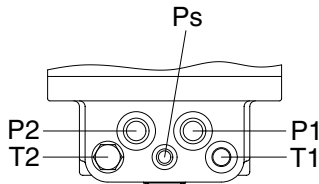
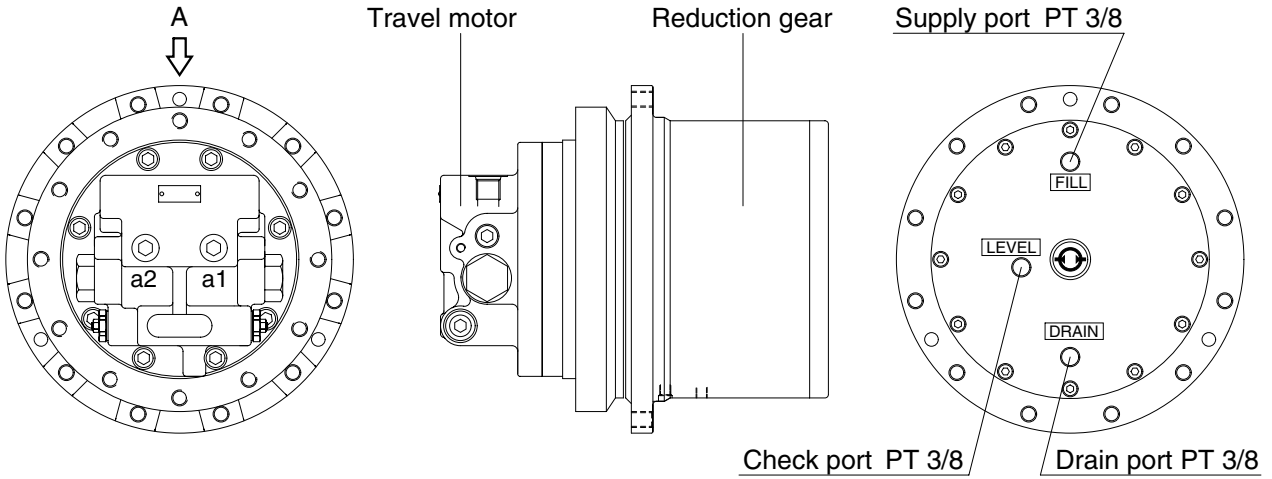


# GROUP 4 TRAVEL DEVICE

## 1. CONSTRUCTION

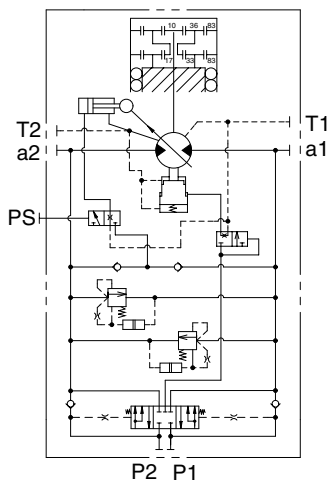
Travel device consists travel motor and gear box.

Travel motor includes brake valve, parking brake and high/low speed changeover mechanism.



