WHEEL MOTOR INSTRUCTION MANUAL

FOR MODEL: PHV-2B-2022A-P-10

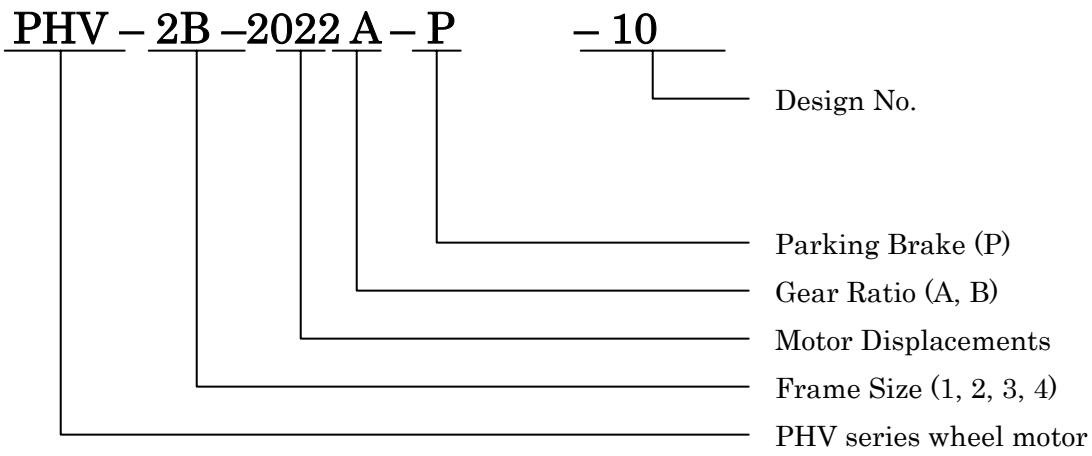
JULY., 2007

NACHI-FUJIKOSHI CORP.

REF#: HD0-020701 (KJA)

CONTENT

1.MODEL CODE



2.SPECIFICATIONS

Speed reducer		
	Max. output torque	1152 N-m. {117 kgf-m}
	Max. output speed	34.2/67.7 min^{-1}
	Gear ratio	1/36.96
Hydraulic motor		
	Displacement	12.4/6.2 cm^3/rev
	Max. operating pressure	19.0 MPa {194 kgf/cm^2}
	Max. output speed	1264/2503 min^{-1}
	Max. flow	16 l/min
	Parking brake static friction torque	16.7 N-m {1.7 kgf-m}
	Parking brake releasing pressure	1.5 MPa {15 kgf/cm^2}
	Speed control pressure	1.5 MPa {15 kgf/cm^2}
Relief valve		
	Cracking pressure	None
	Setting pressure	None

Displacement / Final revolution	458.3/229.2 cm^3/rev
Other	
Oil	ISO VG46
Oil temp.	-20 to 100 degree C
Filtration	10 μ m
Gear oil	SAE-30-CD Amount: 330 cm^3
Mass	17 kg
Paint color	Under coat: Red Top coat: None

