KOBELCO

SK100W-2

TRAINING TEXT

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KOBELCO CONSTRUCTION MACHINERY CO., LTD.

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BRAKE MODE CHANGE SWITCH ④– FIGURE 2.25

Auxiliary brake(AUX) is used as an auxiliary equipment for working, but not as a parking brake.
Don't fail to park the machine after placing the switch to "P" mode.
(Don't fail to put the bucket down to the ground before leaving the operator's seat.)
The "W" mode is applicable only for various works in the condition of being generally stopped.

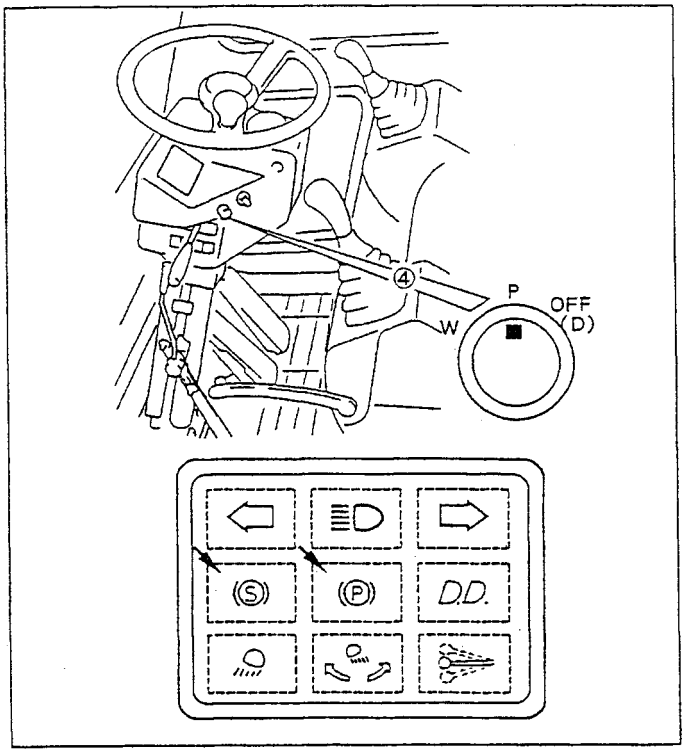


FIGURE 2.25

- SWITCH CONTROLS

OFF mode: (D) (Travel mode) — The brake is released and only foot (D) brake pedal functions.

P mode: — Parking brake actuates, and parking brake lamp and warning lamp light up.

W mode: — Auxiliary brake(AUX) and parking brake actuate. (But only when engine is rotating.) Warning lamp lights up to inform if the function is provided or not.

⚠ WARNING

PRECAUTIONS TO USE AUXILIARY BRAKE (AUX)

(1) **Don't use the auxiliary brake when the engine stops.**
(2) **Don't leave the vehicle while the auxiliary brake is working.**
(3) **Use the auxiliary brake only for work in the temporarily stopped condition, and don't use it to stop the vehicle.**
(4) **Don't use the auxiliary brake for one (1) hour or more.**

* **The auxiliary brake is of the type which operates after actuation of the parking brake. Only the parking brake actuates at the parking brake position, but both parking brake and auxiliary brake actuate at the auxiliary brake position.**
* **While the engine is stopped, braking force sufficient to secure the safety during work may be lost because of a drop in brake air pressure, position, but both parking brake and auxiliary brake actuate at the auxiliary brake position.**
* **If the air leaking and/or emergency occur (s) when away from the vehicle while the auxiliary brake is actuated, countermeasures can not be taken immediately , and it may cause a sévere accident.**

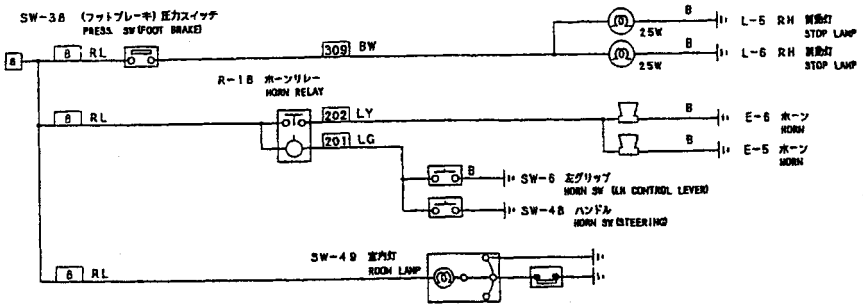
2432P4107

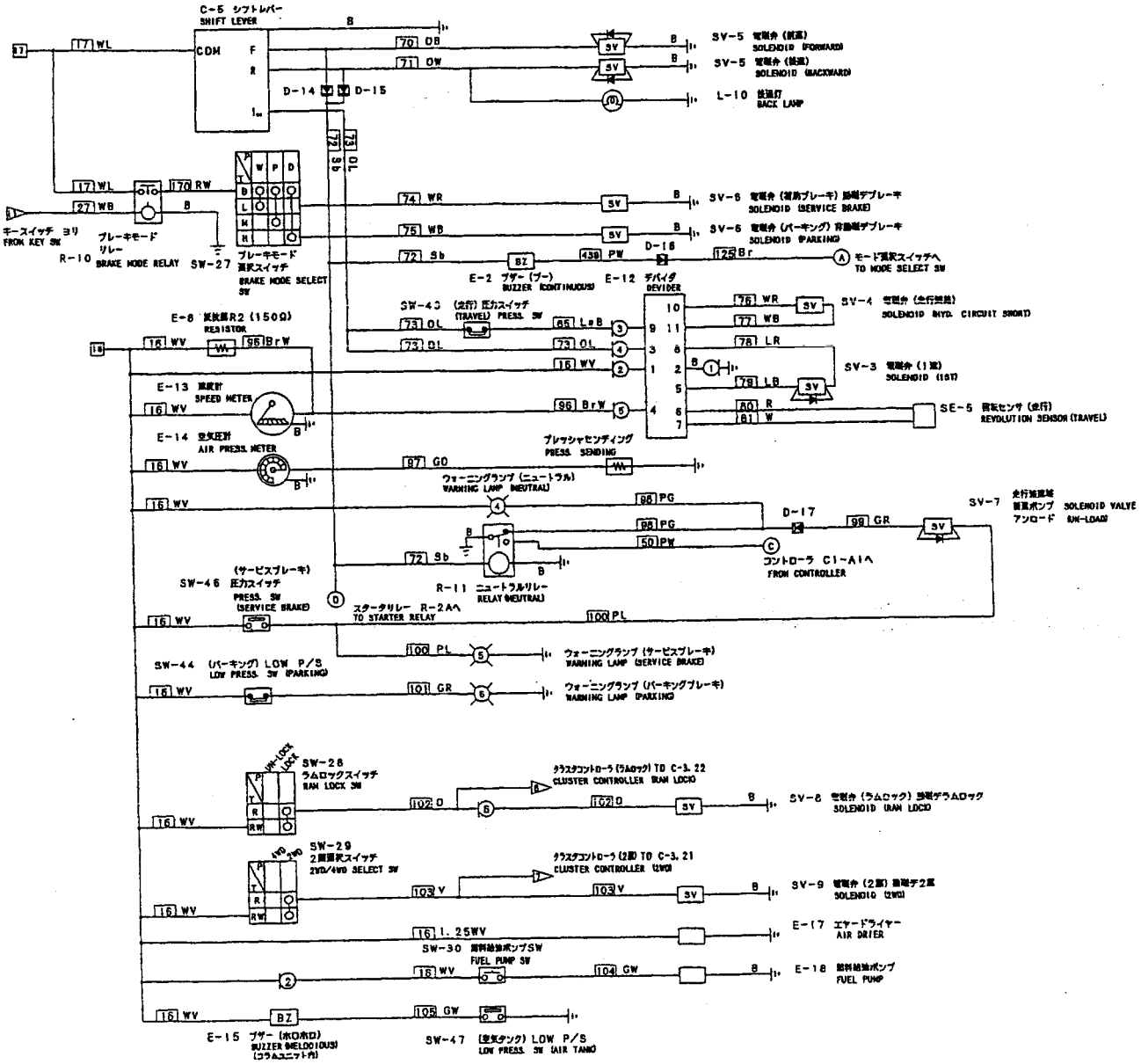
- **Warning lamp lighting pattern when switching the brake mode.**

Switch position	Brake operating condition	Monitor lamp (Red)			Application
OFF (Travel)	Release both parking brake and auxiliary brake.	OFF	Ⓢ Ⓟ	OFF	Travelling
P (Parking)	Operate parking brake only.	OFF	Ⓢ Ⓟ	ON	In general parking condition
W (Working)	Operate both parking brake and auxiliary brake.	ON	Ⓢ Ⓟ	ON	Working in W mode

NOTE

Auxiliary brake(AUX) is applicable in JIS Standard as a brake control system to assist the regular brake (service brake), but for construction machine it means a brake to use for digging works in W mode condition.


