt, nut (-#0595)	M22 × 1.5	105 ± 5.0	760 ± 36
19		Track shoe mounting bolt, nut (#0596-)	M24 × 1.5	140 ± 5.0	1012 ± 36
20	Others	Counterweight mounting bolt	M42 × 3.0	390 ± 40	2821 ± 289
		Center frame support & lower track mounting bolt	M33 × 3.5	220 ± 20	88.2 ± 9.4
21		Cab mounting bolt	M12 × 1.75	12.2 ± 1.3	18.1 ± 3.6
22		Operator's seat mounting bolt	M 8 × 1.25	2.5 ± 0.5	1591 ± 145

※ 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 - Coarse thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6 × 1.0	0.85 ~ 1.25	6.15 ~ 9.04	1.14 ~ 1.74	8.2 ~ 12.6
M 8 × 1.25	2.0 ~ 3.0	14.5 ~ 21.7	2.7 ~ 4.1	19.5 ~ 29.7
M10 × 1.5	4.0 ~ 6.0	28.9 ~ 43.4	5.5 ~ 8.3	39.8 ~ 60.0
M12 × 1.75	7.4 ~ 11.2	53.5 ~ 81.0	9.8 ~ 15.8	70.9 ~ 114
M14 × 2.0	12.2 ~ 16.6	88.2 ~ 120	16.7 ~ 22.5	121 ~ 163
M16 × 2.0	18.6 ~ 25.2	135 ~ 182	25.2 ~ 34.2	182 ~ 247
M18 × 2.0	25.8 ~ 35.0	187 ~ 253	35.1 ~ 47.5	254 ~ 344
M20 × 2.5	36.2 ~ 49.0	262 ~ 354	49.2 ~ 66.6	356 ~ 482
M22 × 2.5	48.3 ~ 63.3	349 ~ 458	65.8 ~ 98.0	476 ~ 709
M24 × 3.0	62.5 ~ 84.5	452 ~ 611	85.0 ~ 115	615 ~ 832
M30 × 3.0	124 ~ 168	898 ~ 1214	169 ~ 229	1223 ~ 1656
M36 × 4.0	174 ~ 236	1261 ~ 1704	250 ~ 310	1808 ~ 2242

(2) Fine thread

Bolt size	8T		10T	
	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8 × 1.0	2.2 ~ 3.4	15.9 ~ 24.6	3.0 ~ 4.4	21.7 ~ 31.8
M10 × 1.2	4.5 ~ 6.7	32.5 ~ 48.5	5.9 ~ 8.9	42.7 ~ 64.4
M12 × 1.25	7.8 ~ 11.6	56.4 ~ 83.9	10.6 ~ 16.0	76.7 ~ 116
M14 × 1.5	13.3 ~ 18.1	96.2 ~ 131	17.9 ~ 24.1	130 ~ 174
M16 × 1.5	19.9 ~ 26.9	144 ~ 195	26.6 ~ 36.0	192 ~ 260
M18 × 1.5	28.6 ~ 43.6	207 ~ 315	38.4 ~ 52.0	278 ~ 376
M20 × 1.5	40.0 ~ 54.0	289 ~ 391	53.4 ~ 72.2	386 ~ 522
M22 × 1.5	52.7 ~ 71.3	381 ~ 516	70.7 ~ 95.7	511 ~ 692
M24 × 2.0	67.9 ~ 91.9	491 ~ 665	90.9 ~ 123	658 ~ 890
M30 × 2.0	137 ~ 185	990 ~ 1339	182 ~ 248	1314 ~ 1796
M36 × 3.0	192 ~ 260	1390 ~ 1880	262 ~ 354	1894 ~ 2562

2) PIPE AND HOSE

Thread size	Width across flat(mm)	kgf · m	lbf · ft
1/4"	19	3	21.7
3/8"	22	4	28.9
1/2"	27	5	36.2
3/4"	36	12	86.8
1"	41	14	101

3) 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	6	43.4
3/4"	36	13	94.0
1"	41	15	109

1. REMOVAL AND INSTALL

1) REMOVAL

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

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

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

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

· Hydraulic tank quantity : 250 ℓ

(4) Remove bolts(16) and disconnect pipe (1,2).