3.CROSS SECTION DRAWING

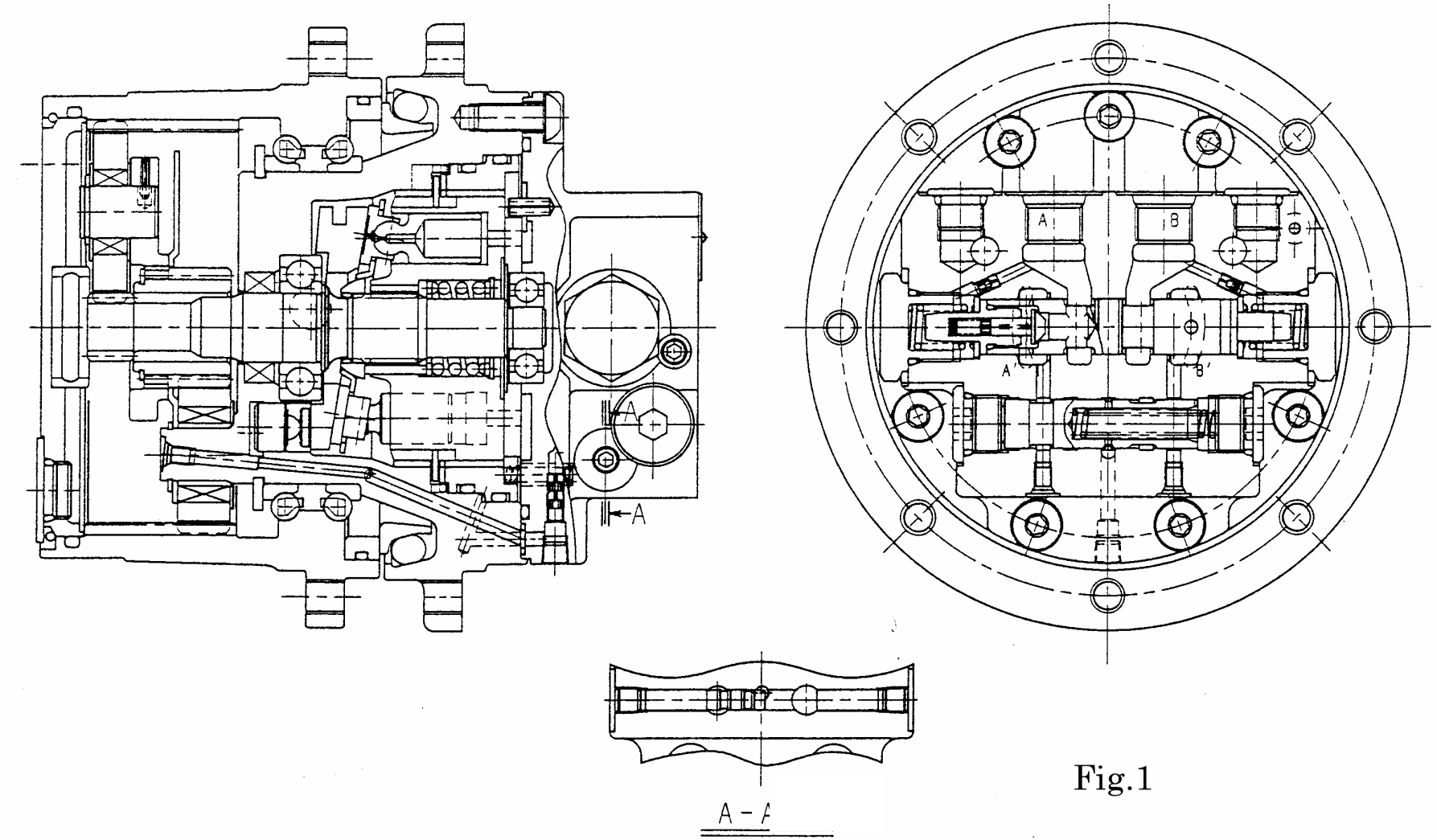


Fig.1

4.OPERATION PRINCIPLE

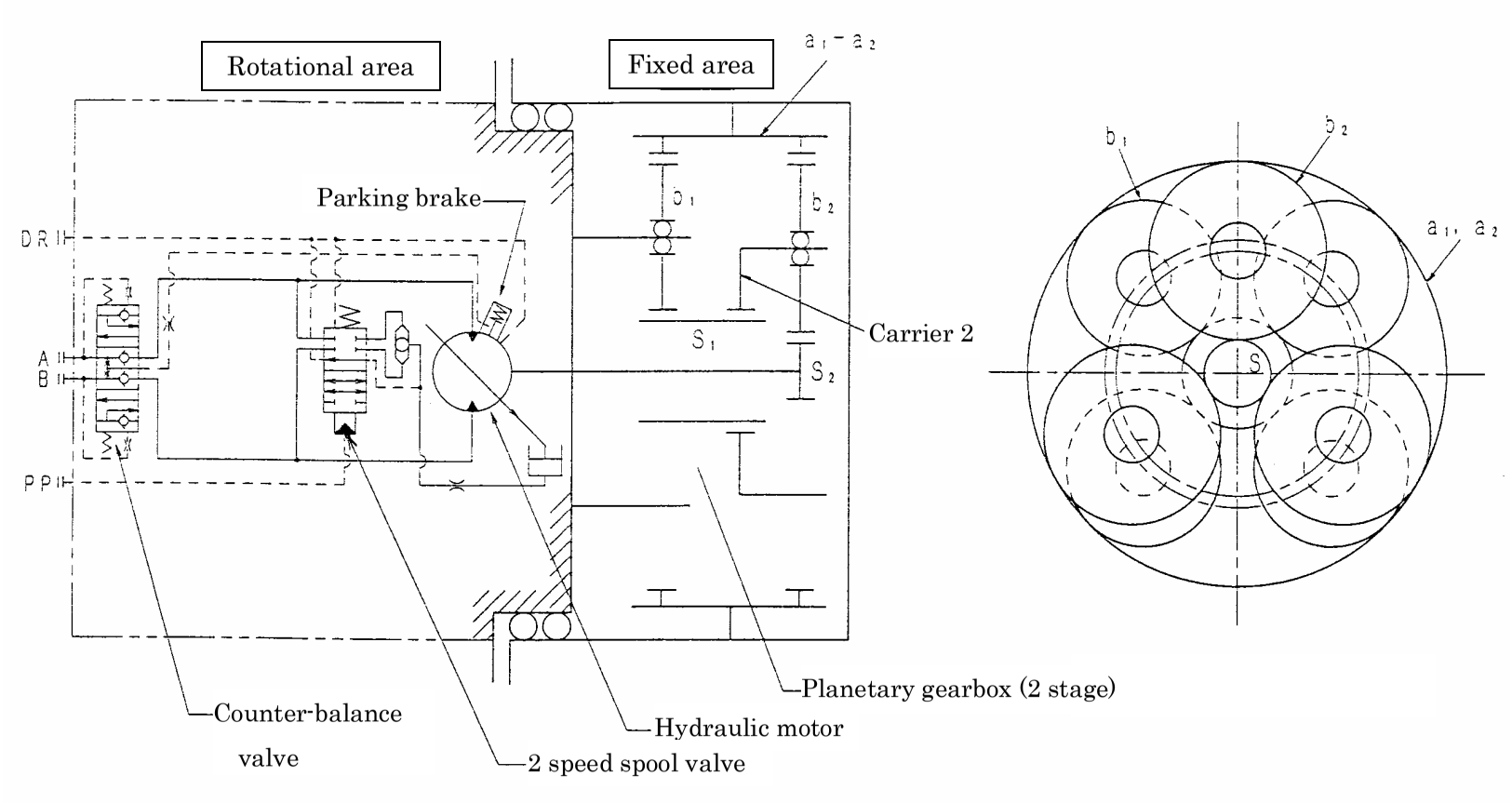


Fig.2

5. OPERATION

PHV series wheel motors consist of the hydraulic motor " Fixed parts" and the simple planetary gear speed reducer "Rotation parts."

A. REDUCTION GEAR SECTION

1). Work

PHV series wheel motor speed reducer is 2 stage simple planetary gear type, and getting the body case rotation by changing the hydraulic motor high output speed to reduced low speed with high torque.

2). Operation

The s2 gear is attached to the hydraulic motor shaft, and the s2 output speed is reduced between the gears (s2, b2, a2) as the first stage speed reducer.

The reduced output speed of this first stage is reduced again between the gears (s1, b1, a1) which are connected to the carrier2 with the spline.

This reduced output speed of the second stage is transmitted to the body case "Rotation parts" through the inner gears (a1, a2) and makes the driving force.

