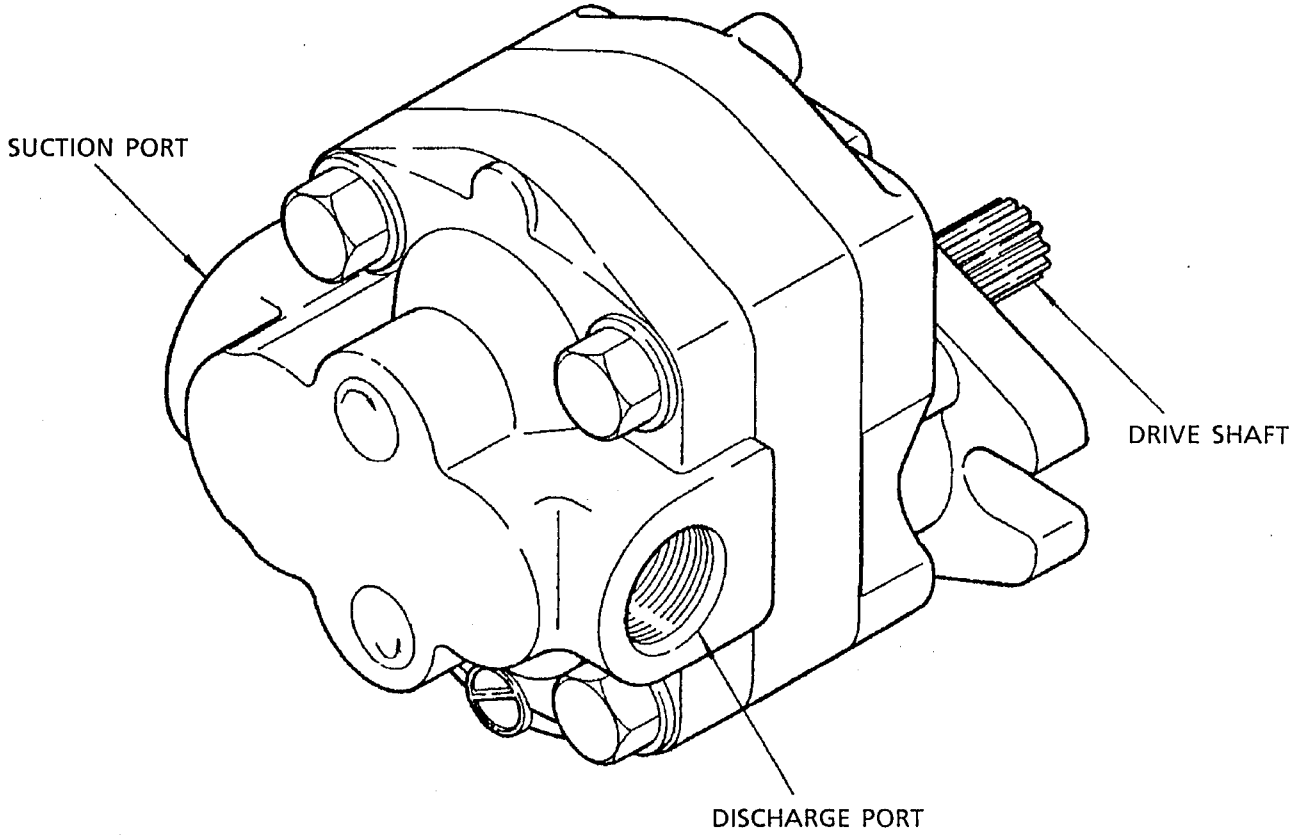


# 1. SPECIFICATION

## 1.1 GENERAL VIEW



## 1.2 MAJOR SPECIFICATIONS

Fig.1 Right (Clockwise) Revolution Type

Table 1

Item		Specification of an actual machine
Pump models		KP10-11CLFSS
Displacement capacity	cc/rev (cuin/rev)	11.2 (0.683)
Max. pressure	kg/cm <sup>2</sup> (psi)	MAX 55 (782)
Revolution	(r.p.m)	600~2,200
Suction side pressure	kg/cm <sup>2</sup> (psi)	-0.2~1.2 (2.84~17.1)
Revolution direction (See from drive shaft side)		Right (Clockwise)
Port	Suction	PF <sup>3/4</sup> (JIS O ring port)
	Discharge	PF <sup>3/8</sup> (JIS O ring port)
Weight	kg (lbs)	About 1.8 (3.97)