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

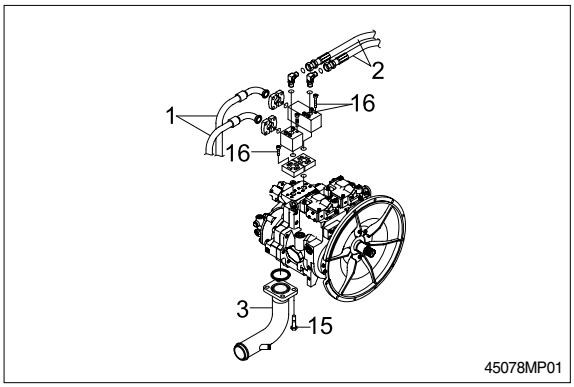
(6) Remove bolts(15) and disconnect pump suction tube (3).

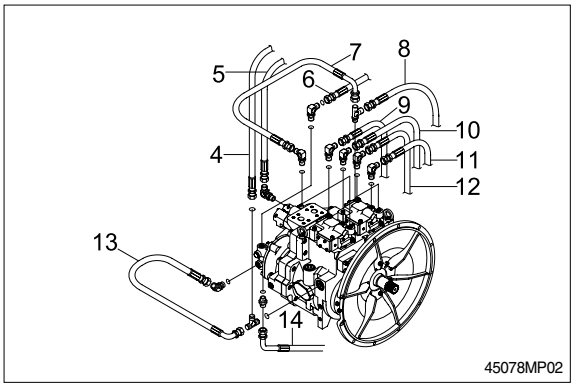
※ When pump suction tube is disconnected, the oil inside the piping will flow out, so catch it in oil pan.

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

· Weight : 240kg(530lb)

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





2) INSTALL

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

(2) Remove the suction strainer and clean it.

(3) Replace the return filter with a new one.

(4) Remove breather and clean it.

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

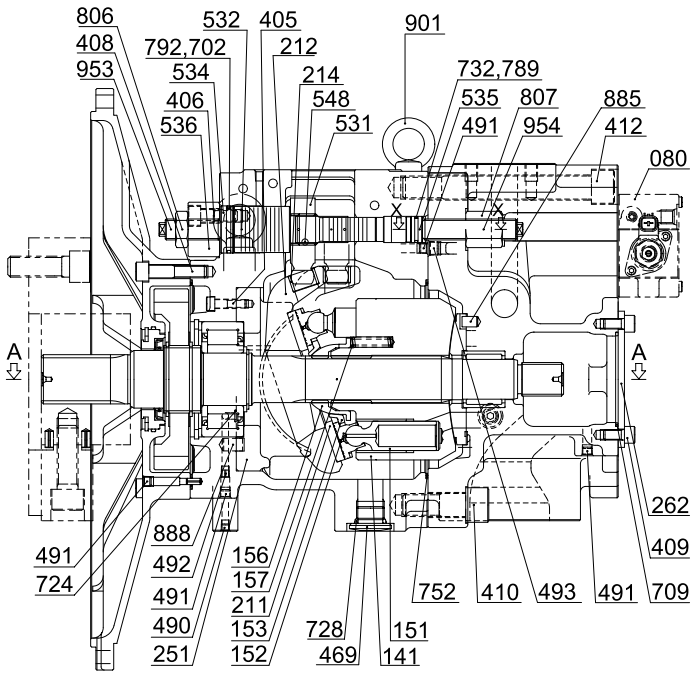
(6) Bleed the air from the hydraulic pump.
① Remove the air vent plug(2EA)
② Tighten plug lightly
③ Start the engine, run at low idling, and check oil come out from plug.
④ Tighten plug.

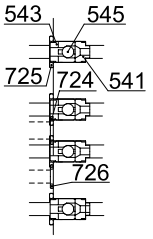
(7) Start the engine, run at low idling(3~5 minutes) to circulate the oil through the system.