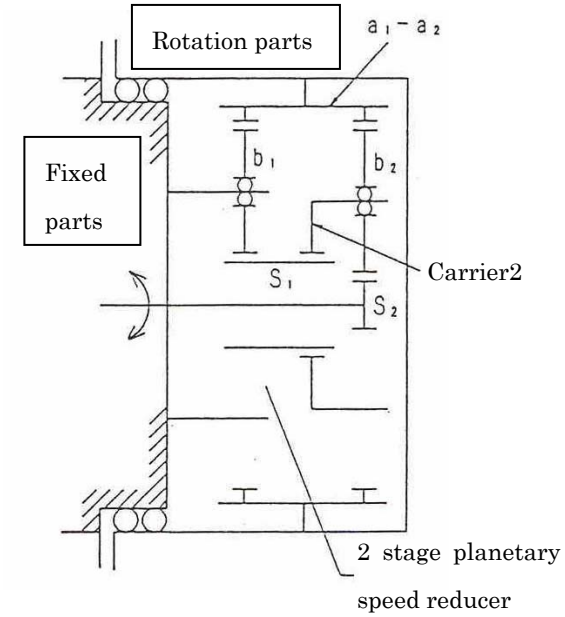


Fig.3

The gear ratio of 2 stage simple planetary speed reducer is calculated using the following formula.

$$R = \frac{Zs_1}{Zs_1+Za_1} \times \frac{Zs_2}{Zs_2+Za_2}$$

Note Z_{**} : Number of teeth

With the PHV series wheel motor, the body case is rotating, so the gear ratio is;

$$R' = \frac{1}{1 - 1/R}$$

B. HYDRAULIC MOTOR SECTION

1). Work

This hydraulic motor is a axial piston type, and changes the hydraulic energy supplied from the pump to the rotational motion.