## 2. CONSTRUCTION AND FUNCTION

### 2.1 CONSTRUCTION

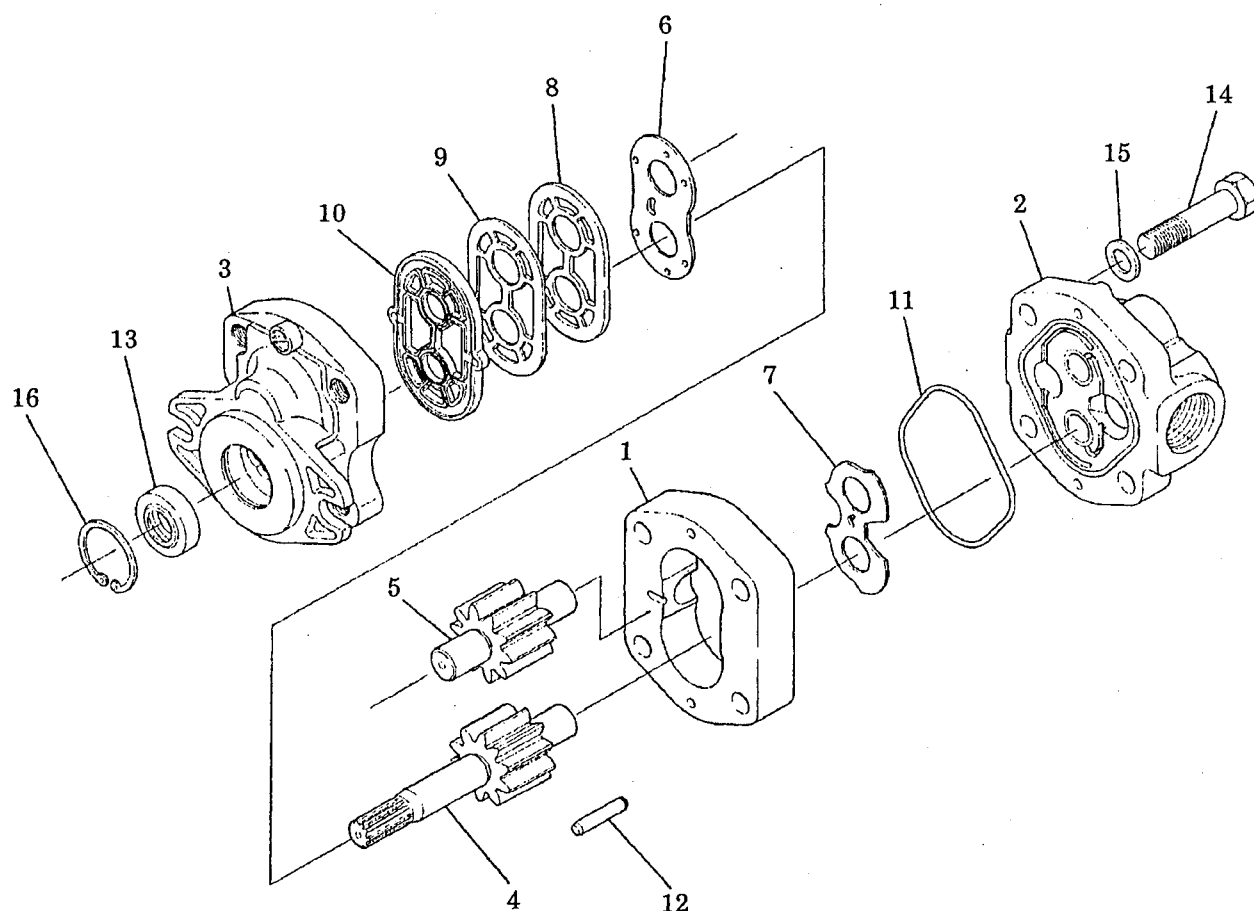


Fig.2 Right (Clockwise) Revolution Type

Table 2

No.	Port name	Q' ty	No.	Port name	Q' ty
1	GEAR PLATE	1	9	GASKET B	1
2	COVER	1	10	BALANCE SEAL	1
3	MOUNTING FLANGE	1	11	O RING	1
4	DRIVE GEAR	1	12	DOWEL PIN	2
5	DRIVEN GEAR	1	13	OIL SEAL	1
6	SIDE PLATE A	1	14	BOLT	4
7	SIDE PLATE B	1	15	WASHER	1
8	GASKET A	1	16	SNAP RING	1

The casing consists of the gear plate (1), cover (2), and mounting flange (3). Incorporated in the casing are a pair of gears—drive gear (4) and driven gear (5)—and bushings supporting the gears, that are press fitted into the cover and the routing flange. On the side of the mounting flange are incorporated a pair of side plates—side plates A (6) and B (7)—that seal off the leak from

the side face of the gears, balance seal (10), gasket A (8) and gasket B (9) that form pressure compensation chamber.