(8) Confirmed the hydraulic oil level and check the hydraulic oil leaks or not.

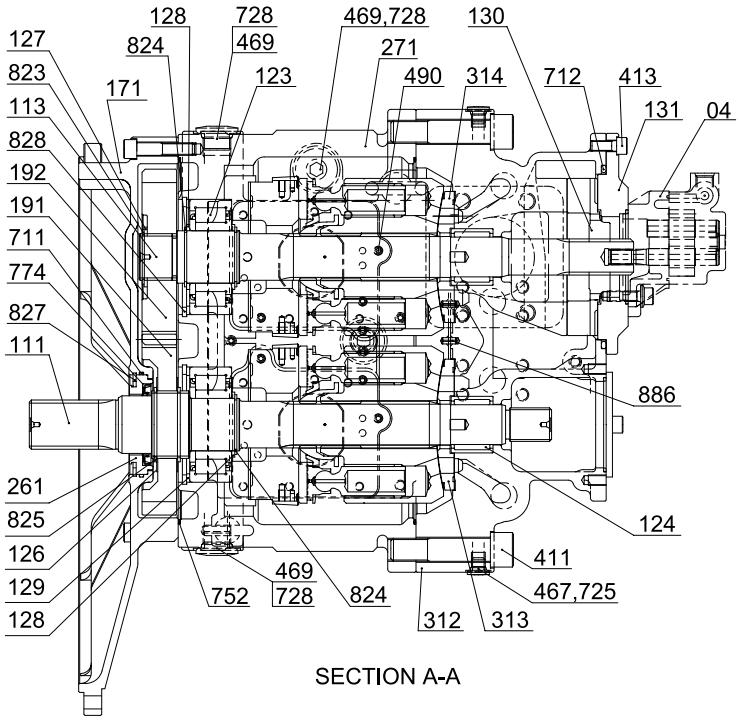
2. MAIN PUMP(1/2)