2). Structure

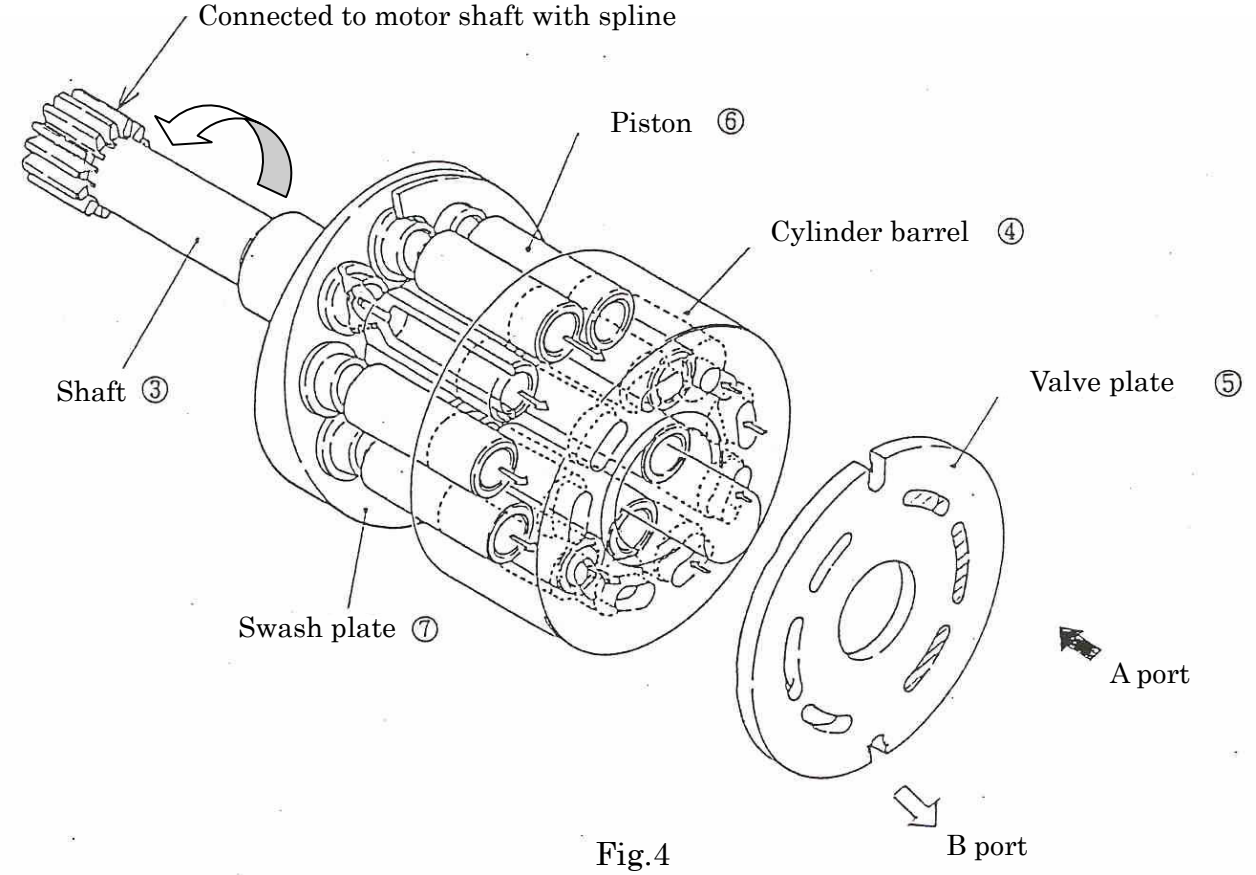


Fig.4

Through a hydraulic valve, the pressurized oil is supplied to the valve plate (5). When the pressurized oil is supplied to the (A) port, this pressurized oil pushes the piston (6) in the cylinder barrel (4). This pushing force is changed to the rotational power by the swash plate (7) and transmitted to the shaft (3) which is connected to the cylinder barrel (4) with the spline. The return flow from the cylinder port is going out through the (B) port of the valve plate (5). To reverse rotation, pressurized oil is supplied to the (B) port and returning oil exits through the (A) port.

3). 2 speed motor operation

The swash plate, which has Ⅰ and Ⅱ surface in the opposite side to the shoe sliding surface, is supported by the 2 balls which is fixed to the body 2.

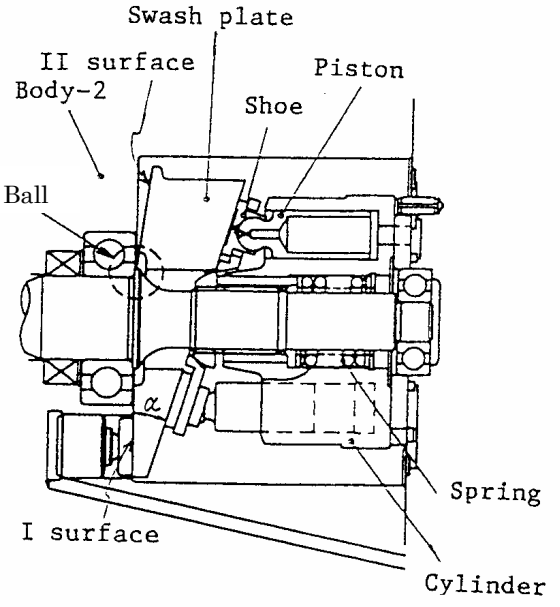
Since the balls are located in the eccentric position, in the low speed range, the Ⅰ surface is faced to the body 2 by the oil pressure in the piston and the spring force in the cylinder barrel. The swash plate angle is α (Max. capacity).

When the speed change lever is changed, the pressurized oil is led to the control chamber which is made by the stopper ring and the control cylinder.

The control cylinder moves forward until the Ⅱ surface of swash plate is attached to the body 2, and the swash plate angle becomes β.

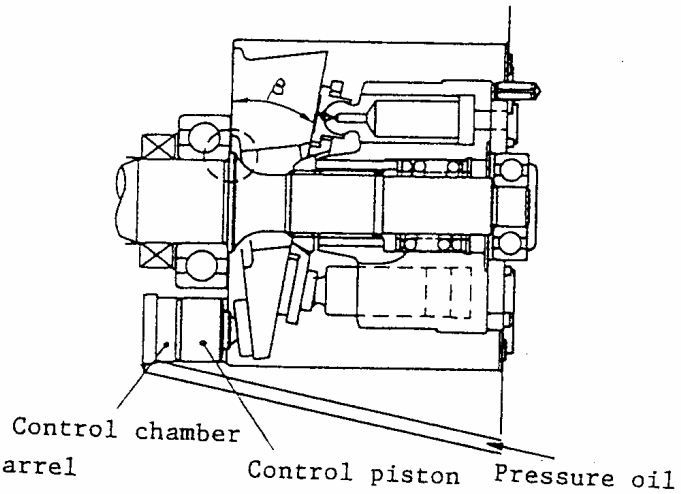
The motor capacity is made small.