SW-38 (フットブレーキ) 圧力スイッチ
PRESS. SW (FOOT BRAKE)
R-18 ホーンリレー
HORN RELAY
SW-6 左グリップ
HORN SW (LH CONTROL LEVER)
SW-48 ハンドル
HORN SW (STEERING)
SW-49 室内灯
ROOM LAMP
L-5 RH 制動灯
STOP LAMP
L-6 RH 制動灯
STOP LAMP
E-6 ホーン
HORN
E-5 ホーン
HORN


C-5 シフトレバー
SHIFT LEVER
R-10 ブレーキモードリレー
BRAKE MODE RELAY
SW-27 ブレーキモード選択スイッチ
BRAKE MODE SELECT SW
SV-5 電磁弁 (前進)
SOLENOID (FORWARD)
SV-5 電磁弁 (後進)
SOLENOID (BACKWARD)
L-10 後進灯
BACK LAMP
SV-6 電磁弁 (常用ブレーキ) 油圧デブレーキ
SOLENOID (SERVICE BRAKE)
SV-6 電磁弁 (パーキング) 常油圧デブレーキ
SOLENOID (PARKING)
モード選択スイッチへ
TO MODE SELECT SW
E-2 ブザー (ブー)
BUZZER (CONTINUOUS)
E-12 デバイダ
DEVIDER
SW-43 (走行) 圧力スイッチ
(TRAVEL) PRESS. SW
SV-4 電磁弁 (走行油路)
SOLENOID (HYD. CIRCUIT SHORT)
SV-3 電磁弁 (1速)
SOLENOID (1ST)
E-8 減抵抗R2 (150Ω)
RESISTOR
E-13 速度計
SPEED METER
E-14 空気圧計
AIR PRESS. METER
SE-5 回転センサ (走行)
REVOLUTION SENSOR (TRAVEL)
プレッシャセンディング
PRESS. SENDING
ウォーニングランプ (ニュートラル)
WARNING LAMP (NEUTRAL)
SV-7 走行油圧用ポンプ アンロード
SOLENOID VALVE (UN-LOAD)
コントローラ C1-A1へ
FROM CONTROLLER
SW-46 (サービスブレーキ) 圧力スイッチ
PRESS. SW (SERVICE BRAKE)
R-11 ニュートラルリレー
RELAY (NEUTRAL)
スタータリレー R-2Aへ
TO STARTER RELAY
SW-44 (パーキング) LOW P/S
LOW PRESS. SW (PARKING)
ウォーニングランプ (サービスブレーキ)
WARNING LAMP (SERVICE BRAKE)
ウォーニングランプ (パーキングブレーキ)
WARNING LAMP (PARKING)
SW-26 ラムロックスイッチ
RAM LOCK SW
クラスタコントローラ (ラムロック) TO C-3, 22
CLUSTER CONTROLLER (RAM LOCK)
SV-8 電磁弁 (ラムロック) 油圧デラムロック
SOLENOID (RAM LOCK)
SW-29 2輪選択スイッチ
2WD/4WD SELECT SW
クラスタコントローラ (2駆) TO C-3, 21
CLUSTER CONTROLLER (2WD)
SV-9 電磁弁 (2駆) 油圧デ2駆
SOLENOID (2WD)
E-17 エアードライヤー
AIR DRIER
SW-30 燃料給油ポンプSW
FUEL PUMP SW
E-18 燃料給油ポンプ
FUEL PUMP
E-15 ブザー (ホロホロ)
BUZZER (MELODIOUS)
(コラムユニット内)
SW-47 (空気タンク) LOW P/S
LOW PRESS. SW (AIR TANK)

1. OUTLINE

The advantage of this machine are described below.

(1) Pumping control with I.T.C.S. (Intelligent Total Control System)
(2) Hydraulic travelling system with variable travel motor
(3) Slewing motor mechanical braking
(4) Arm digging auto conflux circuit
(5) Swing shockless mechanism
(6) Vibration relaxation circuit with D.D. switch when travelling
(7) Engine auto accel control

[Construction of machine]

This machine is made up of 2 units of variable displacement pump (For travel and operation), 3 units of gear pump, main control valve, slewing control valve, slewing motor, swivel joint, oil cooler, hydraulic tank, variable travel motor, pilot valve, various types of cylinder and filter, etc.

[Fuel consumption economy system]

The total pressure of two pumps is controlled so as not to exceed a constant value by two regulators, and consequently the engine output is always used effectively.
And the fuel consumption during operation is reduced by combining it with negative control, negative control relief cut valve control and KPSS (KOBELCO Power Sensing System), and also by taking advantage of the engine with direct injection type exhaust turbocharger.

[Travel circuit]

Travel drive is performed with the hydraulic travel system.
The travelling to forward or rearward is switched by switching the solenoid valve, control valve and direction of rotation of motor through the change lever.
When running at high speed (40km/h), the 1st and 2nd speeds are switched through transmission.
The transmission is switched through clutch by the power shift pump.
Combined operation is possible under the travel and attachment simultaneous operation.

[Slewing circuit]

The slewing circuit is an independent circuit, and allows reduction of abrupt change of slewing speed. In addition, the slewing motor with mechanical brake is effective for avoiding the slewing drift on slopes.
When concurrently operating the slewing and arm-in motions, it actuates as a slewing priority circuit to make the slewing push-on digging and arm slanted leveling motions smooth.
And further the swing shockless valve is placed in the slewing control valve to stop the motion due to inertia load and consequently prevents the inversion of hydraulic motor.

[Attachment circuit]

The bucket works from one pump, therefore when operating it with other attachment concurrently, smooth operation is available conforming to the lever stroke because of the parallel circuit.
For boom riase operation, parallel conflux circuit from two pumps is provided, and for boom lower operation, steady recirculation circuit is provided.
When operating the arm-in motion at light load, it is actuated through the variable recirculation circuit to reduce the speed change. When operating the arm-in motion at heavy load, it is actuated through the auto conflux circuit of sequence valve which makes the flow from two pumps confluxed speed up.
The arm out operation is performed by confluxing the flow from two pumps.
And when operating arm-in and slewing motions concurrently, the slewing priority circuit is used.

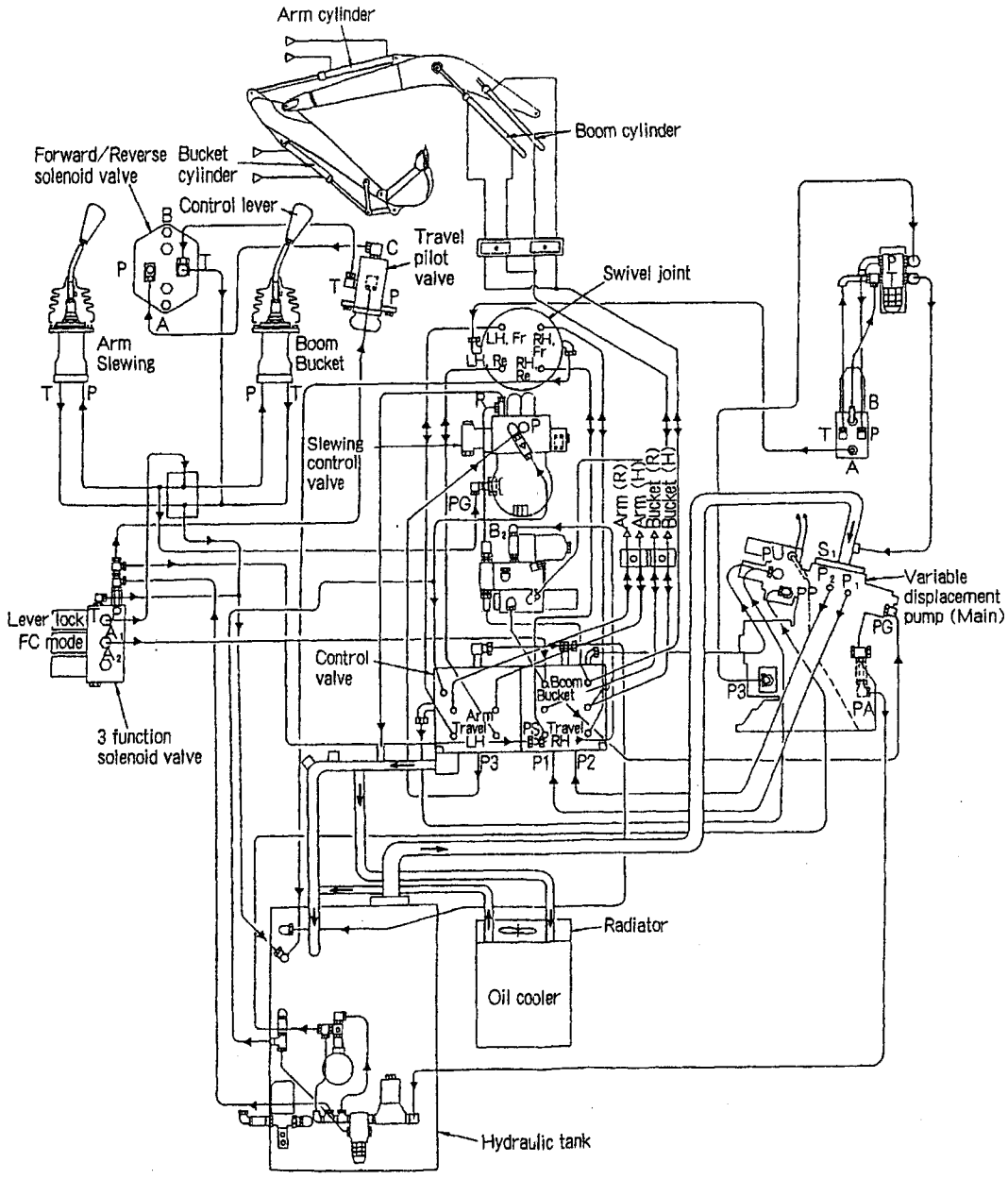
[Hydraulic oil control]

The tank is a closed type to prevent the entry of dust into hydraulic oil so as to keep it from being contaminated.
Further, the pressure type tank is applied to improve the self-priming capacity of pump. The suction oil to the variable pump passes through the suction strainer to remove foreign matter.
And the contamination of return oil in main circuit is removed by filter in the hydraulic tank.
The contamination of delivery oil in pilot circuit is removed by line filter at the outlet of gear pump.
The contamination in drain circuit from each equipment is removed by the drain filter.
The hydraulic oil temperature is cooled down by the oil cooler in front of the radiator.