1) STRUCTURE





SECTION X-X

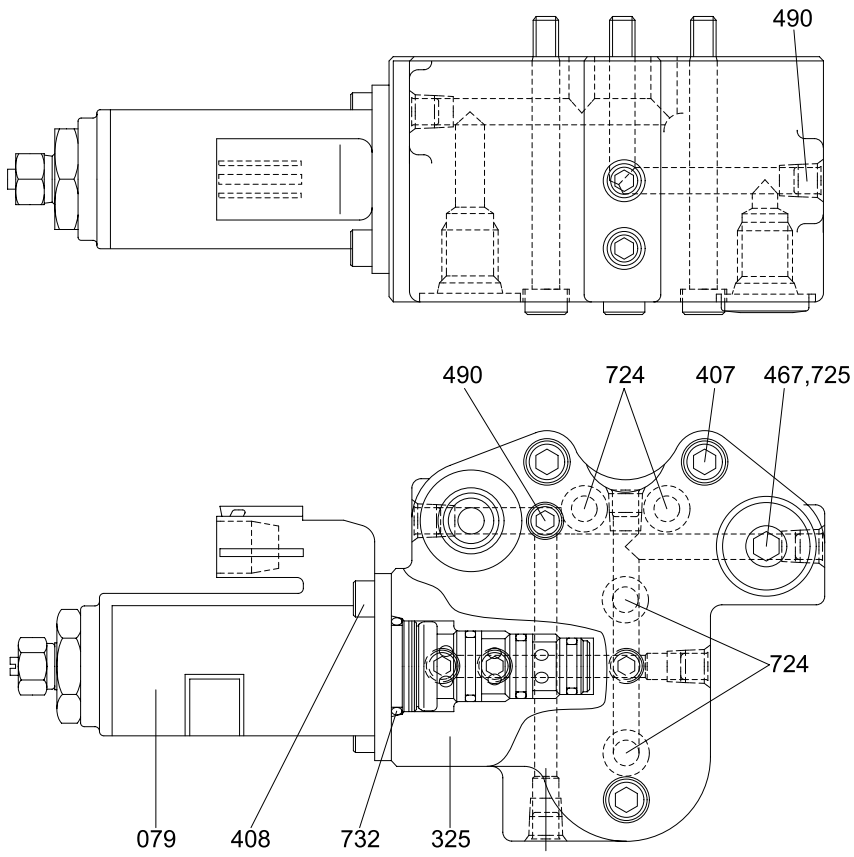


SECTION A-A

45070MP03

04	Gear pump	262	Cover	548	Feed back pin
080	Proportional reducing valve assy	271	Pump casing	702	O-ring
		312	Valve cover	709	O-ring
111	Drive shaft	313	Valve plate(R)	711	O-ring
113	Driven shaft	314	Valve plate(L)	712	O-ring
123	Roller bearing	405	Hexagon socket bolt	724	O-ring
124	Needle bearing	406	Hexagon socket bolt	725	O-ring
126	Spacer	408	Hexagon socket bolt	726	O-ring
127	Spacer	409	Hexagon socket bolt	728	O-ring
128	Bearing spacer	410	Hexagon socket bolt	732	O-ring
129	Bearing spacer	411	Hexagon socket bolt	752	Seat packing
130	Booster	412	Hexagon socket bolt	774	Oil seal
131	Booster cover	413	Hexagon socket bolt	789	Back up ring
141	Cylinder block	467	Plug	792	Back up ring
151	Piston	469	Plug	806	Nut
152	Shoe	490	Plug	807	Nut
153	Plate	491	Plug	823	Snap ring
156	Bushing	492	Restrictor	824	Snap ring
157	Cylinder spring	493	Plug	825	Snap ring
171	Front casing	531	Tilting pin	827	Snap ring
191	Drive gear	532	Servo piston	828	Snap ring
192	Driven gear	534	Stopper(L)	885	Valve plate pin
211	Shoe plate	535	Stopper(S)	886	Spring pin
212	Swash plate	536	Servo cover	888	Pin
214	Tilting bushing bushing	541	Seat	901	Eye bolt
251	Swash plate support	543	Stopper	953	Set screw
261	Front cover	545	Steel ball	954	Set screw

MAIN PUMP(2/2)



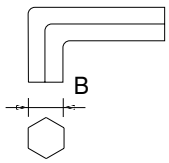
45070MP04

079	Proportional reducing valve	408	Hexagon screw	724	O-ring
325	Valve casing	467	Plug	725	O-ring
407	Hexagon screw	490	Plug	732	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 cap screw	PT plug (PT thread)	PO plug (PF thread)	Servo piston
	4	M 5	BP-1/16	-	-
	5	M 6	BP-1/ 8	-	-
	6	M 8	BP-1/ 4	PF-1/4	-
	8	M10	BP-3/ 8	PF-3/8	-
	10	M12	BP-1/2	PF-1/2	-
	14	M16, M18	BP-3/4	PF-3/4	-
	17	M20, M22	BP-1	PF-1	M30
Double ring spanner, socket wrench, double(Single) open end spanner 	-	Hexagon head screw	Hexagon hut	Hexagon socket head set screw	
	10	M6	M6	-	
	13	M8	M8	M20	
	30	M20	M20	-	
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, TSR200, TRR200			
Steel bar		Steel bar of key material approx. $10 \times 8 \times 200$			
Torque wrench		Capable of tightening with the specified torques			
Seal tape		For BP-1/4			

(2) Tightening torque

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

3) DISASSEMBLY

(1) Select place suitable to disassembling.

※ Select clean place.

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

※ Fix pump casing(271) by using thread 2-M10×16 in disassembling.

45078MP28

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

(3) Remove outlet port plug(469, lower part of pump casing) and let the oil out of pump casing.

