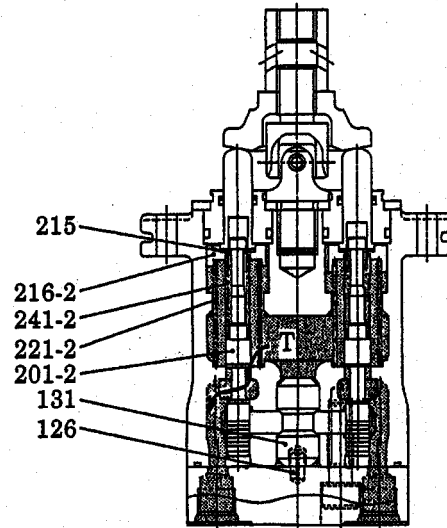


2.2 FUNCTION

(1) Pilot lever in neutral position

(See Fig. 4)

In this case, the force of the secondary pressure setting spring (241-2) that determines the output pressure of the pilot valve is not transmitted to the spool (201-2). Accordingly, the spool is pushed up by the return spring (221), spring seat (216-2) and washer 1 (215) permitting the output 2, 4 to connect with the tank port T. This makes the output pressure equal to the tank pressure.



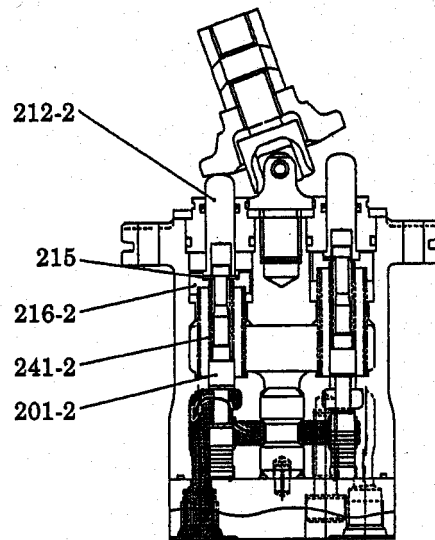
PORT 2,4 PORT 1,3

Fig. 4 Pilot lever in neutral position

(2) When the pilot lever is tilted

(See Fig. 5)

When the lever is tilted and the push rod (212-2) strokes, the spool (201-2) washer 1 (215) and spring seat (216-2) moves downward to make the port P to connect with the port 2, 4, with the result that the oil of the pilot pump runs out to the port 2, 4 to produce a pressure.



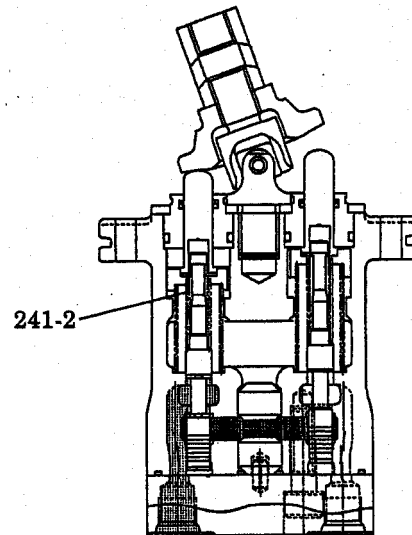
PORT 2,4 PORT 1,3

Fig. 5 When the pilot lever is tilted

(3) The pilot lever being held

(See Fig. 6)

When the lever is tilted till the pressure of the port 2,4 rises to an oil pressure corresponding to the set spring force, the hydraulic pressure is balanced with the spring (241-2) force, and when the pressure of the port 2,4 rises above a set pressure, the port P are closed and the port T are opened. When the pressure of the port 2, 4 falls below a set pressure, the port P are caused to open and the port T are caused to close, thus holding the second pressure constant.