VIEW A

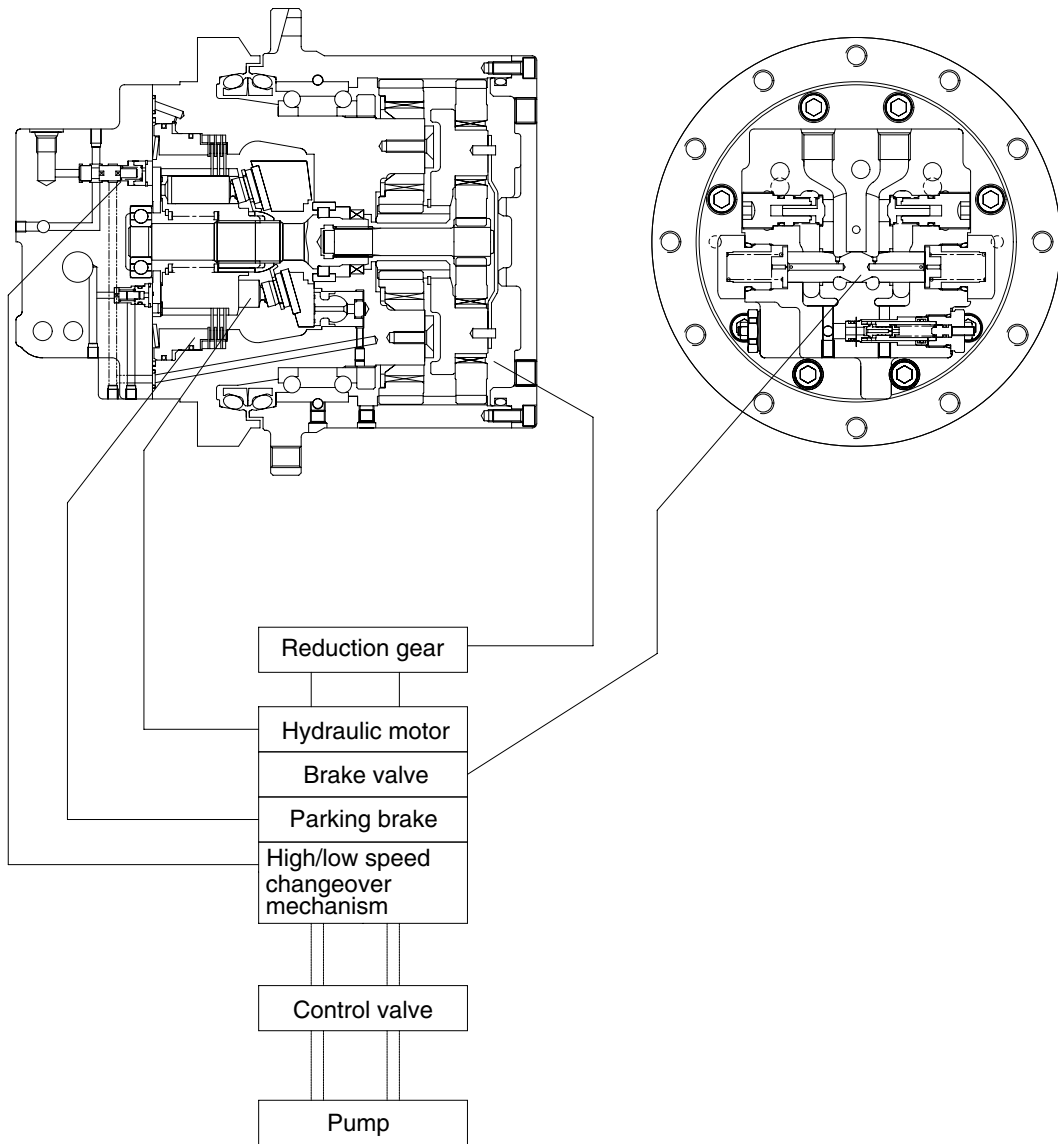
5592TM01



Hydraulic circuit

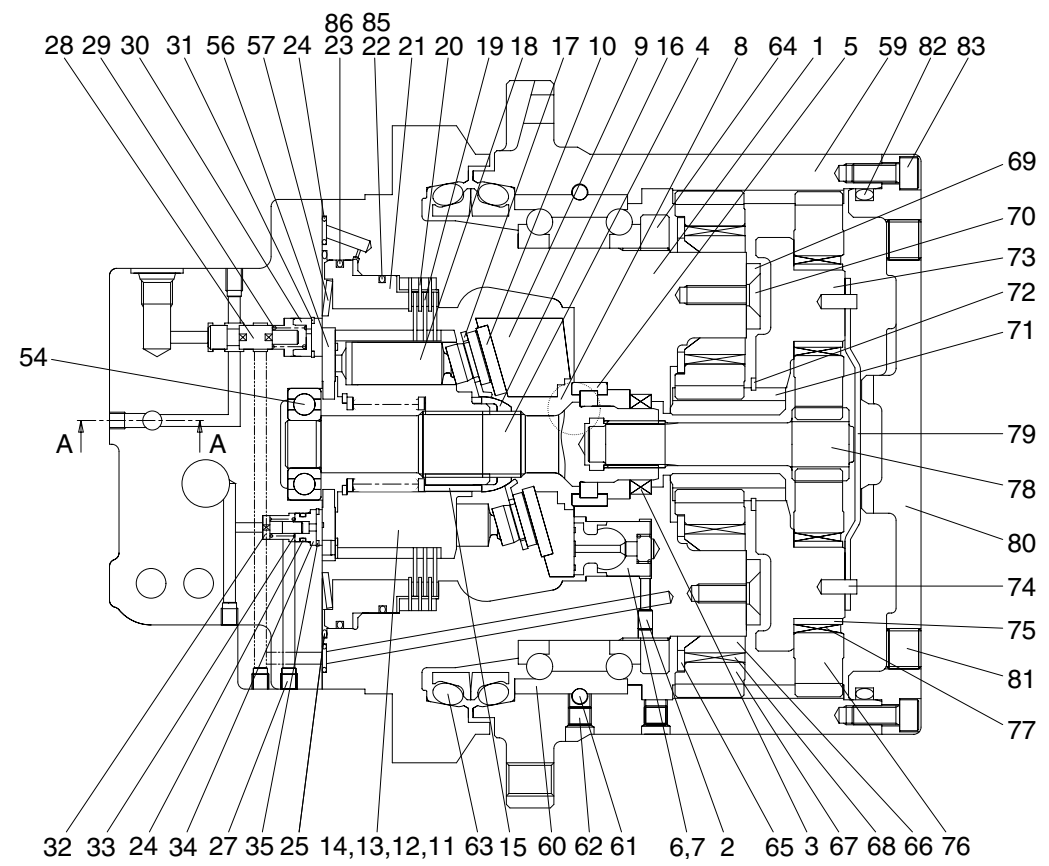
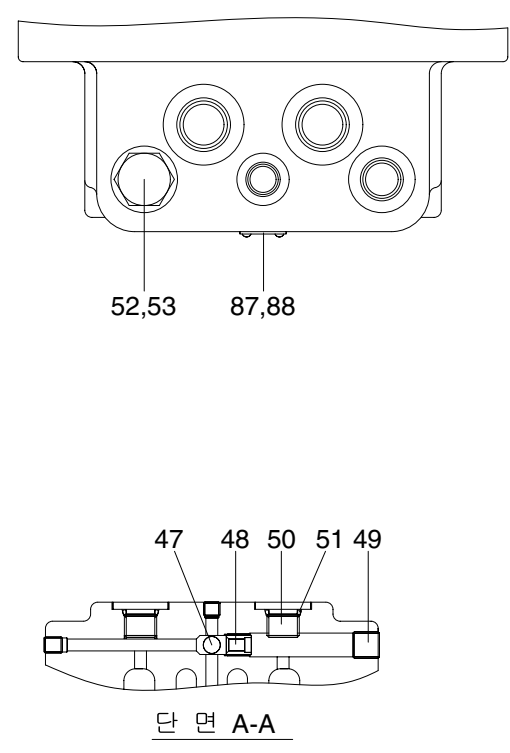