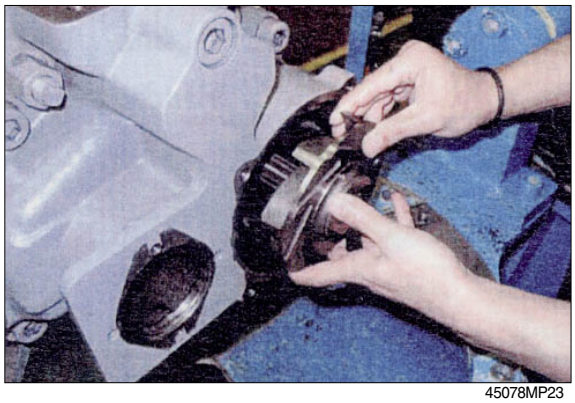
※ In order to be let the oil out of pump casing easily, remove oil filling port plug(469, upper part of pump casing).

(4) Remove hexagon socket head cap screws(412, 413) and remove regulators.

※ In order to avoid mixing up regulator of drive shaft side with that of driven shaft side, mark each of them.

45078MP29

(5) Remove gear pump, booster cover(131), booster(130), and cover(262).



45078MP23

(6) Loosen hexagon socket head cap screws(410, 411, 412) which tighten valve cover(312).

※ Remove regulators before starting this work.

(7) Place pump horizontally on workbench and separate pump casing(271) and valve cover(312).

※ Crane valve cover(312) at this work because it is heavy(about 60kgf).

※ There are two spring pins for fixing position between pump casing(271) and valve cover(312). Since they have a tight fit, remove valve cover(312) upright with respect to drive shaft(111) and driven shaft(113), while lightly tapping the valve cover(312) with a plastic hammer.

※ Take care not to damage fitting surfaces between pump casing(271) and valve cover(312). Take care not to drop valve plates(313, 314), check valve subassemblies(541, 543, 545), O-rings (724, 725, 726) and seat packing(752) in removing valve cover(312).

45078MP03

(8) If necessary, remove needle bearings (124) from valve cover(312).

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

※ Do not loosen hexagon nut(807) of the valve cover. If loosened, flow setting will be changed.

(9) Pull cylinders out of pump casing(271) straightly over drive shaft(111) and driven shaft(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 bush, shoes, swash plate, and so on.

45078MP04

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

45078MP05

(11) If necessary, remove stopper(L, 534), stopper(S, 535), servo piston(532), tilting pin(531), and servo cover(536), from pump casing(271).

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

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

※ Do not loosen hexagon nut(806) on servo cover(536). If loosened, flow setting will be changed.

(12) Remove snap ring(827) and front cover(261) from front casing(171).

※ A groove is provided on the outer circumference of front cover straight with respect to drive shaft(111) by placing a minus type screwdriver in the groove.

※ Since oil seal(774) is fitted on front cover(261), take care not to damage it in removing.

45078MP06

(13) Loosen hexagon socket head cap screws(408) which tighten front casing(271)

(14) Separate front casing(171) and pump casing(271).

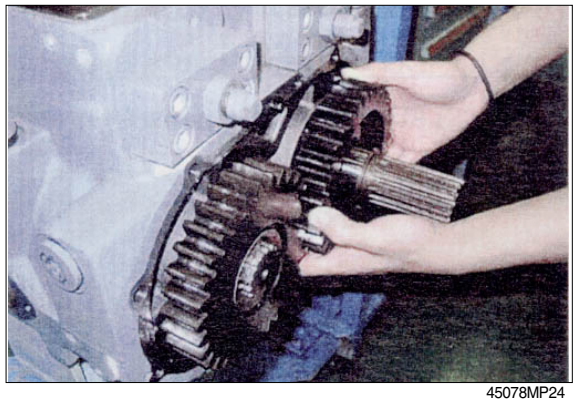
※ Take care of front casing not to fall because it is heavy(about 32kgf).

※ There are two spring pins(886) for fixing position between front casing(171) and pump casing(271). Tapping lightly with a plastic hammer, remove front casing(171) perpendicular to drive shaft(111) because they are fitted firmly. When removing, take care not to damage oil seal sliding surface of drive shaft(111).

※ Take care not to damage fitting surfaces between front casing(171) and pump casing(271).

45078MP07

(15) Remove snap rings(823, 825), bearing spacers(126, 127), drive gear(191), and driven gear(192).