PORT 2,4 PORT 1,3

Fig. 6 The lever being held

3 REMOVAL AND INSTALLATION

3.1 TOOLS


Table 2

No.	TOOL NAME	REMARK
a	Torque wrench	1.5~10kgf·m class (10~75ft·lbs)
b	Flat-bladed screw driver	Width 2~3mm, 4~5mm
c	Cross-recessed screwdriver	
d	General tools	Spanner and allen key wrench


3.2 REMINDERS ON REMOVAL AND INSTALLATION

- 1) Dust is extremely detrimental to hydraulic components.
For this reason, exercise sufficient care to prevent entry of dust when handling hydraulic components.
- 2) Handle the moving parts with sufficient care. In case a slight scratch is made on the moving surface, recondition it or replace the associated part.
- 3) The spools, spring seats and springs used in ports 1,3 and ports 2,4 of this pilot valve differ slightly in dimension ; before removing those parts, record the locations so they are installed in correct positions.

3.3 REMOVAL

- 1) Remove the lever assy, boots and lead wires from valve body (101). (See Fig. 7.)
 - 2) Fix the pilot valve to a vise, using copper plates (or lead plates).
 - 3) Put a wrench in the width across flats of the plate (302) and turn the disk counterclockwise till joint (301) gets loosened.
 : 22mm
 - 4) Remove the operating part of the lever (301, 302, 312) from the valve body (101).
 - 5) Remove plate (151).
 - 6) Remove plug (211) from valve body (101) so as not to exert uneven load upon it, utilizing the groove in the outer circumference of plug (211) and using a flat-bladed screwdriver (b).
- ⚠** Keep in mind that springs (221-1, 221-2, 241-1, 241-2) may pop out by the spring action when the plug (211) is drawn out.
- 7) Remove push rods (212) and spring seats (216-1, 216-2).
 - 8) Record the relative dimensions of the holes in the spool assy with the holes of valve body (101). Remove the spool assy from valve body (101).

- 9) Take off springs (241-1, 241-2).
- 10) Loosen socket bolts (125), using an allen key wrench and separate port plate (111) from valve body (101).

 : 6mm

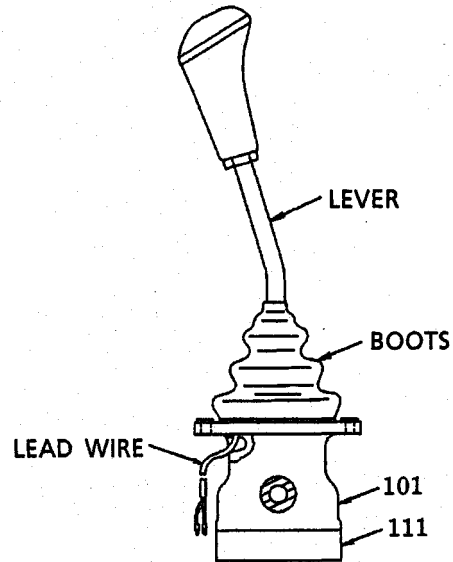


Fig. 7 Removing lever

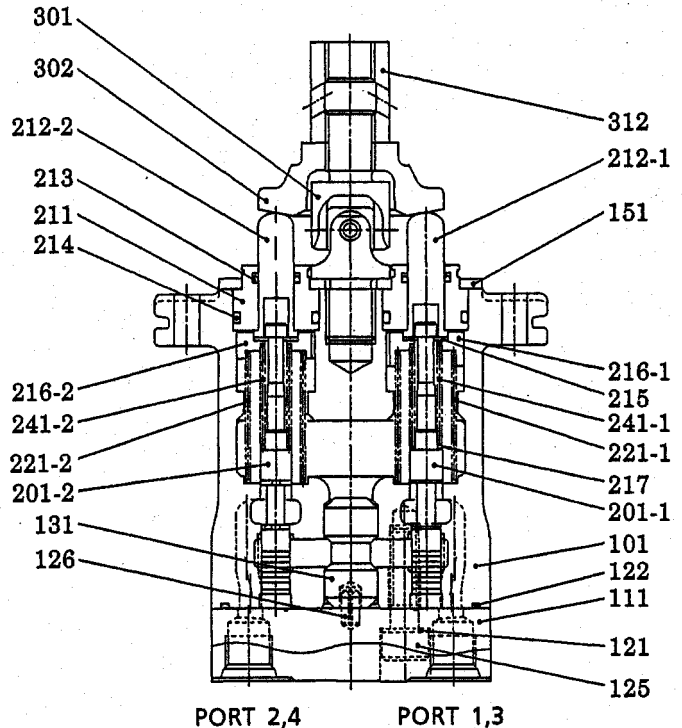



Fig. 8 Removing valve

11) In removing the spool assy, erect the bottom end of spool (201-1, 201-2) upright on a plain work bench, hang spring seat (216-1, 216-2) under it and take off the two semi-circular washers 1 (215) by the tip of a small screwdriver (within 6mm). (See Fig.9.)
On that occasion, use care so as not to score the surface of spool (201-1, 201-2).