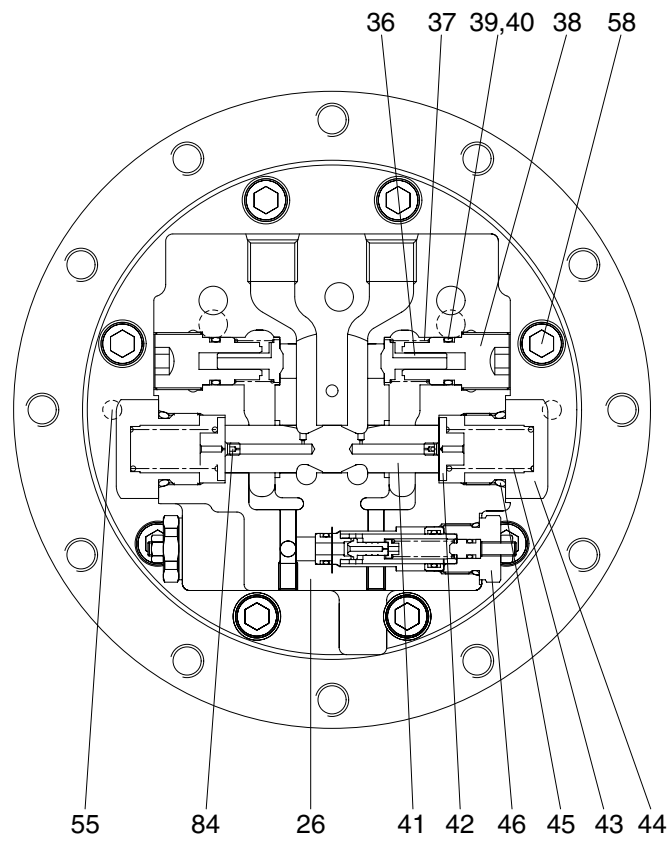
Port	Port name	Port size
P1	Main port	PF 1/2
P2	Main port	PF 1/2
a1,a2	Gauge port	PT 1/4
T1,T2	Drain port	PF 3/8
Ps	2 speed control port	PF 1/4