[Pilot circuit]

The machine is of pilot control system. The pilot control circuit is equipped with two gear pumps (for control pilot and travel pilot, and for power shift) connected with two units of variable displacement pump and one gear pump installed outside of the engine (for power steering).

2. HYDRAULIC DIAGRAM



DD (Dynamic damper) circuit

The DD circuit is provided to reduce the vibration and rocking of the body and to ensure a good ride when running.
The DD is of the mechanism that, when the DD is actuated, the oil chamber on the boom cylinder head side is connected to the outer accumulator to allow controlling the vibration of body with the function of buffer spring of the accumulator. Consequently, when running, the conventional model is vibrated together with the attachments, but this mechanism allows absorption of the rocking of ATTs due to the undulation of road, dissipates the vibrational energy, and reduces the vibration and rocking of the body when running.
(See Figure 16.)

1) Pilot circuit

Turn the DD OFF, and the pilot pressure passes through Port B2 of port block (35) and solenoid valve (30), and charges the accumulator in advance.
Turn the DD ON (Press DD switch), and the solenoid valve (30) switches, the pilot pressure is branched into 4 circuits in port block (35), and the pilot pressure is generated in the circuit on the upperstream by the orifice of port AST.
The pilot pressure of two circuits from ports Pa and Pb moves the spool of valve (8) to the neutral position at the mid point.
The pilot pressure of the 3rd circuit from port AP1 enters into Port X of pilot check valve (36) and pushes and opens the pilot check valve.
The pressure of the 4th circuit passes through orifice of port AST and returns into the drain circuit.

2) DD main circuit

Turn the DD ON, and solenoid valve (30) switches, or the spool of valve (18) moves to the mid point, and consequently the passage of accumulator is connected to the boom cylinder H side, and the pilot check valve opens and the boom cylinder R side is connected to the tank passage.

3) DD mode switching operation

When running in the DD mode, the Att must be raised 150mm higher than the support position.
Press DD switch after turning the KPSS switch to " D" (drive) position, and the DD functions. With the DD function, the DD monitor lamp on the warning lamp panel goes on.
Turn the KPSS switch to the work mode, the DD function is canceled (DD OFF).
When the DD functions, the KPSS switch is turned to"D" mode and the lever lock is locked, making ATT operation unavailable.

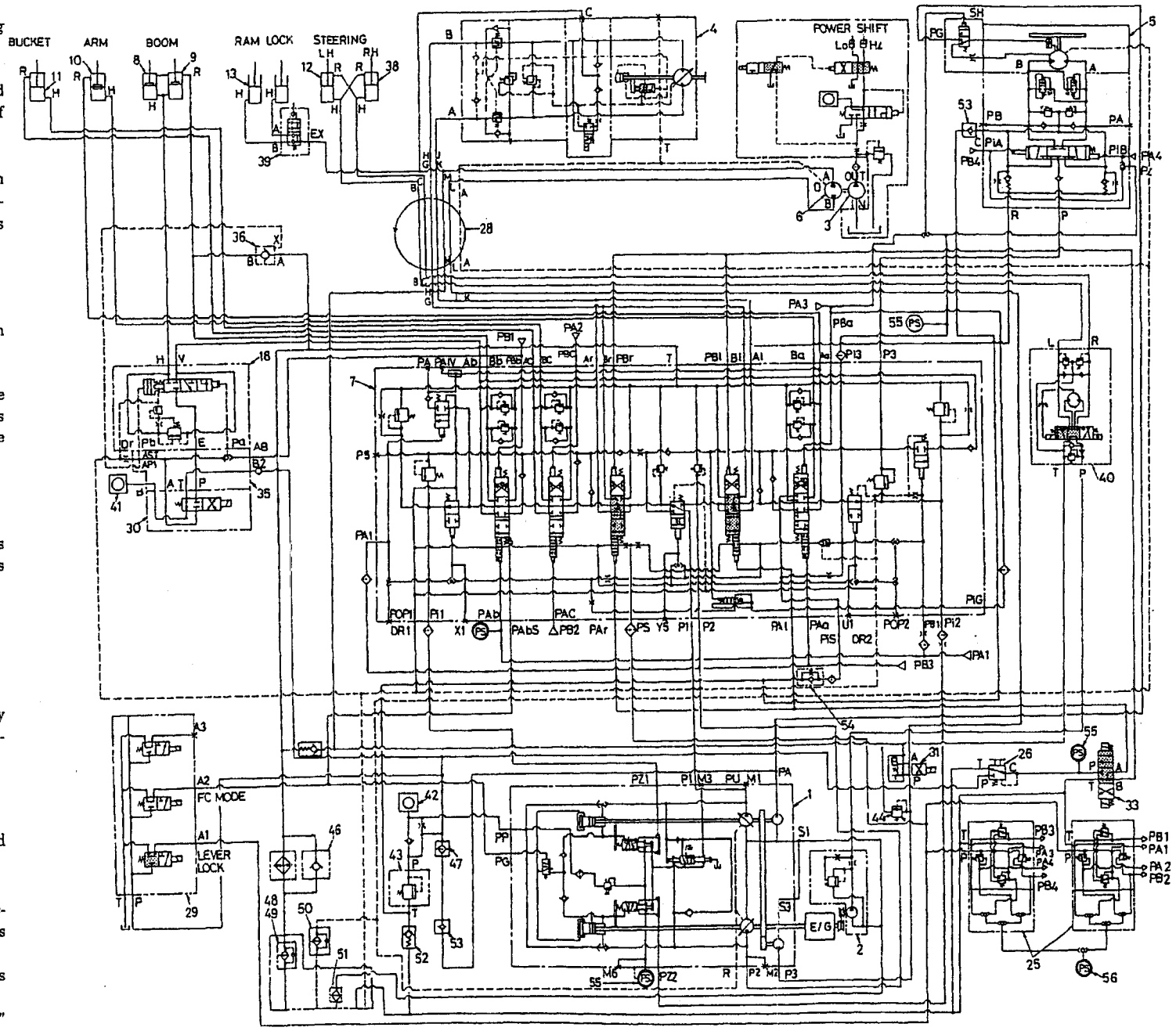


Fig. 16 Travel (Forward) at 2nd speed / DD operation

Operation

Outline

Both control plates are connected with the rod fixed on the piston (b) through the center holes and convert the linear motion to variation of tilt angle of the rotary group.

The piston (a) moves back and forth in the cylinder block, and the stroke width is decided according to the tilt angle.

That is, the volume of oil corresponding to the piston bore and the stroke is sucked through the suction port of the control plate from the bottom dead point to the top dead point, and discharged from the top dead point to the bottom dead point.

The maximum tilt angle is controlled by the piston (c) on the valve cover described later and the minimum tilt angle is controlled by the retainer.

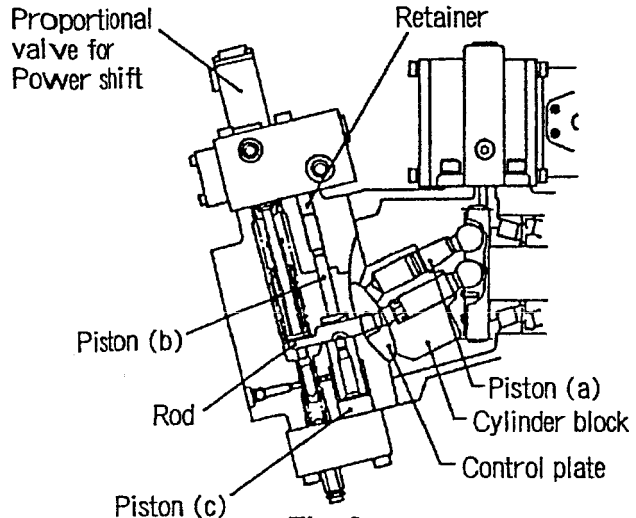


Fig. 3

Control function

Control function

Added total horse power control

Large volume flow control with external command pressure (Negative control)

Both pump power reduction control with solenoid valve

Maximum flow control 2 stage select control

1) Added total power control

This control is applied to have equal delivery rate corresponding to the command of two piston pump total pressure.

As shown in Figure 4, the total pressure is,

$$\Sigma P = P1 + P2$$

Consequently, each delivery rate,

$$Q_1 = Q_2$$

Is settled.

And then, it is approximated to the hyperbolic curve and the input power is constant with two springs.

This control is performed with two pressure average control valve in the regulator cover.