12) Remove spool (201-1, 201-2), spring seat (216-1, 216-2), spring (241-1, 241-2) and washers 2 (217).

●Handle them as an assy till installation.

13) Loosen plate (302), adjust nut (312) and lock nut on the lever operating part, and remove joint (301). (See Fig. 8)

 : 22mm

3.4 INSTALLATION (SEE FIG. 10)

1) Before installation, wash parts with clean oil and dry them with jet air, Avoid using rag as much as possible.


●Before installation, always correct faults made during removal, clean parts, coat moving parts with oil and refit parts back in place.

2) Replace O rings with new ones.
Replace seal washers (121) with new ones, also.

3) Fit O rings (122) into valve body (101).

4) Install port plate (111) to valve body (101).
In that case, beware of the mounting position so that spring pin (126) can be set in the hole of valve body (101) side.

5) Tighten it slowly by turns to a specified torque, by two socket bolts (125) with seal washers (121).

 : 6mm,

Tightening torque: $3 \pm 0.3 \text{ kgf} \cdot \text{m}$
($22 \pm 2 \text{ ft} \cdot \text{lbs}$)

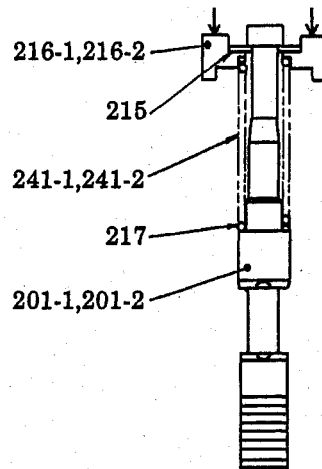


Fig. 9 Spool assy

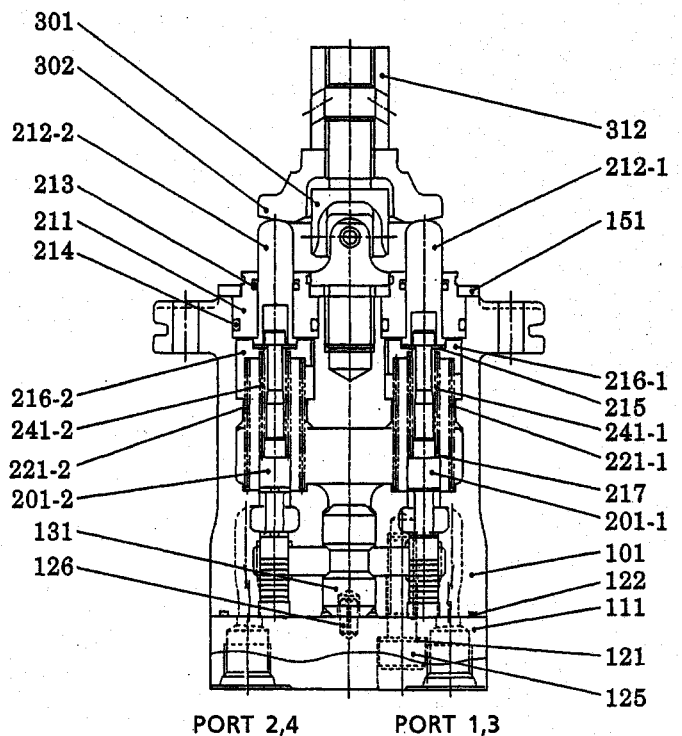




Fig. 10 Installation

- 6) Install washer 2 (217), spring (241-1, 241-2) and spring seat (216-1, 216-2) into spool (201-1, 201-2) in that order. (See Fig. 9.)
- 7) Erect the bottom end of spool (201-1, 201-2) upright on a plain work bench, push down spring seat (216-1, 216-2) within 6mm (0.24in) and insert two semi-circular washers 1 (215) into the top of spring seat (216-1, 216-2) so one washer not lie upon another.
- 8) Fix spring (221-1, 221-2) into valve body (101) so it was located before removal.
- 9) Place the reducing valve assy into valve body (101).
- 10) Place seal (213) in plug (211) so its lip is oriented according to Fig. 11. Then insert push rod (212) with spring seat (216-1, 216-2) into plug (211). Coat the surface of push rod (212) with hydraulic oil. (See Fig. 11.)