# 1) BASIC STRUCTURE



5592TM02

2) STRUCTURE



- |                    |                   |                   |                      |                   |                    |
|--------------------|-------------------|-------------------|----------------------|-------------------|--------------------|
| 1 Shaft casing     | 16 Ball guide     | 31 Snap ring      | 46 Relief valve assy | 61 Steel ball     | 76 Planetary gear  |
| 2 Expand           | 17 Set plate      | 32 Check          | 47 Steel ball        | 62 Plug           | 77 Needle bearing  |
| 3 Oil seal         | 18 Piston kit     | 33 Spring         | 48 Check seat        | 63 Floating seal  | 78 Drive gear      |
| 4 Shaft            | 19 Friction plate | 34 Seat           | 49 Plug              | 64 Nut            | 79 Thrust plate    |
| 5 Bearing          | 20 Parking plate  | 35 Snap ring      | 50 Plug              | 65 Washer         | 80 Ring gear cover |
| 6 Swash piston kit | 21 Parking piston | 36 Check          | 51 O-ring            | 66 Collar         | 81 Plug            |
| 7 Spring           | 22 O-ring         | 37 Spring         | 52 Plug              | 67 Planetary gear | 82 O-ring          |
| 8 Swash steel ball | 23 O-ring         | 38 Plug           | 53 O-ring            | 68 Needle bearing | 83 Wrench bolt     |
| 9 Swash plate      | 24 O-ring         | 39 O-ring         | 54 Ball bearing      | 69 Plate          | 84 Orifice         |
| 10 Shoe plate      | 25 O-ring         | 40 Back up ring   | 55 Pin               | 70 Bolt           | 85 Back up ring    |
| 11 Cylinder block  | 26 Rear cover     | 41 Main spool kit | 56 Valve plate       | 71 Sun gear       | 86 Back up ring    |
| 12 Spring seat     | 27 Plug           | 42 Spring seat    | 57 Spring plate      | 72 Snap ring      | 87 Name plate      |
| 13 Spring          | 28 Spool          | 43 Spring         | 58 Wrench bolt       | 73 Carrier        | 88 Rivet           |
| 14 Snap ring       | 29 Spring         | 44 Plug           | 59 Ring gear         | 74 Spring pin     |                    |
| 15 Pin             | 30 Stopper        | 45 O-ring         | 60 Angular bearing   | 75 Collar         |                    |

555K2TM03

## 2. PRINCIPLE OF DRIVING

### 1) GENERATING THE TURNING FORCE

The high hydraulic supplied from a hydraulic pump flows into a cylinder (11) through valve casing of motor (26), and valve plate (56).