In order to prevent oil leakage outside, an O ring (11) is provided to the cover (2) while the oil seal (13) and the balance seal (10) are used in the mounting flange (3)

## 2.2 Mechanisms Unique to Gear Pump

### (1) Trapping

The state which part of the hydraulic oil is confined between two meshing teeth is called "trapping". From the beginning to the end of the trapping the volume (C) between the teeth changes due to the contraction and expansion of the oil. The oil expansion may create a negative pressure which separates the air dissolved in the oil to form air foams, thereby causing cavitation and vibration of the gears.

Relief slots G and G' are provided in the side plate A(6) and side plate B(7), respectively, to prevent such problems.

### (2) Special loading mechanism

Two side plates A(6) and B(7) face each other across both gears (4) and (5). At the back of the side plate A(6) is provided a pressure compensation chamber partitioned by the balance seal (10), gasket A(8) and gasket B(9). The discharge pressure of the pump is admitted to the pressure compensating chamber from the slot "P" provided on the discharge side of the gear plate (1) through the hole "A" of the balance seal, thus keeping the side plate A(6) constantly pressed toward the gear side. However, the hydraulic pressure acting on the side plate A(6) from the gear side varies with such elements as discharge pressure, suction pressure, revolution, oil temperature, hydraulic oil viscosity and how the hydraulic oil is contaminated. In order to maintain high efficiency of the pump under such circumstances, the rear face of the side plate A(6) is marked off into eight areas by the balance seal (10), gasket A(8) and gasket B(9), and pressure of the gear side linked to that of the marked-off areas by way of the six holes "B" in the side plate and the cutouts (S) and (D) on the side plate of the suction side, thus balancing the oil pressure on both faces of the side plate A(6).