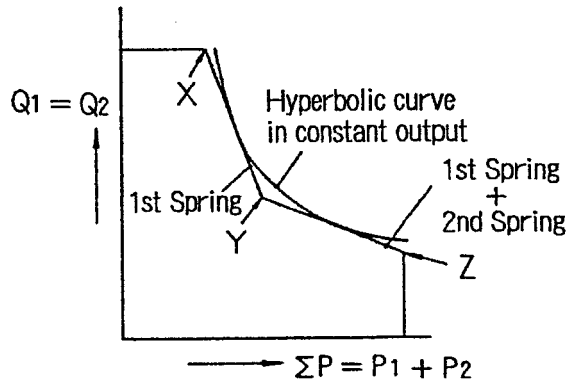


Fig. 4

(1) Two pressure average control valve

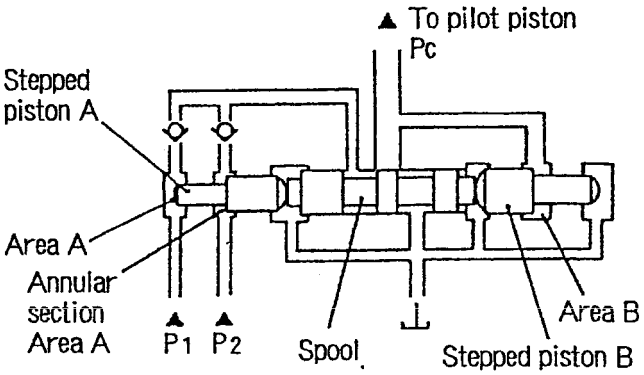


Fig. 5

The delivery pressure (P1,P2) of the 1st pump (drive) and 2nd pump (idler) acts on the stepped piston A to have equal pressure receiving area. Area A = Annular area A. The delivery high pressure selected by check valve is depressurized by spool and led to the pilot piston which controls the delivery flow rate.

The reduced pressure acts on the stepped piston (A) and the opposite stepped piston (B).

Where the controlled pressure is PC,

$$Pc \times B = A\,(P1 + P2)$$

When equation $B = 2A$ is substituted in equation $Pc \times B = A\,(P1 + P2)$,

$$Pc = 1\,(P1 + P2) / 2 \quad \cdots\cdots\cdots\cdots (1)$$

That is, the control pressure is an average pressure of delivery pressure P1 and P2.

Consequently, the pilot piston is always acted by pressure $(P1 + P2) / 2$ and simultaneously controls the pump in the constant operation.

4) **Maximum flow rate two step select control**

This is a control to switch the maximum flow rate in two step with external pilot pressure.

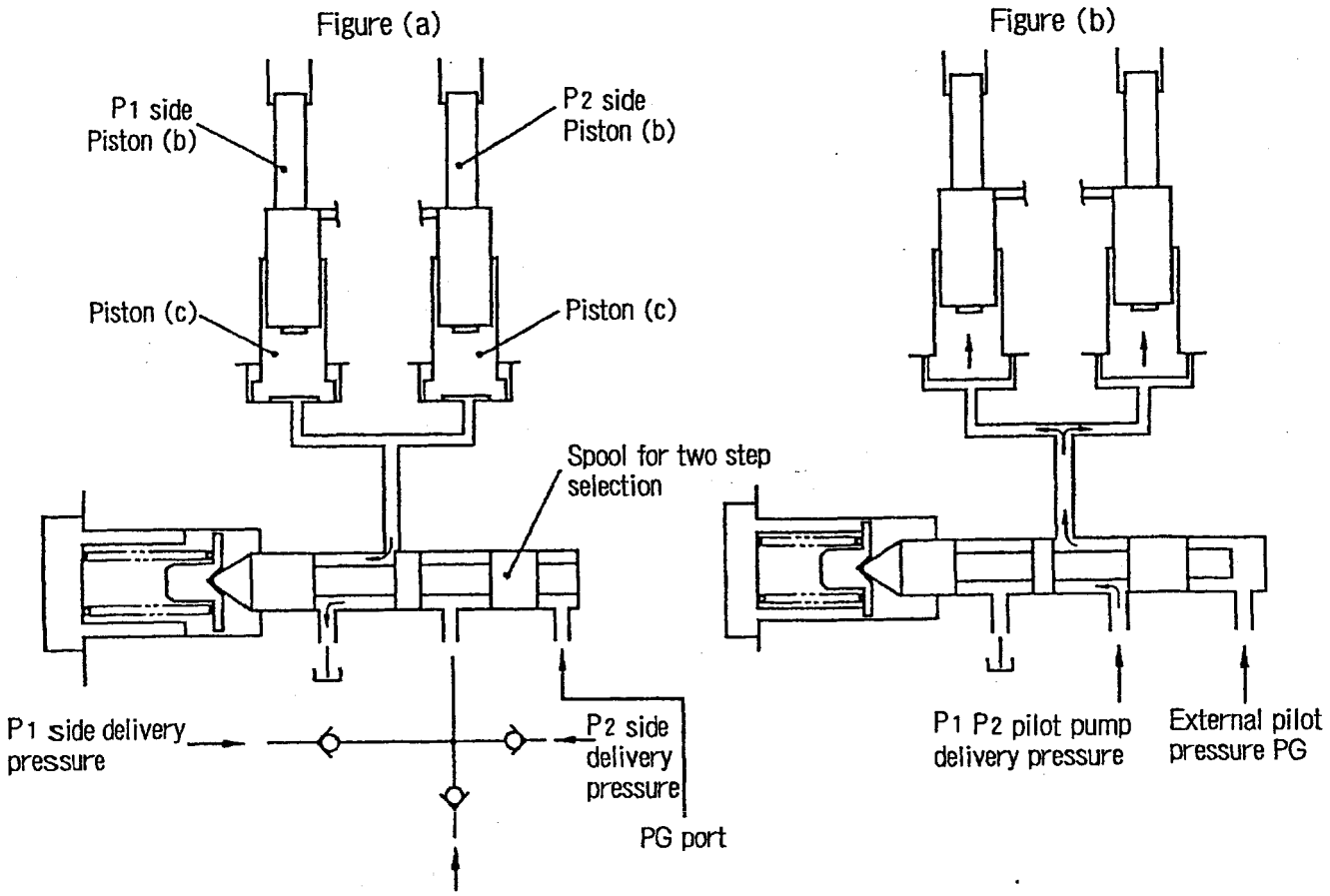


Fig. 11

The maximum tilt angle is controlled by piston (c) mentioned above.

Two step select control is performed by switching piston (c) with the spool for two step selection.

When the external pilot pressure does not actuate, it is in the condition shown in Figure (a), then the oil passage to piston (c) is connected to the hydraulic tank.

Consequently, piston (c) is pushed down by the delivery pressure acting on the small bore side of piston (b) and the spring force.

And the maximum flow rate, Qmax, in the 1st step is held.

Then, after flowing the external pilot pressure in it through PG port, the spool for two step selection moves leftward as shown in Figure (b), the highest pressure of delivery pressures of P1, P2 or pilot pumps acts on piston (c) through the oil passage.

Consequently, piston (c) pushes up piston (b) and reduces the initial maximum flow rate Qmax' and holds the maximum flow rate Qmax' in the 2nd step.

And, as shown in the figure, one spool for two step selection is available to switch the maximum flow rate of P1 and P2 pumps concurrently.