The high hydraulic is built as flowing on one side of Y-Y line connected by the upper and lower sides of piston (18).

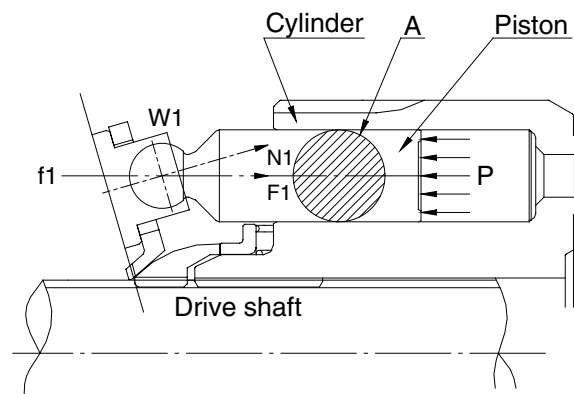
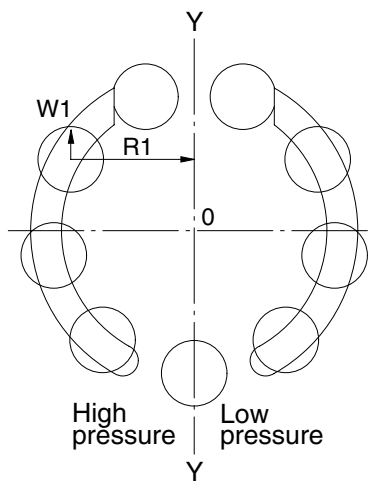
The high hydraulic can generate the force,  $F1 = P \times A$  (P : Supplied pressure, A : water pressure area), like following pictures, working on a piston.

This force, F1, is divided as N1 thrust partial pressure and W1 radial partial pressure, in case of the swash plate (9) of a tilt angle,  $\alpha$ .

W1 generates torque,  $T = W1 \times R1$ , for Y-Y line connected by the upper and lower sides of piston as following pictures.

The sum of torque ( $\Sigma W1 \times R1$ ), generated from each piston (4~5pieces) on the side of a high hydraulic, generates the turning force.

This torque transfers the turning force to a cylinder (11) through a piston; because a cylinder is combined with a turning axis and spline, a turning axis rotates and a turning force is sent.



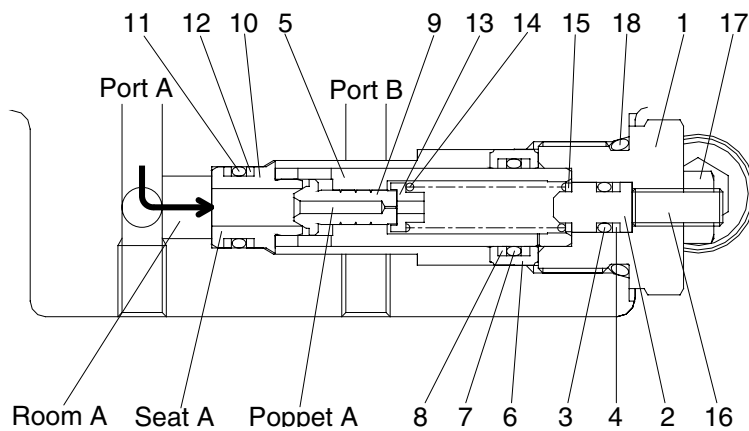
5592TM03

## 2) WORKING OF RELIEF VALVE

Relief valve carries on two functions of followings.

- (1) It standardizes a pressure in case of driving a hydraulic motor ; bypasses and extra oil in a motor inlet related to acceleration of an inertia to an outlet.
- (2) In case of an inertia stopped, it forces an equipment stopped, according to generating the pressure of a brake on the projected side.

Room A is always connected with port A of a motor. If the pressure of port is increased, press poppet B. And if it is higher than the setting pressure of a spring, the oil of an hydraulic flows from room A to port B, because poppet A is detached from the contact surface of seat A.