- 11) Fit O ring (214) to plug (211).
- 12) Fix the plug assy into valve body (101). (It stops because of the sliding resistance of the O ring.)
- 13) Attach plate (151) to valve body (101).
- 14) Fasten joint (301) against valve body (101) to a specified torque.

 : 22mm,

Tightening torque: $4.8 \pm 0.3 \text{ kgf} \cdot \text{m}$
 $(35 \pm 2 \text{ ft} \cdot \text{lbs})$

- 15) Attach plate (302) to joint (301) and fasten adjust nut (312) in a position where the plate contacts the tip of four push rods (212), to a specified torque.

 : 22mm,

Tightening torque: $7 \pm 0.5 \text{ kgf} \cdot \text{m}$
 $(51 \pm 4 \text{ ft} \cdot \text{lbs})$

- Fasten the adjust nut so the gap between plate (302) and push rod (212) gets below 0.2mm (0.008in).

- 16) Put a lead wire through the hole of the valve body and through the side hole in the adjust nut located between 60° and 120° and pull it out.
- 17) Put bushing (457) into plate (151) and run a lead wire through. Slacken the lead wire to an extent that is required for moving when operation is performed.
- 18) Apply heat resistant grease over the contact surface of the joint rotating part, the plate and the push rod.
- 19) Install the lever assy and the boots to valve body (101).

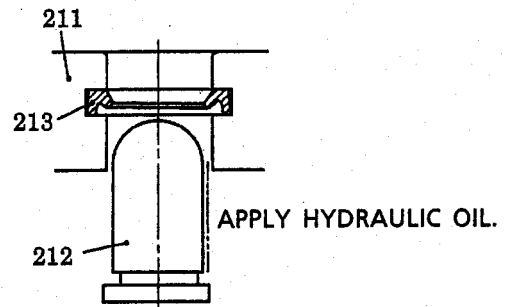


Fig. 11 Inserting push rod

4. MAINTENANCE STANDARDS

4.1 PARTS REPLACEMENT STANDARD

- 1) Replace O rings and other seals at each removal and installation.
- 2) Replace worn parts if leaks affects the operating system.
- 3) Replace spools having excessive wear on their moving areas.
- 4) Replace a push rod that is worn to 1mm (0.04in) or over on its top end. (See Fig. 12.)
- 5) Replace operating lever and pins that have a gap of 2mm (0.08in) or over.
- 6) Replace such parts that arise abnormal sounds, hunting and drops in the primary pressure.