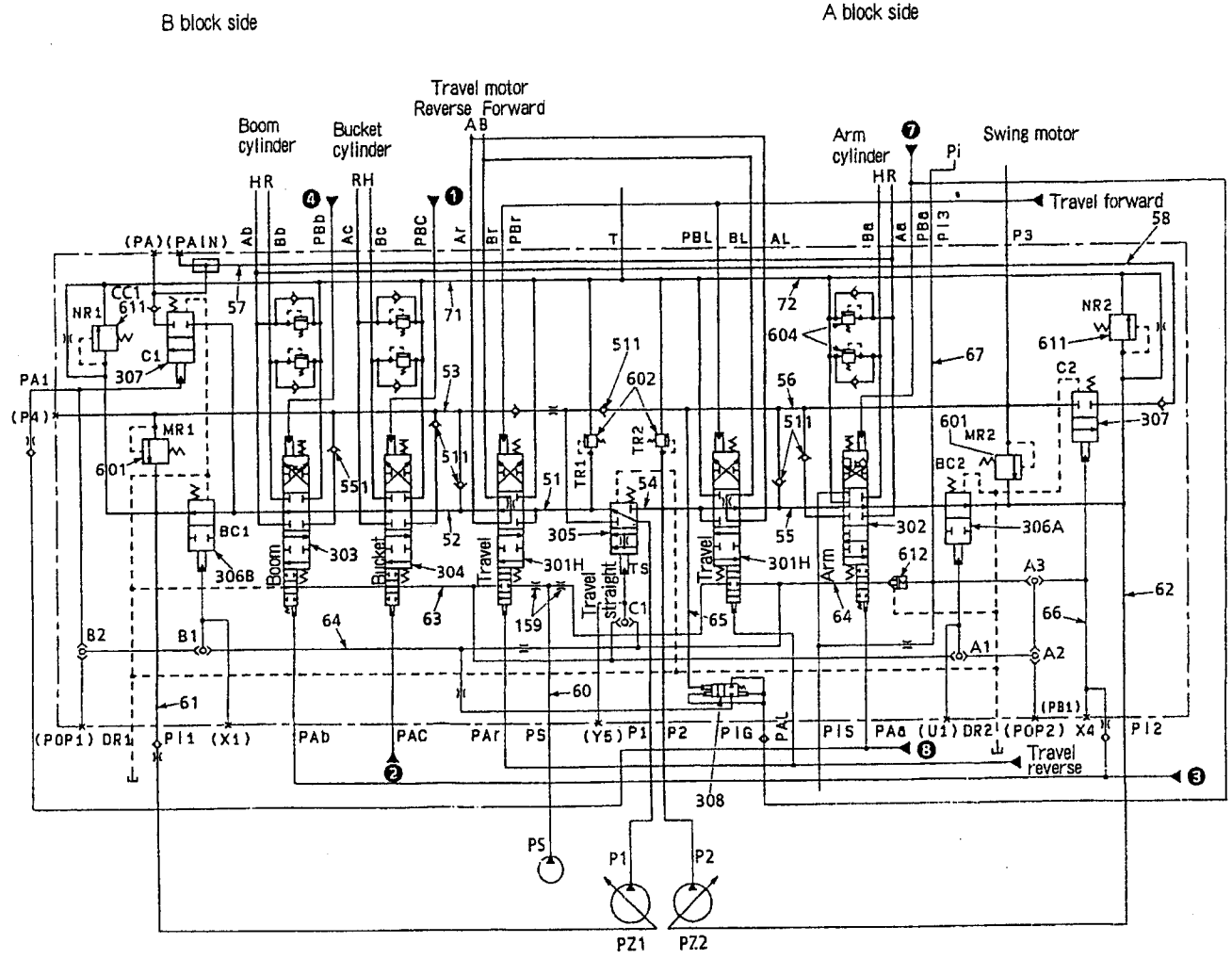


Fig. 7 Hydraulic diagram

Table 6

Port code	Port Size	Name	No.	Name
		Main port		Passage, Circuit
P1	PF3/4	Pump P1 port	51	Main passage (B block)
P2	PF3/4	Pump P2 port	52	By-pass circuit (B block)
P3	PF3/4	Swing port	53	Parallel circuit (B block)
T	Flange	Tank port	54	Main passage (A block)
Br	PF3/4	Travel port (Forward)	55	By-pass circuit (A block)
Ar	PF3/4	Travel port (Reverse)	56	Parallel circuit (A block)
BL	PF3/4	Travel port (Forward)	57	Arm conflux circuit
AL	PF3/4	Travel port (Reverse)	58	Boom conflux circuit
Ab	PF3/4	Boom raise port	60	Servo press. circuit
Bb	PF3/4	Boom lower port	61	Nega-con signal circuit (B block)
Ba	PF3/4	Arm in port	62	Nega-con signal circuit (A block)
Aa	PF3/4	Arm out port	63	Side by-pass circuit (B block)
Bc	PF3/4	Bucket digging port	64	Side by-pass circuit (A block)
Ac	PF3/4	Bucket dump port	65	Arm conflux signal circuit
		Pilot port	66	Boom conflux signal circuit
PAb	PF3/8	Boom raise pilot port	67	Swing priority signal circuit
PBb	PF3/8	Boom lower pilot port	71	Return circuit (B block)
PBa	PF3/8	Arm in pilot port	72	Return circuit (A block)
PAa	PF3/8	Arm out pilot port		Spool
PBC	PF3/8	Bucket digging pilot port	301H	Travel spool
PAC	PF3/8	Bucket dump pilot port	302	Arm spool
PAr	PF3/8	Travel reverse pilot port	303	Boom spool
PBr	PF3/8	Travel forward pilot port	304	Bucket spool
PAL	PF3/8	Travel reverse pilot port	305	Travel priority spool
PBL	PF3/8	Travel forward pilot port	306	By-pass cut spool (A, B)
PS	PF1/4	Servo press. port	307	Arm conflux spool, Boom conflux spool
DR1	PF1/4	A block drain port	308	Arm conflux sequence spool
DR2	PF1/4	B block drain port		Poppet, Relief valve
Pi1	PF1/4	P1 pump nega-con port	511	Poppet
Pi2	PF1/4	P2 pump nega-con port	601	Main relief valve
PB1	PF1/4	Boom raise conflux signal port	602	Travel relief valve
PA1	PF1/4	Arm out conflux signal port	604	Port relief valve
Pi3	PF1/4	Swing priority pilot port	611	Nega-con relief valve
PiG	PF1/4	Arm conflux pilot port	612	Lock valve poppet (Arm)
PiS	PF1/4	Arm recirculation port		Pump
		Measuring port	P1	Main pump
U1	PF1/8	Press. measuring port	P2	Main pump
X1	PF1/8	Press. measuring port	P3	Pilot pump (Travel)
Ys	PF1/8	Press. measuring port		Pilot valve pump
		Option	❶	Bucket pilot valve (Digging port)
POP1	PF1/4	Option pilot port	❷	Bucket pilot valve (Dump port)
POP2	PF1/4	Option pilot port	❸	Boom pilot valve (Raise port)
			❹	Boom pilot valve (Lower port)
			❼	Arm pilot valve (In port)
			❽	Arm pilot valve (Out port)

1) Drive circuit operation

On the other hand, the hydraulic pump P2 delivery oil enters in P2 port of the control valve B block and flows in the A block from notch C of travel priority selector spool (305) and flows into travel spool (301H) through main circuit (54).

The oil entered in travel spool (301H) is branched into parallel circuit (56) at by-pass circuit (55) and the center notch F section of the travel spool when the travel spool (301H) is at the neutral position.

But since all the flows in downstream of parallel circuit (56) are closed when the spool is at neutral position, the pressure oil other than that of main relief (601) operation does not flow in.

By-pass circuit (55) is led to by-pass cut spool A(1306) through arm spool (302).

Because by-pass cut spool A (306) is not cut off, the oil flows into negative control relief valve (611) through this spool. The same as in the B block mentioned above, the oil flows to negative control signal circuit (62) from control valve (Pi2), enters in regulator (PZ2), and the delivery flow rate by the variable displacement pump P2 is minimized.

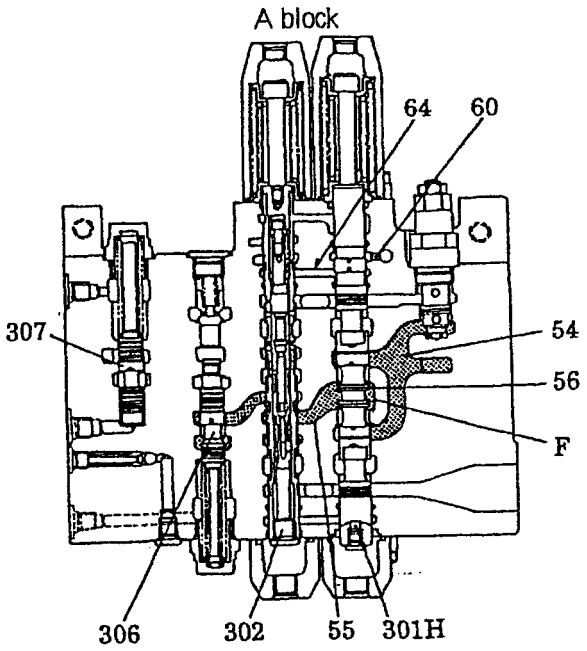


Fig. 12

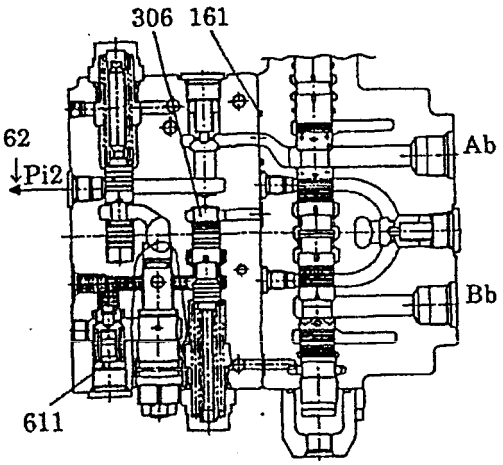


Fig. 13

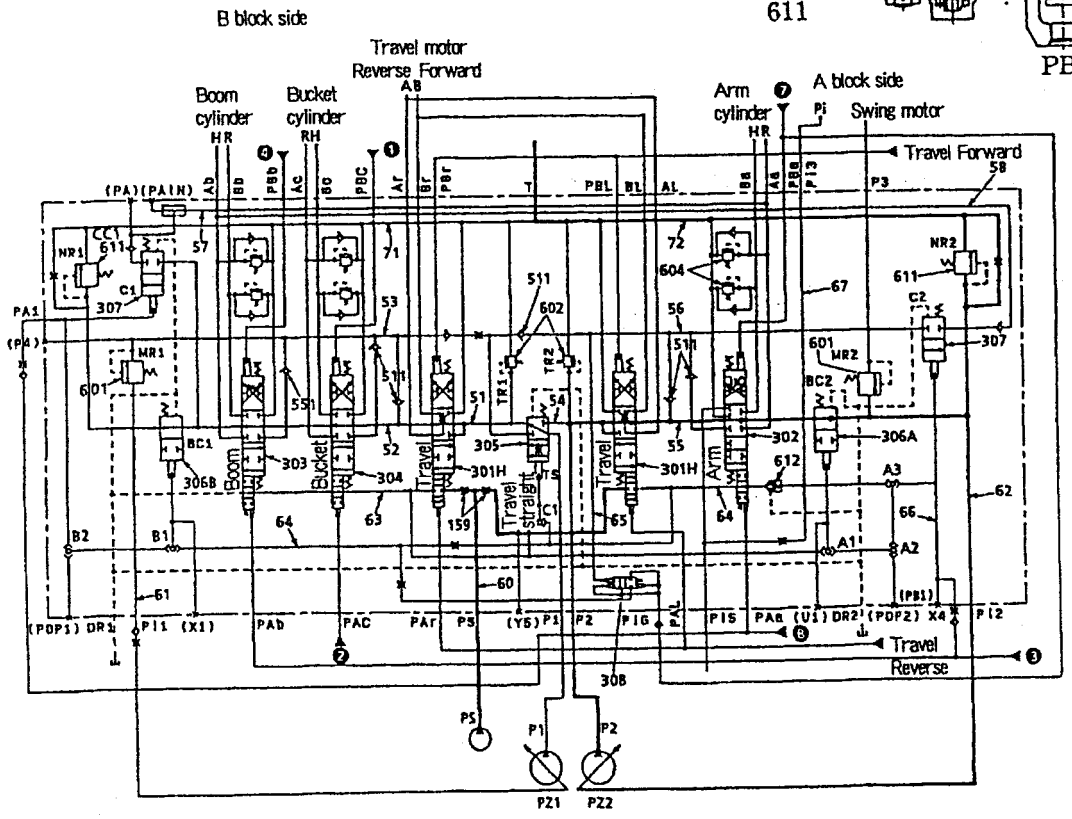


Fig. 14 At neutral position (A block)