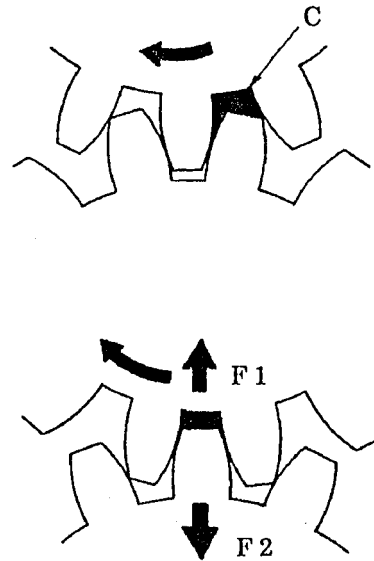


Fig. 3 Confinement of oil

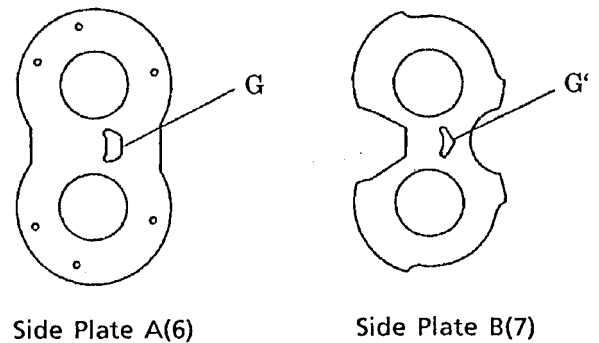


Fig. 4 Relief grooves in side plates

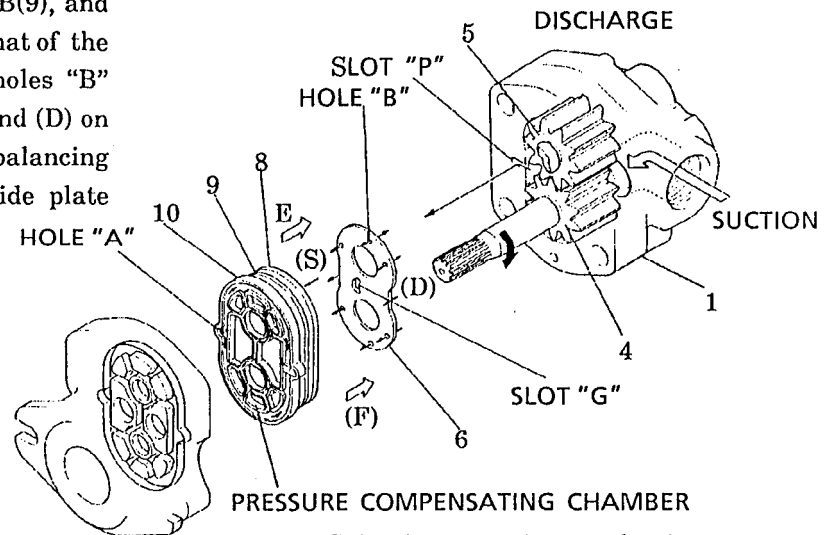


Fig. 5 Side plate pressing mechanism

### 3. DISASSEMBLY AND ASSEMBLY

#### 3.1 TOOLS

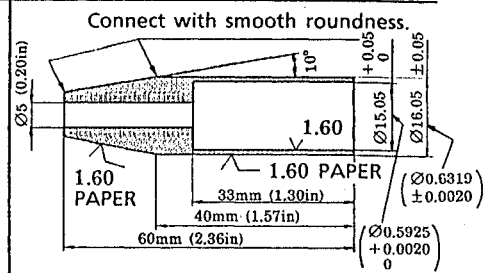
Select a clean, less dusty place and prepare cleaning oil, hydraulic oil waste and tools.

	Tools	Description
a	Work bench with vise	
b	Pliers (for shaft)	For snap ring (16)
c	Screw driver	Minus, medium size
d	Box wrench	14mm
e	Hammer	Tightening torque :3.5~4.0kgf·m (25.3~28.9ft·lbs)
f	Torque wrench	Plastic mallet

#### 3.2 DISASSEMBLY

Before disassembly, wash the pump outside clean. Place disassembled parts on a clean bench or cloth and handle them with care so as not to spoil or damage them.

- 1) Pinch the mounting flange of the pump in a vise with the flange downward, loosen bolt (14) and remove washer (15).

Tools	Description
g Oil seal fitting tool	<p>Connect with smooth roundness.</p> 

- 2) Remove cover (2), O ring (11) and side plate B (7).

☞ Remove the cover straight toward the axial direction. If it is difficult to remove, tap the cover lightly toward the axial direction with a plastic mallet.

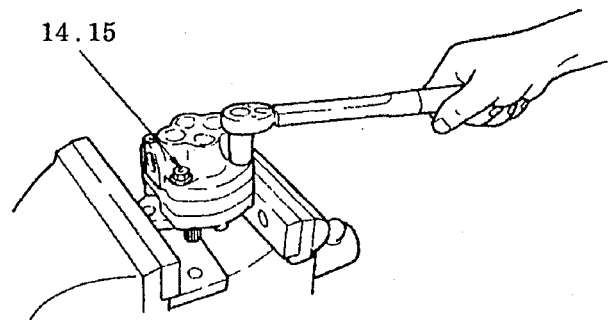


Fig. 6 Removing bolts

- 3) Remove drive gear (4) and driven gear (5).

☞ At this time, make a matching marks on each shaft end gear for identification at assembly.

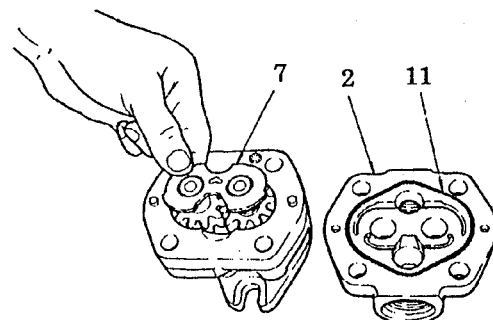


Fig. 7 Removing the cover

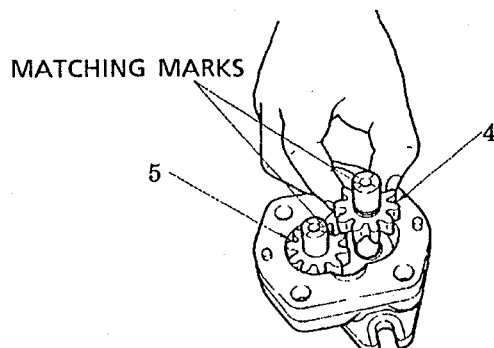


Fig. 8 Removing the gear

- 4) Draw out the side plate A (6) at the bottom of the gear plate (1) straight and level.

☞ At this time take care not to incline the side plate. Otherwise the side plate may become hard to take out. In case the side plate gets stuck, hold the drive shaft end of the drive gear (4), insert it into the gear plate and force the raised part of the side plate into the shaft. The side plate will sink in the original position.

Try to take it out again.