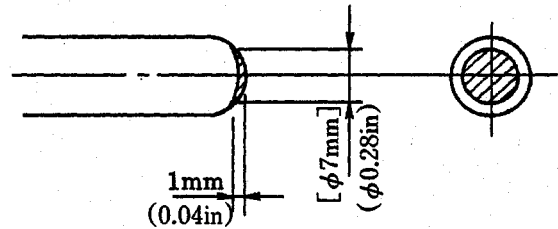


Fig. 12 Wear of push rod

5. TROUBLESHOOTING

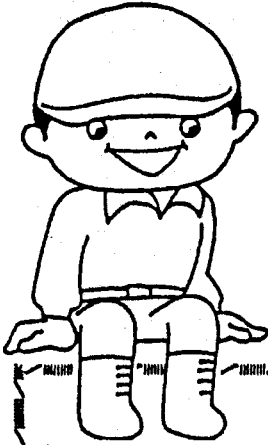
Trouble	Cause	Remedy
Secondary pressure does not rise.	<ol style="list-style-type: none"> 1) Primary pressure is insufficient. 2) Springs (241-1, 241-2) are broken or fatigued. 3) Clearance between spool (201-1, 201-2) and valve body (101) is abnormally large. 4) Lever has a gap. 	<ol style="list-style-type: none"> 1) Secure primary pressure. 2) Replace with new ones. 3) Replace assembly. 4) Disassembly and reassembly or replace lever section.
Secondary pressure is unstable.	<ol style="list-style-type: none"> 1) Sliding parts are caught. 2) Tank line pressure varies. 3) Air has mixed into pipeline. 	<ol style="list-style-type: none"> 1) Correct. 2) Bring pressure directly to oil tank. 3) Let air off.
Secondary pressure is high	<ol style="list-style-type: none"> 1) Tank line pressure is high. 2) Sliding parts are caught. 	<ol style="list-style-type: none"> 1) Bring pressure directly to oil tank. 2) Correct.

KOBELCO**SHOP MANUAL**

PILOT VALVE
(ATT, AB SHIFTER)
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PREFACE

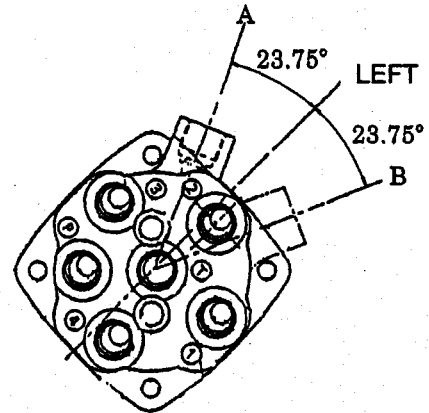
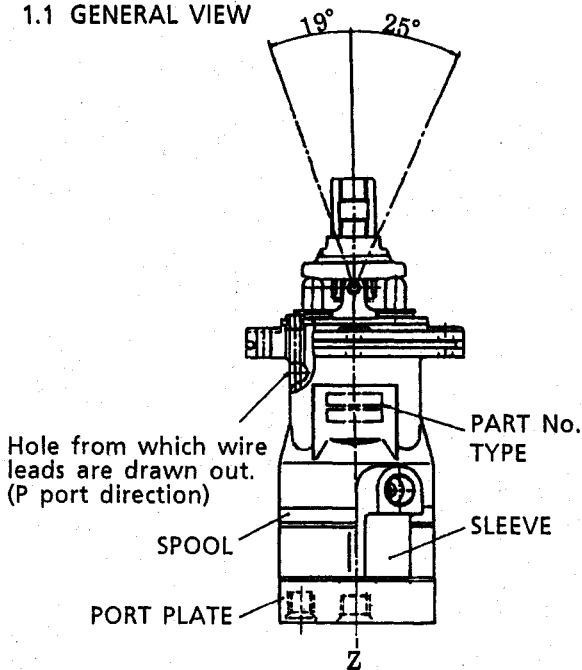
The pilot valve, called also remote control valve, is used for remote control. The pilot valve is a pressure reducing valve that contains four reducing valves in the valve casing. If the operating lever is operated, the primary pilot pressure discharges the reduced secondary pressure in proportionate to the tilting angle of the operating lever. This delivery pressure is called secondary pilot pressure (reduced proportionate). The AB shifter pilot valve is used only for left-hand operation. The feature of this valve is that double action becomes possible if the AB shifter is turned 90°.

Models	Applicable Machines	Notes	Models	Applicable Machines	Notes
SK15SR	PU06001~				
SK20SR	PM02001~				

Revision	Date of Issue	Remarks
First revision	July, 1997	S5130845E S

1. SPECIFICATION

1.1 GENERAL VIEW



VIEW Z

Port size	Tightening torque kgf·m(ft·lbs)	Port Name	Function
PF 1/4	3.7±0.2 (26.8±1.4)	1~4	Operating secondary pressure port
		T	Tank port
		P	Pump port