CONSTRUCTION AND OPERATION

Structure

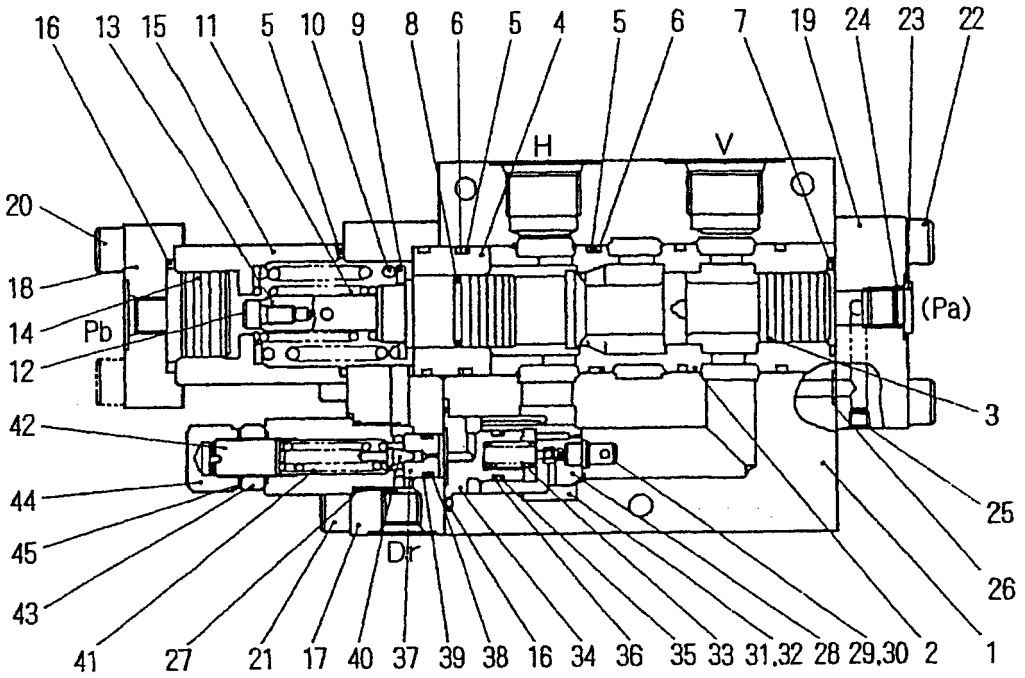


Fig. 2 Sectional view of Valve

Code	Name	Q'ty	Code	Name	Q'ty
1	Body	1	24	O-Ring ; 1B P11	1
2	Sleeve	1	25	Plug ; NPT 1/16	2
3	Spool	1	26	O-Ring ; 1B P9	2
4	Spool guide	1	27	O-Ring ; 1B P22	2
5	O-Ring ; 1B G40	6	28	Valve	1
6	Back-up ring	2	29	Bar	1
7	O-Ring ; 1B G30	1	30	O-Ring ; 1A P6	1
8	Capseal	1	31	Ball ; 5/32	1
9	Washer	1	32	Spring	1
10	Return spring	1	33	Spring	1
11	Return spring	1	34	Spring guide	1
12	Socket bolt ; M6×12	1	35	O-Ring ; 1A P14	1
13	Washer	1	36	Back-up ring	2
14	Piston	1	37	Body	1
15	Piston case	1	38	O-Ring ; 1B P12	1
16	O-Ring ; 1B G35	2	39	Back-up ring	1
17	Flange	1	40	Valve	1
18	Flange	1	41	Spring	1
19	Flange	1	42	Setscrew	1
20	Socket bolt ; M10×120	2	43	Nut	1
21	Socket bolt ; M10×45	4	44	Nut	1
22	Socket bolt ; M10×40	4	45	O-Ring ; 1A S16	2
23	Plug ; PF1/4	1			

The Figure 4 shows the motion diagram of steering system.

This machine is equipped with a hydraulic power steering system which is used to change the running direction through the steering cylinder (3) installed on the front axle which is moved by the pressure oil pumped up by the gear pump (1) attached to the main pump.

Therefore, the hydraulic equipment installed between gear pump (1) and steering cylinder (3) is connected with tube, hose, etc. and has no mechanism mechanically required.

The relief valve (4) is installed on the circuit on pressure side from the gear pump (1) to prevent the pressure from rising more than the specified pressure, and the pressure oil flows into the return circuit through the by-pass circuit in the overload anti-cavitation valve (6) installed on the steering unit (5).

By turning the steering handle clockwise or counterclockwise, the direction of front wheel is changed through the steering cylinder (3) of which the actuation is varied according to the oil quantity, corresponding to the rotation angle of steering handle delivered by the steering valve directly connected to the handle, with the aid of pressure oil from the gear pump (1).

If the gear pump (1) is malfunctioning, the steering valve (5) is changed to the manual pumping operation, which sucks the oil in from the return circuit, sends it to the steering cylinder (3) and controls the running direction. (For details of steering operation, see the separate volume "Steering Valve".)

⚠ Don't operate the handle when the engine is stopped because the booster is not working.

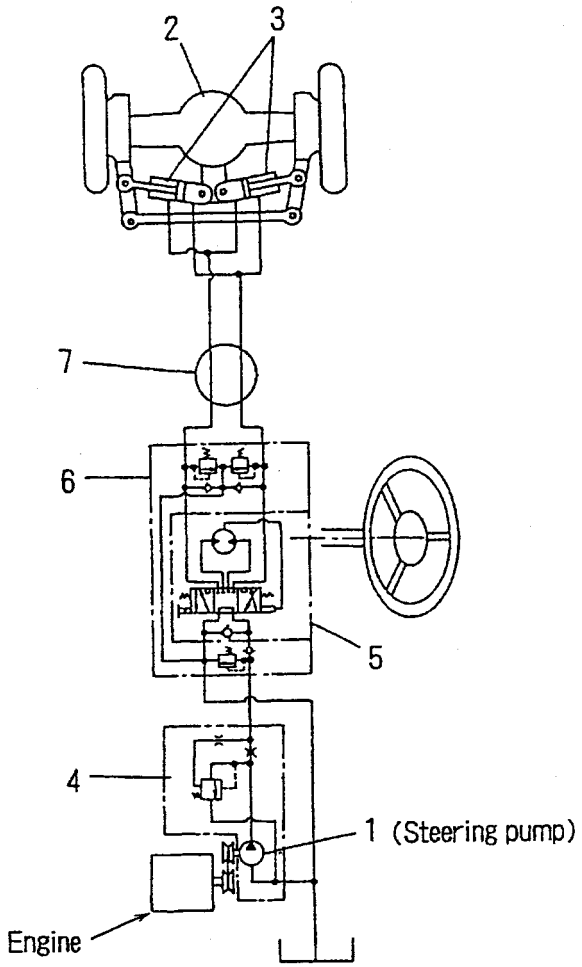


Fig. 4

Operation

(1) At neutral position (See Figure 5.)

The pressure oil led to pump port P on the steering valve enters in passage (1), and returns into the hydraulic tank through spool groove (2), passage (3) and tank port T.
Then, the cylinder ports L and R are blocked in the sleeve, so consequently the steering cylinder maintains the operating condition.

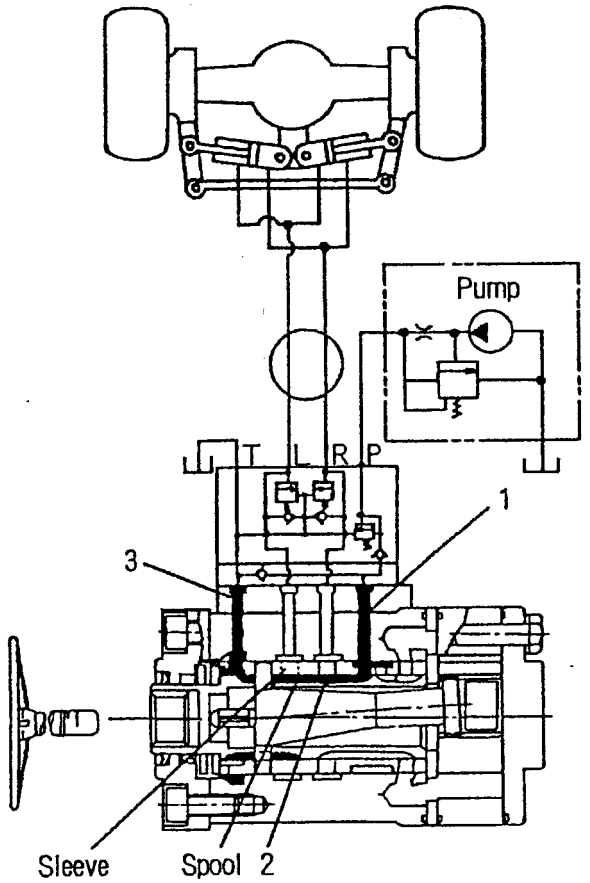


Fig. 5

(2) When steering rightward (See Figure 6.)