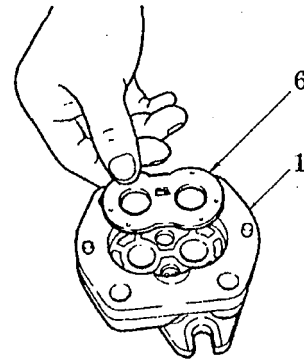


Fig. 9 Drawing out the side plate

- 5) Remove gear plate (1) from mounting flange (3). Tap around the gear plate lightly with a wooden mallet.

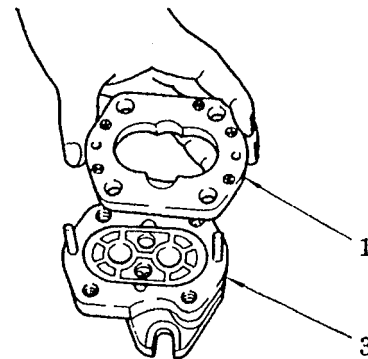


Fig. 10 Removing the gear plate

- 6) Remove balance seal (10), gaskets A(8) and B(9).

☞ Insert the end of a screw driver into the hole of the balance seal (10) and pry it up.

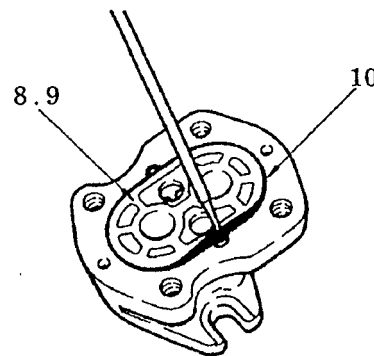


Fig. 11 Removing the balance seal, etc.

- 7) Remove snap ring (16) and take out oil seal (13), using a screw driver.

☞ Do not disassemble the oil seal except when necessary, as it can not be reused once removed.

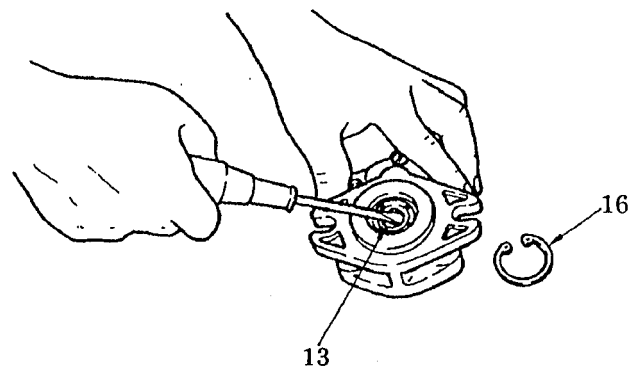


Fig. 12 Drawing out the oil seal

### 3.3 INSPECTION BEFORE ASSEMBLY

Inspect disassembled parts for contamination and flaw and then wash them with hydraulic oil light oil.

Do not immerse rubber parts in light oil.

Inspect the following parts and if any abnormality is found, repair or replace them.

#### 1) Gear plate

In order to improve efficiency the gear pump is so constructed that the gear tooth ends run in slight contact with the gear plate in run-in state. Therefore the gear pump once run has a contact mark near the suction port.

A normal contact mark is not longer than half the inner circumference of the gear hole and not deeper than 0.1mm(0.0039in).

In case of  $a \geq 0.15\text{mm}(0.0059\text{in})$ , replace the gear plate with a new one.

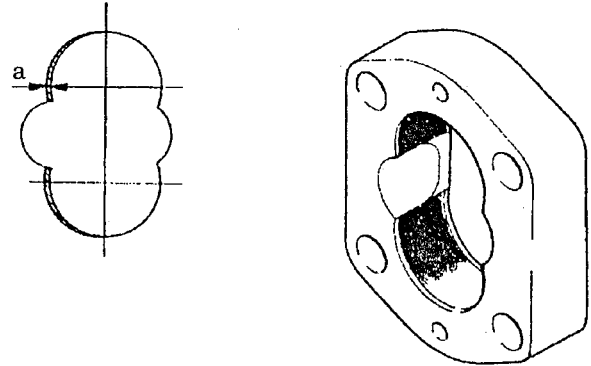


Fig. 13 Measuring the gear plate

#### 2) Drive gear and driven gear

The shaft and gear side faces take on a smooth contact state with little deterioration of surface roughness as long as the hydraulic oil is clean. If the shaft and gear side faces are roughened to the extent that you can not slide your nail smoothly on the surfaces, replace them with new ones.

If the shaft diameter ( $\varnothing D$ ) is less than 14.96mm(0.59in), replace the with a new one.