Fig. 1 General views of pilot valve

1.2 SPECIFICATION

Table 1

Part No.	PM30V00016F1
Type	TH40MR1014
Operating torque	Refer to Fig.2 (Single operation, max.)
Operating angle	25° (Ports 1, 3) 19° (Ports 2, 4) (Single operation, max.)
Weight	approx 5kg (11lbs)

PORT 2, 4

1.3 PERFORMANCE CHARACTERISTICS

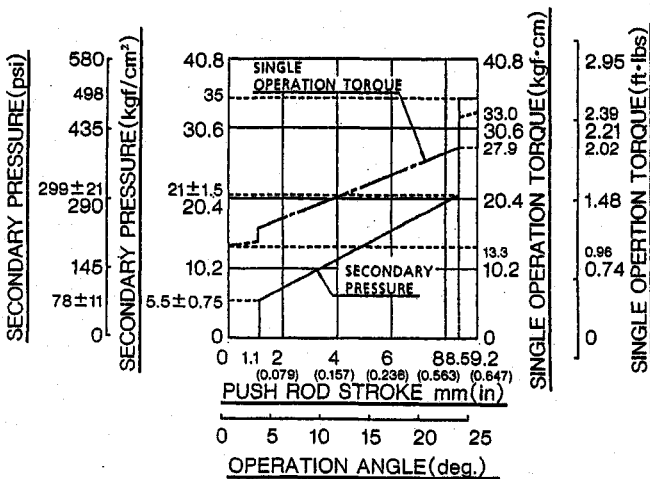
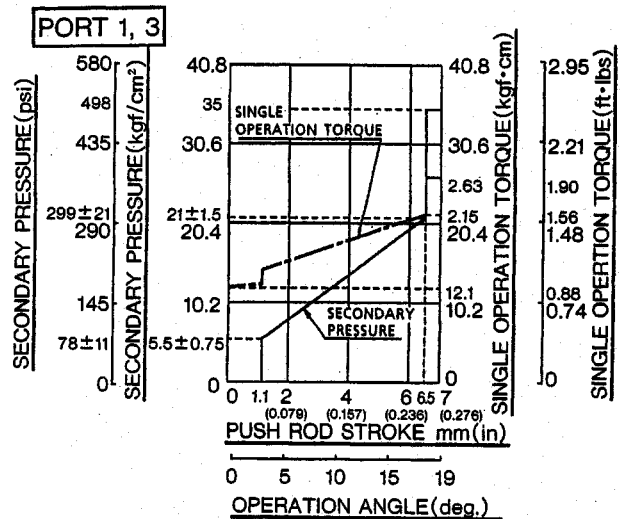
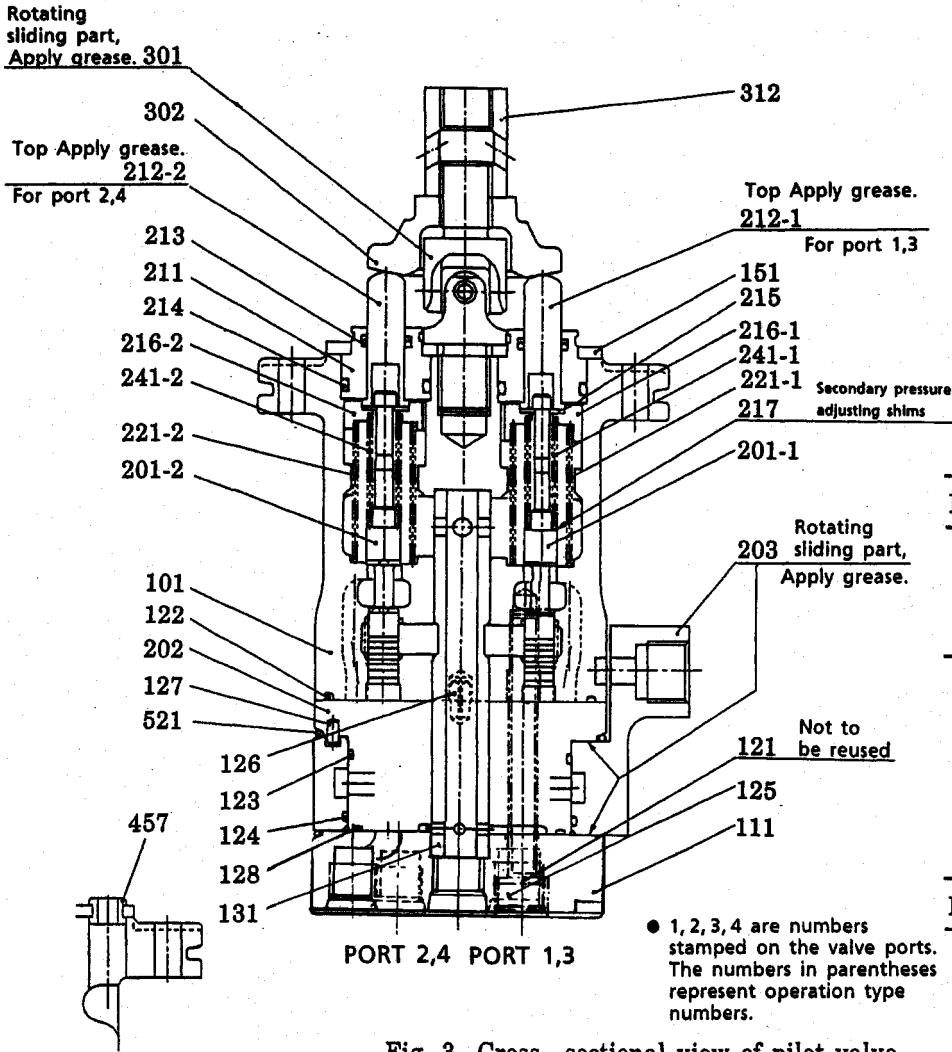