Rotate the handle clockwise, and the spool also rotates clockwise, the passage between spool and sleeve for pressure oil is connected, and passage from (1) to (4) and (5) while restricting the passage from (1) to (2) opens, and the passage to pump chambers A, B, and C of the gerotor is connected.
Concurrently the passage from gerotors D, E and F to cylinder port R through passages (6),(7),(8) is formed and the hydraulic oil to be led from the pump to the cylinder is fed into the cylinder through the metering mechanism.
On the other hand, the oil discharged by the cylinder flows from the cylinder port L to passages (9), (2), (3), and returns into the hydraulic tank through the tank port T.
When the hydraulic oil delivered by hydraulic pump passes through the metering mechanism, external gear (11) and trochoid gear (10) are rotated clockwise, and the rotation is transmitted to the sleeve through the centering spring, and consequently the sleeve and spool are rotated in the same direction. And after the relative position of the sleeve and spool returns to the neutral position, the oil flowing from the pump to the metering mechanism is cut, and returns into the hydraulic tank through passages (2),(3) and the port T.

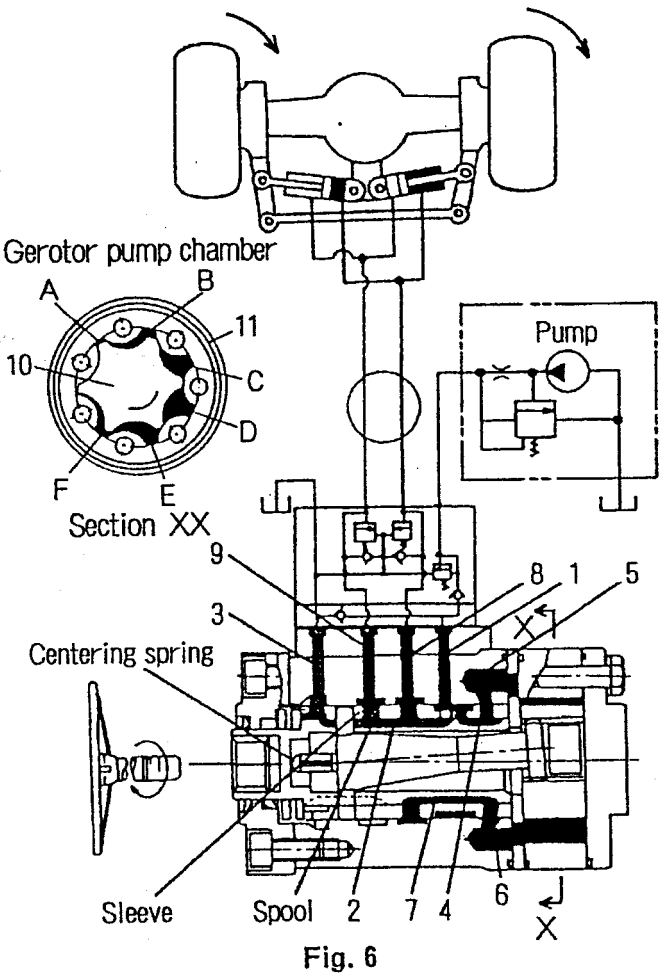


Fig. 6

Operation

Motor section (See Fig. 4 and Table 2)

As shown in Figure 4, the pressure oil passes through IN port (a) of valve plate (131) which has ports (shaped somewhat like a crescent) which distribute the oil to inlet or outlet and flows into cylinder block (111), and the pressure acts on piston (121) and the force F is generated in the direction of shaft. The force F is broken down with vector into force F1 vertical to shoe plate (124) and force F2 at right angles to the shaft.

The force F2 is transmitted to cylinder block (111) through piston (121), and drive shaft (101) starts rotating, and rotating moment is produced.

Nine pistons (121) are put in order on cylinder block (111), and the rotating torque is transmitted to drive shaft (101) in order by piston (121) connected to high pressure inlet port (a).

If the oil inlet and outlet directions are reversed, drive shaft (101) also rotates reversely.

The theoretical output torque T can be found by using the following formula.

$$T = \frac{Q \times P}{2\pi 100}$$

T = Output torque ..... kgf•m
P = Effective differential pressure ... kgf/cm²
Q = Capacity per rotation ..... cc/rev

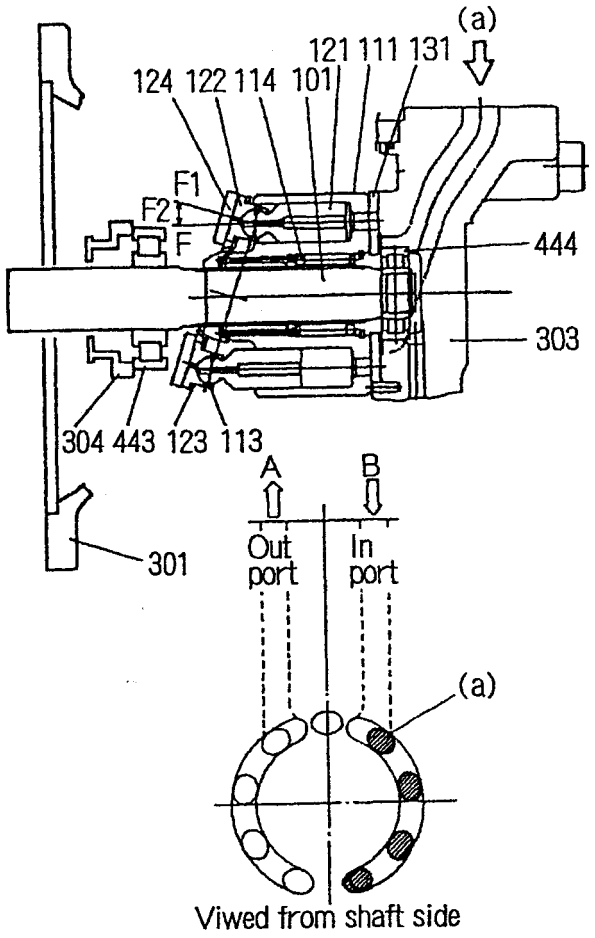


Fig. 4

Table 2

Rotating direction (viwed from shaft side)	Counter-clockwise	Clockwise
Oil inlet	B	A
Oil outlet	A	B

Brake section (See Fig. 5)

Cylinder (111) is linked with drive shaft (101) by spline. And the rotation in perimeter direction of separator plate (743) is restricted by circular arc-shaped groove on casing (301).

When friction plate (742) linked with the outer side of cylinder with spline is pushed against casing (301) by brake spring (712) through separator plate (743) and brake piston (702), and the frictional force between friction plate (742) and casing (301), separator plate (743) and brake piston (702) is produced. This frictional force restricts and brakes the drive shaft.

On the other hand, the pressure is applied on the oil chamber formed between brake piston (702) and casing (301) to release braking, and when the oil pressure is raised higher than the spring force, brake piston (702) moves and consequently friction plate (742) separates from casing (301) releasing the braking.

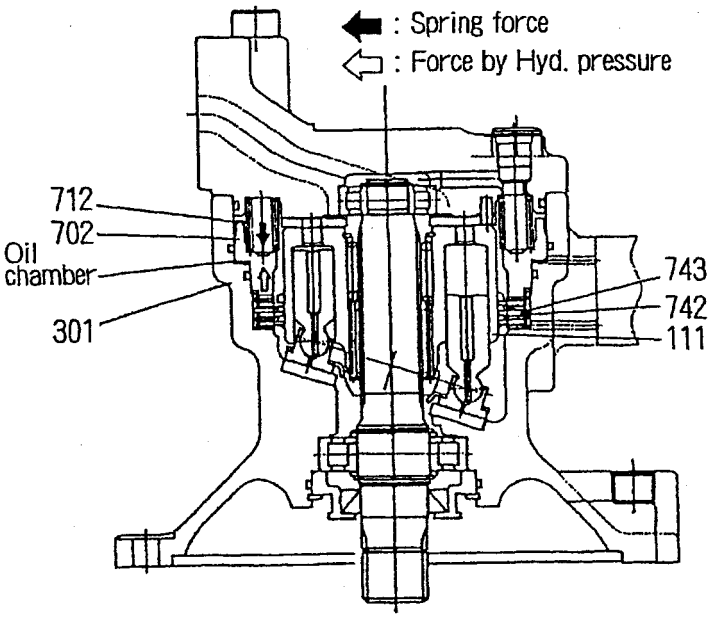


Fig. 5

Operation

The hydraulic motor performs the function of automatically controlling the running torque equivalent to the running resistance as travel motor for the wheel mounted hydraulic excavator, and consists of a counter balance valve to prevent overrunning of the hydraulic motor and anticavitation valve to prevent cavitation.