45078MP24

(16) Remove snap ring(828) and bearing spacer(129) and take out drive shaft(111) and driven shaft(113) tapping lightly ends of them.

45078MP08

(17) If necessary, remove snap rings(824, 825), bearing spacer(128), and roller bearing(123) from drive shaft(111) and driven shaft(113).

※ Do not remove roller bearing as far as possible, except when it is considered to be out of its life span. Use a specified jig in removing because roller bearing is shrinkage fitted to shaft.

(18) Loosen hexagon socket head cap screws(405) which tighten swash plate supports(251) and pump casing(271).

※ Adhesive(No.1305N of threebond make) is applied to hexagon socket head cap screws(405).

(19) Remove swash plate supports(251) from pump casing(271).

※ This is the end of disassembling procedures.

45078MP09

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 repair 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 surfaces, bearings, etc. before assembling them.

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

⑤ Apply grease to O-rings, seat packing, and check valves in assembling them because they tend to come off.

⑥ In case of parallel type pump, rotating directions of drive shaft and driven shaft are different. Take care not to mix up parts of the drive shaft side with those of the driven shaft side.

⑦ For fitting bolts, plug, etc., prepare a torque wrench or so on, and tighten them with specified torques in this maintenance manual.

(2) Select place suitable to assembling.

※ Select clean place.

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

※ Fix pump casing(271) by using thread 2-M10 × 16 in assembling.

45078MP10

(3) Fit swash plates(251) to pump casing (271) and fix them with hexagon socket head cap screws(405).

※ There are O-rings(724) on the matching surface in contact with pump casing(271).

※ Fix them with grease so they do not come off.

※ Positioning pin(888) is placed on the pump casing(271) side. Adjust it so it enters the groove of swash plate support(251) and fix it.

※ Fit swash plate support(251) so it enters straight, while tapping it lightly.

※ Apply adhesive(No.1305N of three bond make) to hexagon socket head cap screws.

45078MP11

45078MP12

(4) To pump casing(271), fit drive shaft(111) set and driven shaft(113) set with roller bearing(123), bearing spacer(128), and snap rings(824, 825). Then fix them with snap rings(828).

※ Direct the sharp edge side of snap rings(824, 825) to the outside.

※ Do not tap shafts with hammer or so on.

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

※ Both side of snap rings(828) are burnished.

45078MP13

(5) Fit drive gear(191), driven gear(192), and bearing spacers(126, 127) to drive shaft(111) and driven shaft(113). Then fix them with snap rings(823, 825).

※ Confirm the attaching direction of drive gear before fitting.

※ Direct the sharp edge of snap rings(823, 825) to the outside.

45078MP14

(6) Fit front casing(171) to pump casing(271) and fix them with hexagon socket head cap screws(408).

※ Take care of front casing not to fall because it is heavy(about 32kgf).

※ There are two spring pins(886) for fixing position between front casing(171) and pump casing(271). Always fit spring pins (886) to the pump casing(271) side.

※ Fit front casing(171) to pump casing(271) perpendicular to drive shaft(111), while tapping it lightly because spring pin(886) has a tight fit. When fitting, take care not to damage oil seal sliding surface of drive shaft(111).

※ Take care not to damage fitting surfaces of front casing(171) and pump casing(271).

※ Apply grease to seat packing(752) because it tends to come off.

45078MP15

45078MP16

(7) Fit front cover(261) to front casing(171) and fix them with snap ring(827).

※ Apply grease lightly to oil seal in front cover.

※ Assembling oil seal, take full care not to damage it.

※ Direct the sharp edge of snap ring(827) to the outside.

45078MP06

(8) Place pump casing(271) horizontally. Fit servo piston(532), tilting pin(531), stopper(L, 534), and stopper(S, 535) to pump casing. Then fit servo cover(536) to pump casing and fix them with hexagon socket head cap screws(406).

※ Fix pump casing(271) by using thread 2-M10×16 in assembling.

※ In tightening servo piston(532) and tilting pin(531), use a protector to prevent tilting pin head and feedback pin from being damaged. In addition apply adhesive (No.1305N of threebond make) to their threaded sections.