When a engine is stopped, the control chamber is led to the tank port and the swash plate position becomes to the low speed one by the spring force. Starting position is always the low speed.



Low Speed

Fig.5



High Speed

Fig.6

C. HYDRAULIC VALVE SECTION

1). Structure

When the pressurized oil is supplied from the (A) port, the pressurized oil opens the check valve (3) and flows into the hydraulic motor inlet (A') port. At the same time, the pressurized oil goes through the orifice (C) into the chamber (D), pushes the spring (4) and moves the spool (2) to right. Then the returned oil from the hydraulic motor flows into the (B) port, goes through area (E) and drives the hydraulic motor. When the pressurized oil is supplied from the (B) port, the hydraulic motor rotates in reverse.

Even the pressurized oil of the (A) port is shut off, the hydraulic motor tries to rotate by inertia force. When the pressurized oil from the (A) port is shut off, the spool (2) tries to return to left by the spring (4) force. At this time, the oil in the chamber (D) tries to go out to the (A) port through the orifice (C), but due to the throttle effect of orifice (C), the spool (2) speed is reduced. With the orifice and notches on the spool, the returned oil is controlled gradually and the hydraulic motor stops smoothly.

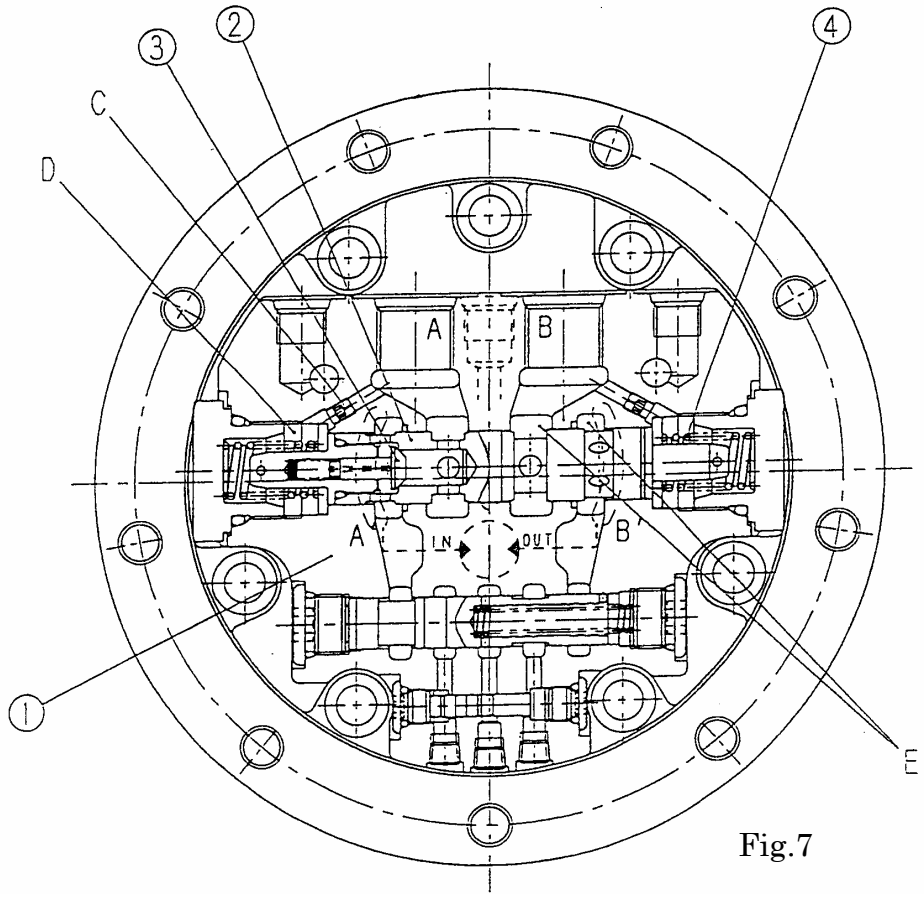


Fig.7

D. PARKING BRAKE SECTION

1). Structure

The parking brake fixes the output shaft of hydraulic motor mechanically while the wheel motor is stopped. And it is applied automatically in the following fashion.