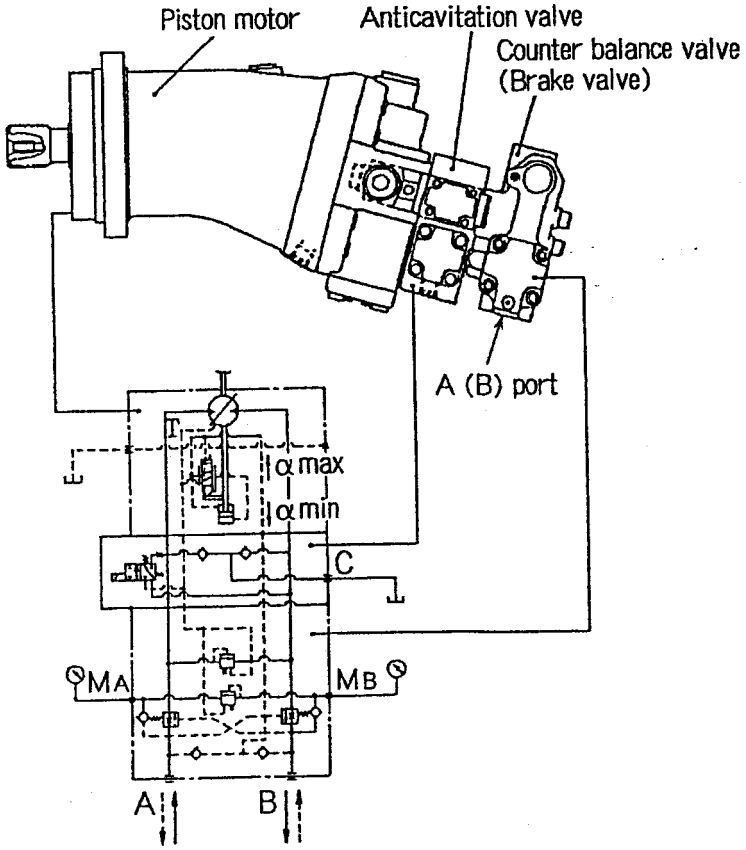


Fig. 3 Hydraulic diagram (Travel motor)

Construction

(1) Transmission

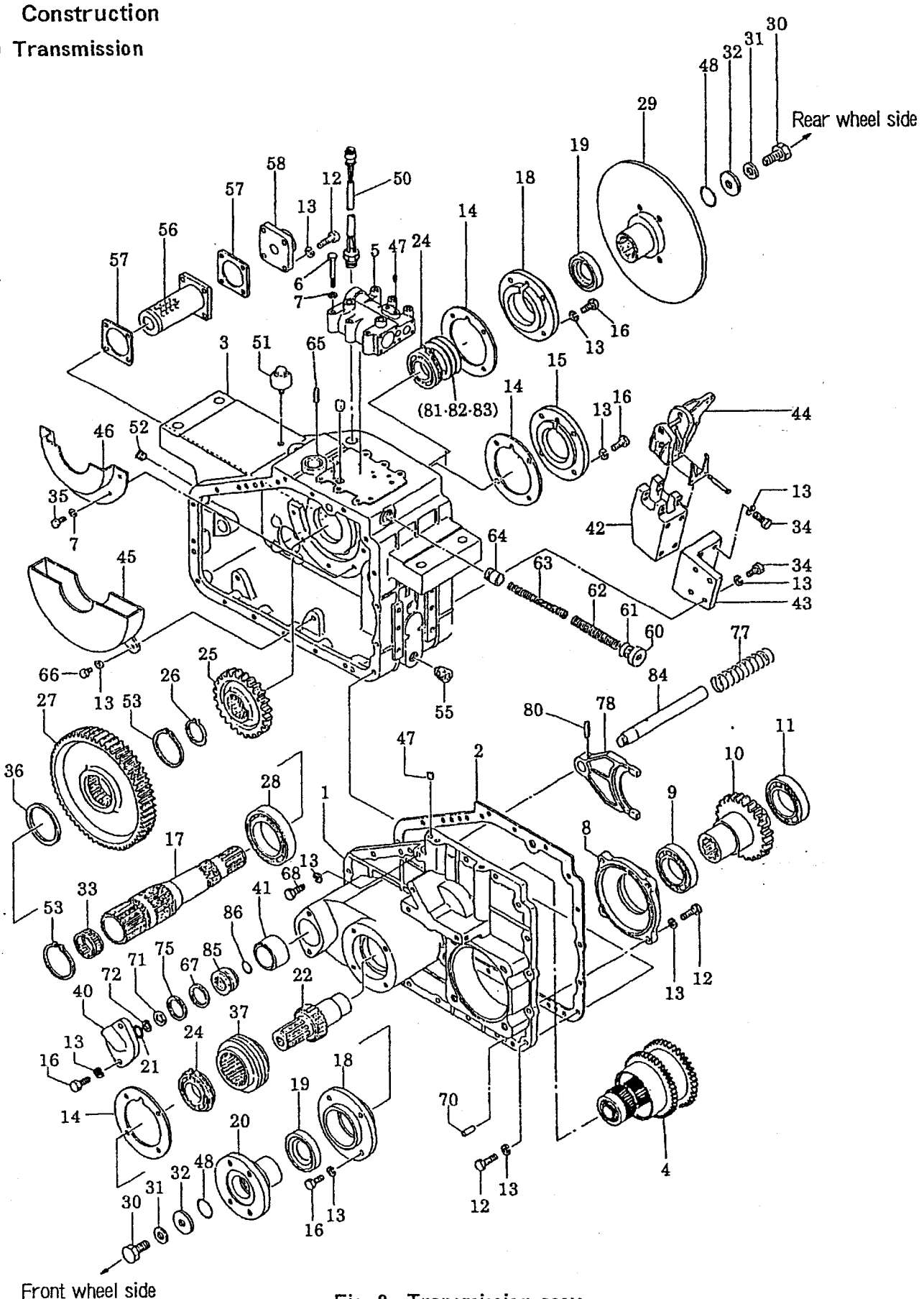


Fig. 2 Transmission assy

Operations [For figures in ( ) in this manual, refer to Figures 2 and 3.]

(1) Transmission (See Figure 5.)

The construction of transmission is made up of input gear A (10), hydraulic clutch shaft (101) and output shaft (17).

The power of hydraulic motor is transmitted to hydraulic clutch shaft (101) through input gear A (10).

By switching the speed lever to 1st or 2nd speed, the hydraulic clutch actuates and either of Lo or Hi is engaged.

When it is engaged to the Lo side, the power is transmitted to output shaft (17) through hydraulic clutch shaft (101), gear C (116) and gear F (27) in order.

When it is engaged to the Hi side, the power is transmitted to output shaft (17) through hydraulic clutch shaft (101), gear D (122) and gear E (25) in order.

And the power transmitted to output shaft (17) is then transmitted to both front and rear wheels.

Also, the switching device from/to 2WD to/from 4WD (37) is installed on the front wheel side of output shaft (17), and the disc brake (29) for parking brake is on the rear wheel side.

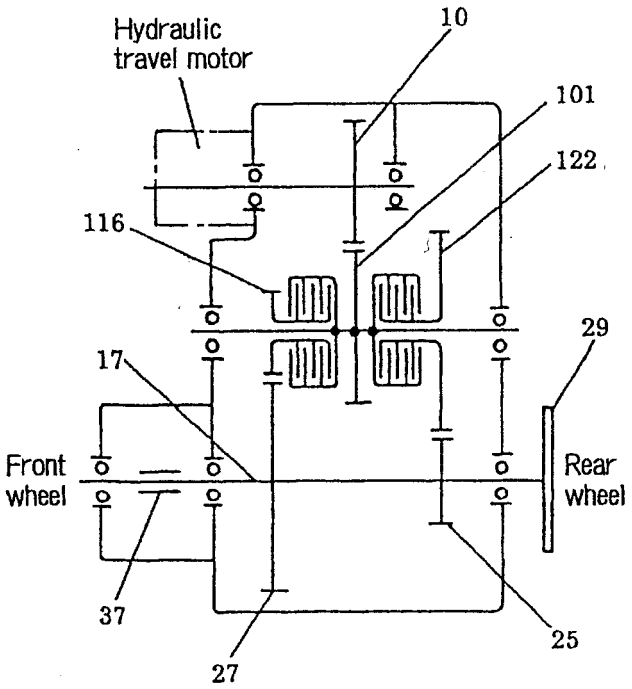


Fig. 5 Power line

(2) Hydraulic clutch (See Figure 6.)

Two hydraulic clutches are installed on one shaft, and each clutch operates independently.

Respective hydraulic clutch is made up of 5 drive plates (107), 5 friction plates (108), piston (102), back plate (109) and conical plate (129).

The power transmitted to gear (101) of the shaft is transmitted to the right or the left according to the following clutch operation.

With the operation of piston (102), drive plate (107) and friction plate (108) are bonded, and the power of shaft is transmitted to gear C (116) or gear D (122) through drive plate (107) and friction plate (108).

Conical plate (129) is installed between back plate (109) and the snap ring, and relaxes the shock generated when it is engaged with the clutch.

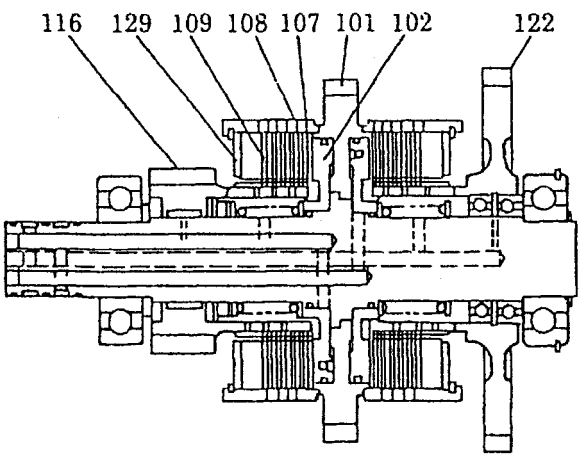


Fig. 6 Hydraulic clutch shaft