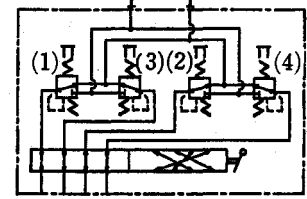
Fig. 2

2. CONSTRUCTION AND FUNCTION

2.1 CONSTRUCTION

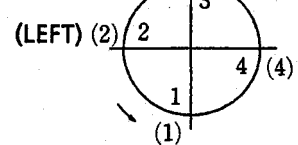


Relation between left operation No. and valve port



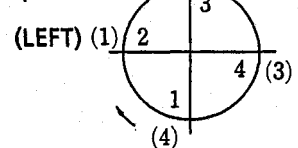
1 3 2 4
HYDRAULIC SYMBOLS

A type left operation (3) (FRONT)



Port	Operation	A type operation No.
1	ARM DIGGING	(1)
2	SLEWING LEFT	(2)
3	ARM EXTEND	(3)
4	SLEWING RIGHT	(4)

B type left operation (2) (FRONT)



Port	Operation	B type operation No.
1	ARM DIGGING	(4)
2	SLEWING LEFT	(1)
3	ARM EXTEND	(2)
4	SLEWING RIGHT	(3)

Fig. 3 Cross-sectional view of pilot valve

Tightening torque kgf·m	No.	NAME	Q'TY	Tightening torque kgf·m	No.	NAME	Q'TY
3±0.3	101	CASING	1	4.8±0.3	212-1	PUSH ROD	2
	111	PORT PLATE	1		212-2	PUSH ROD	2
	121	SEAL WASHER	2		213	SEAL	4
	122	O RING	1		214	O RING ; 1B P20	4
	123	O RING	1		215	WASHER 1	8
	124	O RING	1		216-1	SPRING SEAT	2
	125	SOCKET BOLT; M8×65	2		216-2	SPRING SEAT	2
	126	SPRING PIN	1		217	WASHER 2	4
	127	PARALLEL PIN	1		221-1	SPRING	2
	128	O RING	1		221-2	SPRING	2
	131	BUSHING	1		241-1	SPRING	2
	151	PLATE	1		241-2	SPRING	2
	7±0.5	201-1	SPOOL		2	301	JOINT ; M14
201-2		SPOOL	2	302	PLATE	1	
202		SPOOL	1	312	ADJUST NUT ; M14	1	
203		SLEEVE	1	457	BUSHING	1	
	211	PLUG	4	521	O RING	2	