5592TM04

### 3) WORKING OF BRAKE

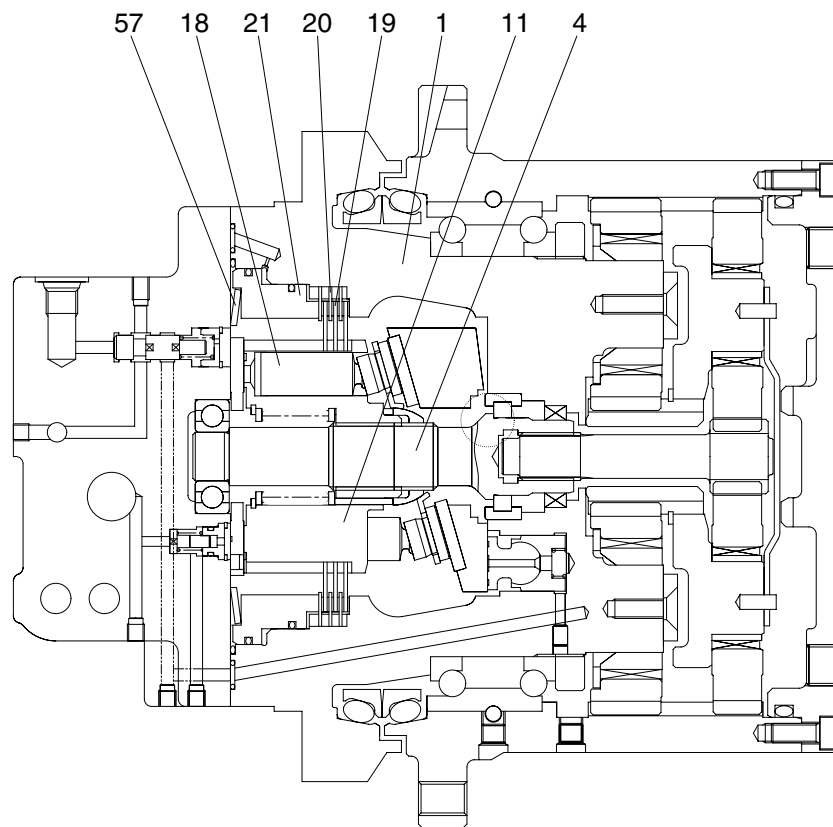
Brake operates the pressure supplied through SPOOL (simultaneous peripheral operation online) installed in valve casing (26) to the part of parking piston (21) and releases a brake.

When the pressure does not work, the brake always runs.

The force of a brake is generated by the frictional force among a plate (20), brake piston (21) and a cylinder block (11) that is connected through spline which are fixed by shaft casing (1) with friction plate (19).

When a pressure does not work on the part of piston, brake spring presses brake piston; oil in a brake room flows into the drain of a motor through an orifice; in that time, brake piston compresses a frictional plate (19) and a detached plate in the middle of shaft casing and brake piston according to the force plate springs (57); finally, it makes a frictional force.

This frictional force helps the brake fixing a turning axis (3) connected by a cylinder and spline operated.

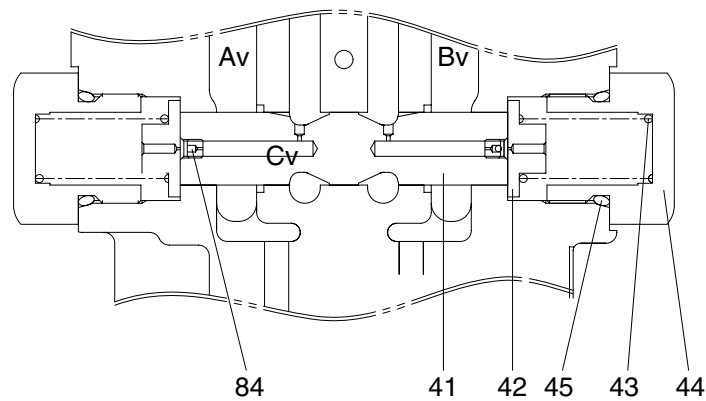


555K2TM06

#### 4) COUNTERBALANCE VALVE

Av port is connected into a hydraulic pump and Bv port is into a tank. Hydraulic pump supplying oil is come into Av → Cv room. In accordance with spring force (43) that is working on the spool's side it moves to the spool (41) on the right side which is medium position and that time motor is turning.