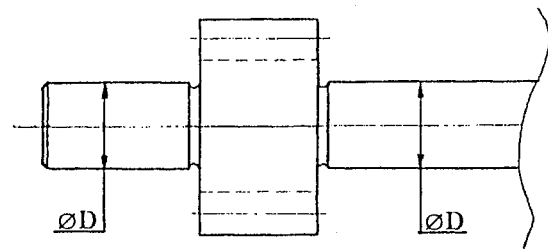


Fig. 14 Measuring the gear

#### 3) Side plates A and B

The side plates are normal if the copper alloy side shows a lusty contact mark.

Replace the side plate with a new one if you have found any scratch in radial direction that may be scratched with your nail.

☞ The non-contact face of the copper alloy side takes on a lustless pear-skin state.

This is not unusual.

#### 4) O ring

Always replace with new ones once removed.

#### 5) Balance seal

Always replace with new ones once removed.

6) Oil seal

The oil seal prevents oil leak with its inner seal lip while it keeps off dust with its dust lip.

Inspect the seal lip for scratch, deformation and elasticity, and if there is any abnormality, replace the seal with a new one.

7) Gasket A

Always replace with a new once removed.

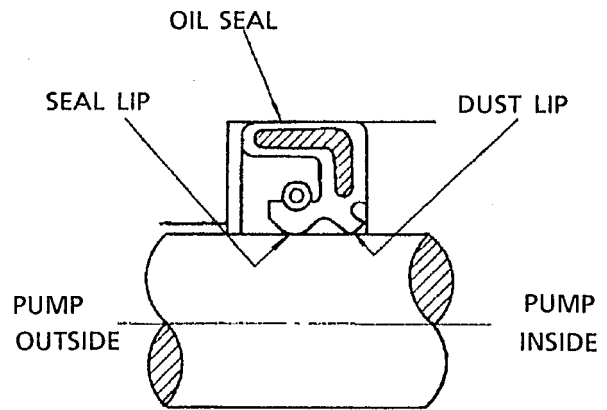


Fig. 15 Checking the oil seal

3.4 ASSEMBLY

Wash each part before assembly.

- 1) Force fit oil seal (13) into mounting flange (3), using oil seal fitting tool (a) and put in snap ring(16).

☞ It is not necessary to coat sealing compound over the perimeter of the oil seal.

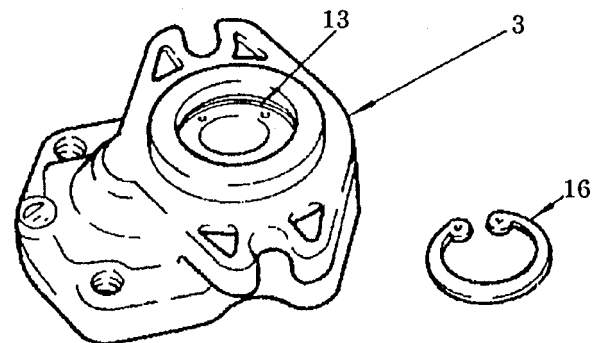


Fig. 16 Pressing in the oil seal

- 2) Push both projections of balance seal (10) lightly with your fingers, insert it into the slot of mounting flange (3) and put the entire seal into the groove with a screw driver.

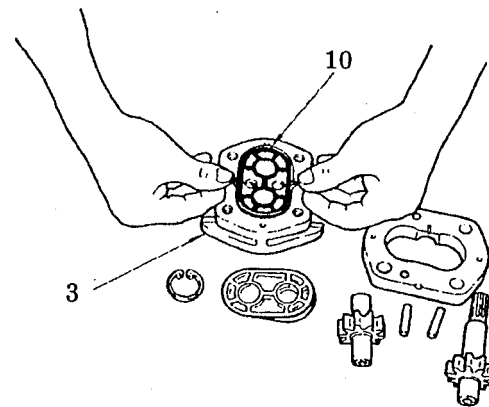


Fig. 17 Fixing the balance seal

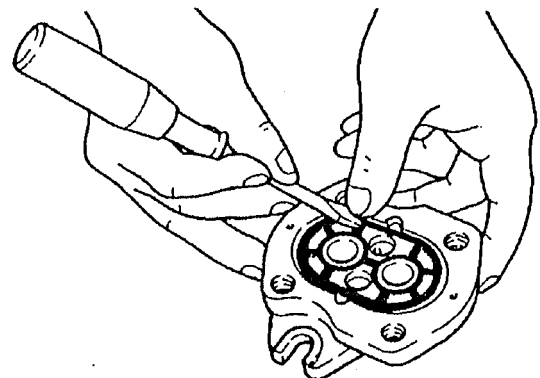


Fig. 18 Fixing a seal into the seal groove

☞ Although the balance seal is symmetrical with respect to its center, it has a face and back.