When A and B ports are not pressurized, the brake piston (1) is pressed in the direction (shown as arrow) by the spring (2). Then the disk plate (4) which is fixed to the cylinder barrel (3) is held between the steel plates (6 and 7) which are fixed to the body 2 (5). As a result, with the friction of these plates, the cylinder barrel (3) and the hydraulic motor are unable to rotate. (Fig.8)

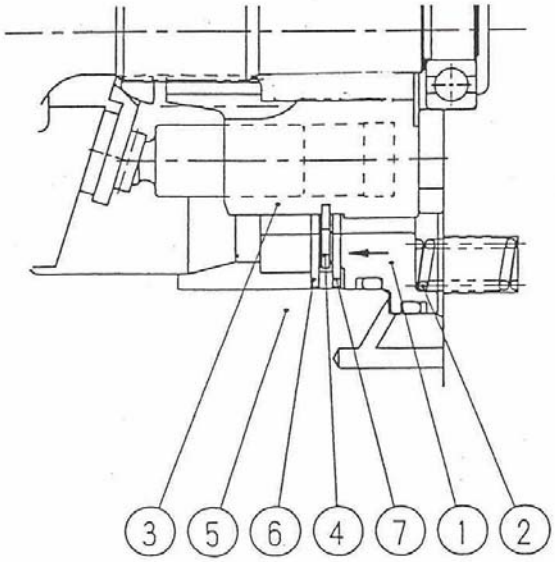


Fig.8

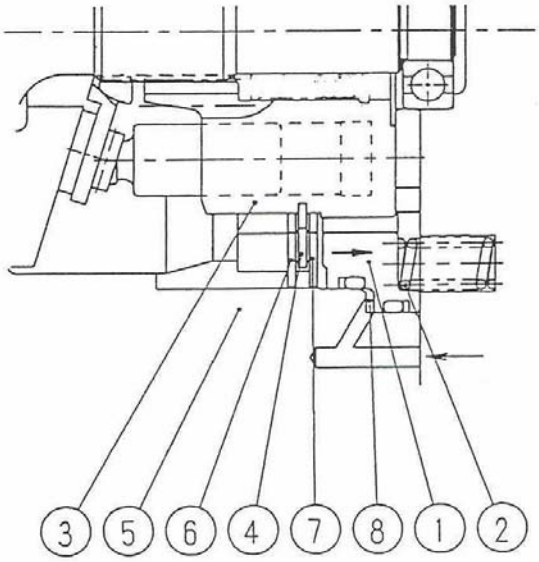


Fig.9

When A or B ports are pressurized, the oil is lead to chamber (8) shown in Fig.7. Then the brake piston (1) is moved to the direction (shown as arrow) against the force of spring (2). As a result, the disk plate (4) is released from the steel plates (6 and 7), and the cylinder barrel (3) can be rotated.(Fig.9)

6. HANDLING

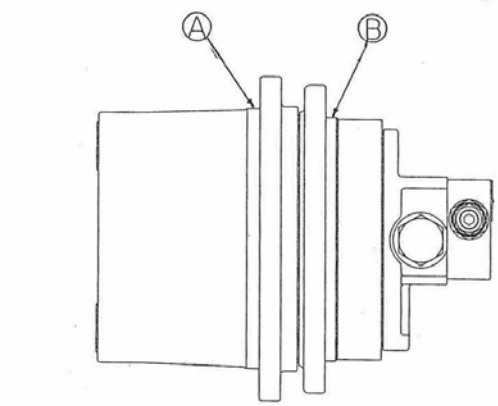
A. MOUNTING

1). Sprocket pilot dimension A

140 h8 $^{0}_{-0.063}$

Body pilot dimension B

140 h8 $^{0}_{-0.063}$



2). When installing the motor to the machine and/or attaching the sprocket to the motor, do not force the sections and/or strike them with a heavy object as damage may result. The best method is to use the mounting bolts as a guide and slowly slide it into place.