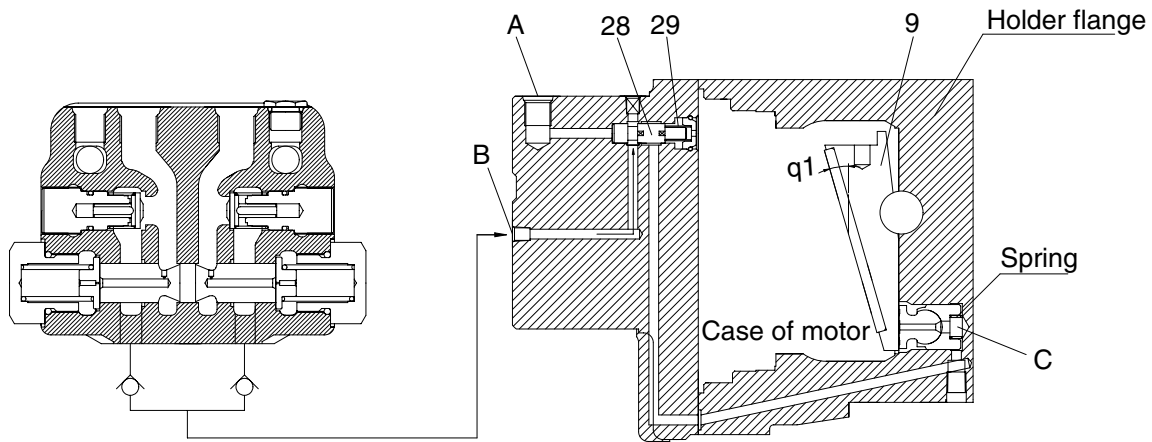
When the spool (41) is come back to the medium position that time hydraulic motor is stopped. In accordance with spool's returning speed and shape control the working oil that is returning from hydraulic motor smoothly stopping the motor.



555K2TM07

#### 4) HIGH/LOW SPEED CHANGEOVER MECHANISM

##### (1) At low speed-at pilot pressure of less than 10 kgf/cm<sup>2</sup> (0.98 Mpa)

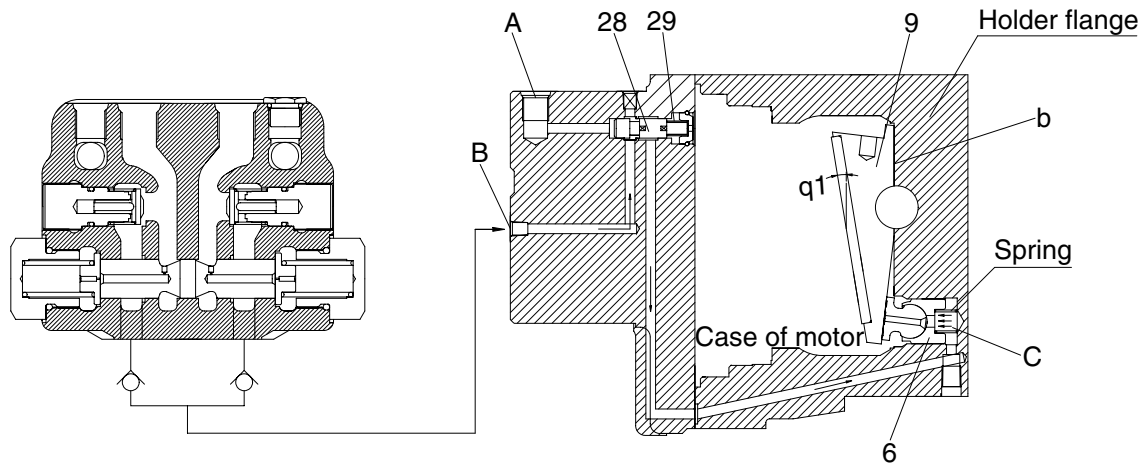


5592TM05

When no pilot pressure is supplied from port (A) at a pressure of 10 kgf/cm<sup>2</sup> (0.98 Mpa) or less, spool (28) is pressed toward the left by the force of spring (29), the pressurized oil supply port B is shut off, and oil in chamber (C) is released into the motor case via spool (28).