The face with a groove is the mounting flange side while the flat face is the gear side. Reversed fitting will cause a fusion of gears.

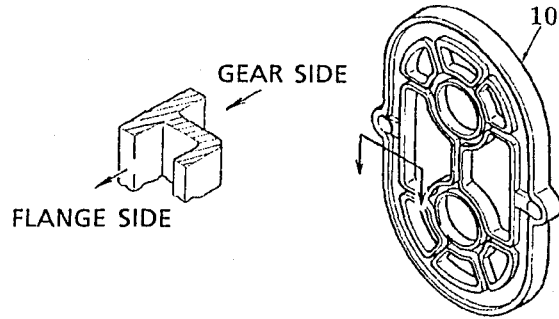


Fig.19 Checking the face and back of the balance seal

3) Mount gaskets B (9) on the balance seal (10) and then gasket A (8) on top of it, in that order.

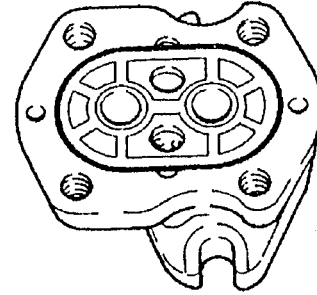


Fig. 20 Attaching a gasket

- ☞ • Gaskets A and B are symmetrical with each other.
- Gasket A is about 1.5mm (0.06in) thick and gasket B about 0.5mm(0.02in) thick.
- Fit gasket A with its square edges facing the gear side.

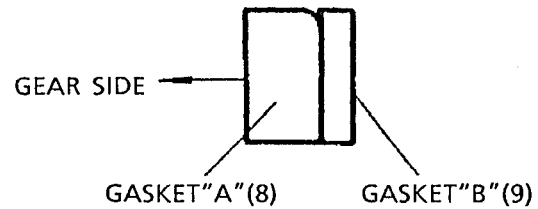
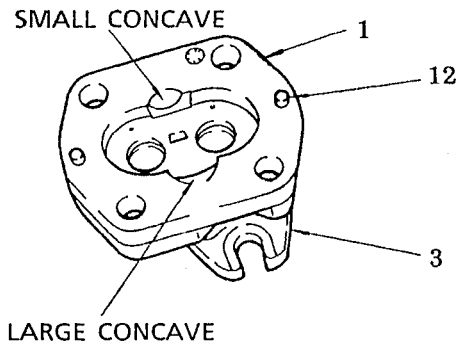
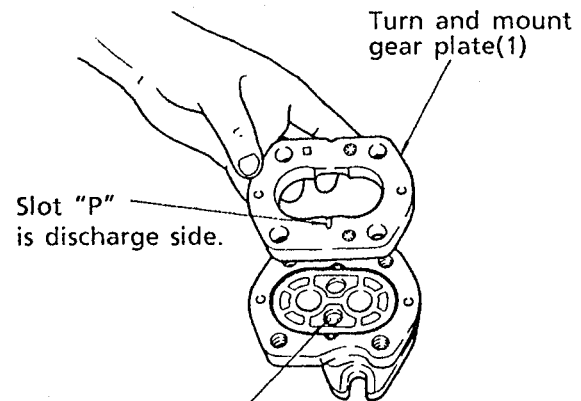


Fig. 21 Checking corner contact of gasket

4) Put dowel pin (12) in gear plate (1) and assemble it into mounting flange (3).  
The face with a large concave is the suction side.  
Assemble with the concave side up or facing the cover side.



- ☞ • Two dowel pins(12)are for positioning.
- The direction of assembly is as shown in Fig. 22.



Drain hole is suction side.

Fig. 22 Fitting the gear plate



- 5) Put side plate A (6) deep into the gear plate with its copper alloy face facing upward. In case it gets stuck at an oblique angle, tap the high portion lightly with the handle of a wooden mallet and insert the side plate level. Coat the copper alloy face with hydraulic oil.

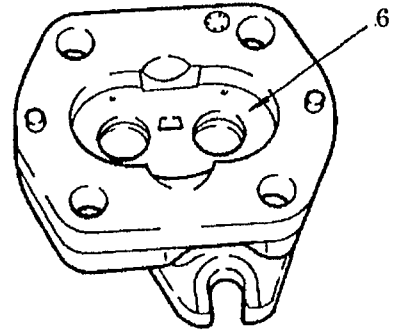


Fig. 23 Fixing side plate A

- 6) Assemble drive gear (4) and driven gear (5) together.