3). Use the specified bolts (equivalent grade 12.9 or higher) for mounting the motor and the sprocket, and tighten using the following torque.

Bolt size	Torque
M10	49 to 64 N-m {5.0 to 6.5 kgf-m}

B. PIPING

1). The installation drawing shows the motor piping. Pay attention to the rotating direction and piping.

2). When shipped, rubber plugs (or steel plugs for drain ports) are attached to the piping ports. When piping, pay attention as not to introduce dirt or welding scale into the ports.

3). One of two drain ports is used as a drain line. Use the upper side port, and fill 200cc hydraulic oil, then connect the piping.

4). The permissible drain pressure is limited by the oil seal. Therefore, pay attention to the size of drain piping so that the drain pressure does not exceed the limit especially in low temperature environment. The permissible drain pressure is 43psi { 3 kgf/cm^2 } (Rated) and 143psi { 10kgf/cm^2 } (Peak).

5). Fine filtration prolongs the hydraulic system life and ensures high reliability. Install a 10 μ m filter, or better filter in the circuit.

C. GEAR LUBRICATING OIL

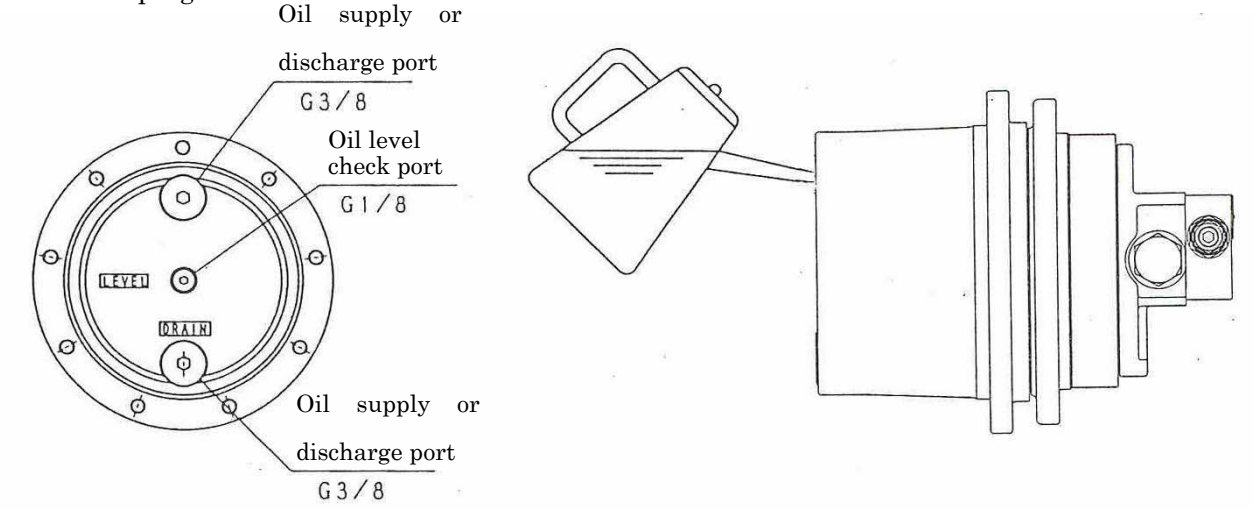
1). Use diesel engine oil SAE-30-CD or equivalent as gear lubricating oil.

(When shipped, Idemitsu Apoloil Diesel Motive S-330 is used.)

2). Any recommended gear oil can be used, but drain old oil completely, and do not mix.

3).When shipped, gear box is pre-filled. Take the following steps to refill. All plugs are sealed by O ring.

1. Remove the oil supply port plug and the level check port plug.
2. Fill the oil from the oil supply port up to the "LEVEL."
3. Check the oil amount and install the oil supply port plug and the level check port plug.



4). Gear oil amount: 330 cc

5). Gear oil change period

First change: 200 hours or 2 months

Second and after: 1000 hours or 1 year

D. GENERAL PRECAUTION

Always pay attention to oil leaks and loose bolts, and find out the trouble as soon as possible to prevent damage to the motor or machine.

Making a check sheet is recommended.