Consequently, swash plate (9) is tilted at a maximum angle ( $\theta = 1^\circ$ ) and the piston displacement of hydraulic motor becomes maximum, thus leading to low-speed rotation.

##### (2) At high speed-at pilot pressure of 10 kgf/cm<sup>2</sup> (0.98 Mpa) or more



5592TM06

When a pilot pressure is supplied from port (A) at a pressure of 10 kgf/cm<sup>2</sup> (0.98 Mpa) or more, the pressure overcomes the force of spring (29) and spool (28) is pressed toward the right. The pressurized oil at supply port (B) is then introduced into chamber (C) via spool (28).

Piston (6) pushes up swash plate (9) until it touches side (b) of the holder flange.

At this time, swash plate (9) is tilted at a minimum angle ( $\theta = 2^\circ$ ) and the piston displacement of hydraulic motor becomes maximum, thus leading to high-speed rotation.

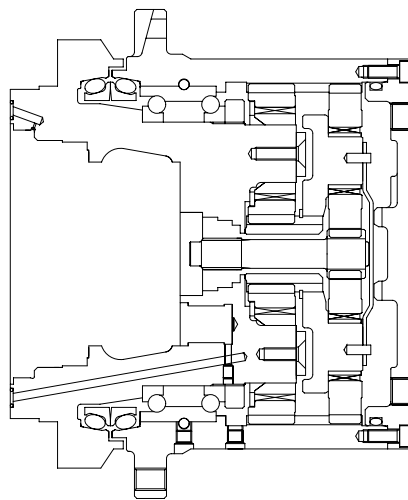
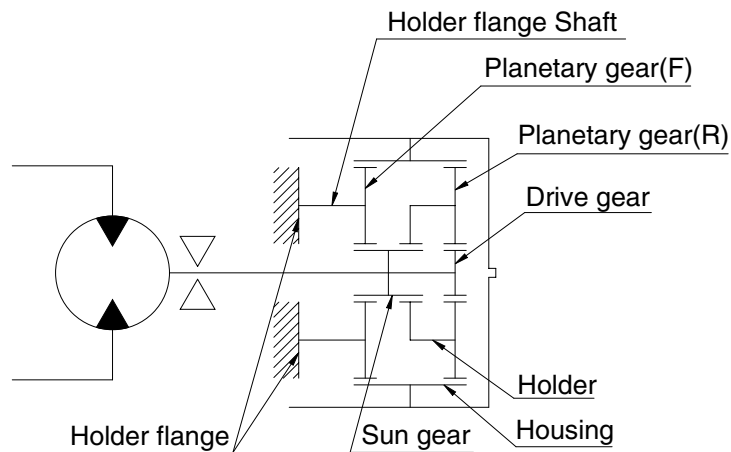
## 2. REDUCTION GEAR

### 1) FUNCTION

The reduction gear unit consists of a combination of simple planetary gear mechanism. This mechanism reduce the high speed rotation from the hydraulic motor and convert it into low speed, high torque to rotate the hub (or case), which in turn rotates the sprocket.

### 2) OPERATING PRINCIPLE

Shaft → Drive gear → Planetary Gear R → Housing  
→ Holder → Sun gear → Planetary Gear F → Rotation of Housing



5592TM07

$$\text{Reduction ratio} = (\text{Housing Teeth/Drive Gear Teeth} + 1) \times (\text{Housing Teeth/Sun Gear Teeth} + 1) - 1.$$