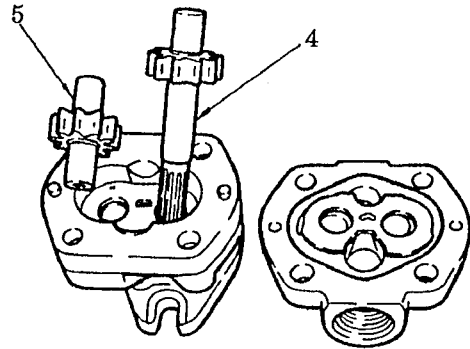


Fig. 24 Fixing gears

- ☞ • Reassemble so as to match the matching marks at disassembly.
- Take care not to damage the lip of oil seal (13) placed in mounting flange (3).

MATCHING MARKS

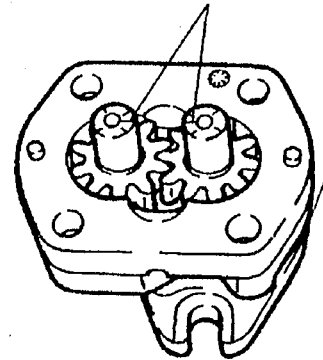


Fig. 25 Checking the matching marks

- 7) Assemble side plate B(7) into gear plate (1) with its copper alloy face down.

- ☞ Coat the copper alloy face with hydraulic oil.

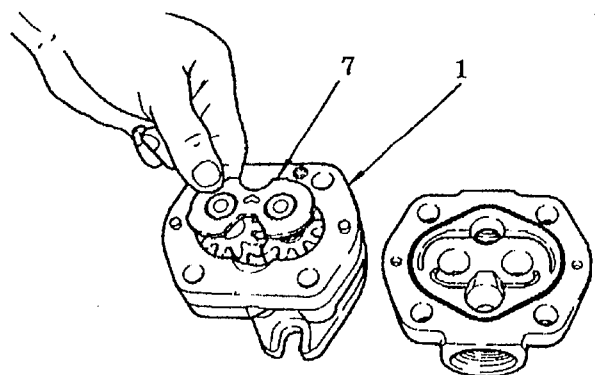


Fig. 26 Fitting side plate B

- 8) Fit O ring (11) in cover (2) and mount cover (2) on gear plate (1).

- ☞
- Bring the letters "IN" to suction side.
  - If there is a gap of over 1.3mm (0.05in) between cover(2) and gear plate (1) when the cover is pushed lightly. it indicates that O ring(11) is off the slot. Remove the cover again and refit the O ring in place.

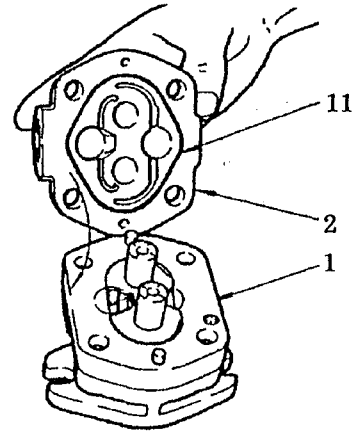


Fig. 27 Attaching the gear plate

- 9) Install washers(15) and bolts(14) Pinch the pump mounting flange of the mounting flange(3) in a vise with a torque of 3.5~4.0kgf·m (25~29ft·lbs)

- ☞ Wet the threaded parts by spraying hydraulic oil and fit bolts.

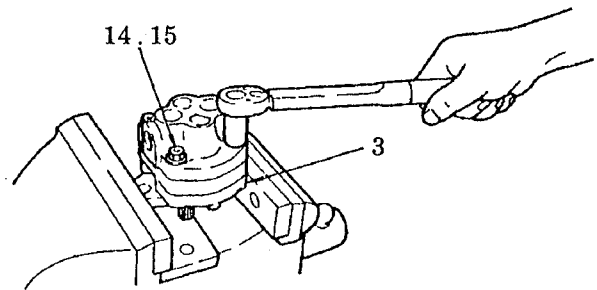


Fig. 28 Fastening bolts

- 10) Hold the end of the drive gear shaft in a vise and turn the pump. Assembly is complete if the pump can be turned lightly. In case the pump cap not be turned with ease. the seal may be bound or pinched. Disassemble the pump and assemble it again.

- 11) This completes assembly, but pay attention to:
- a) that the rotation direction is correct,
  - b) that all parts are assembled,
  - c) that the spigot part of the pump has no struck burn,
  - d) that the pump mounting surface has no struck dent, and
  - e) that there is no flaw or dirt on the pump piping.