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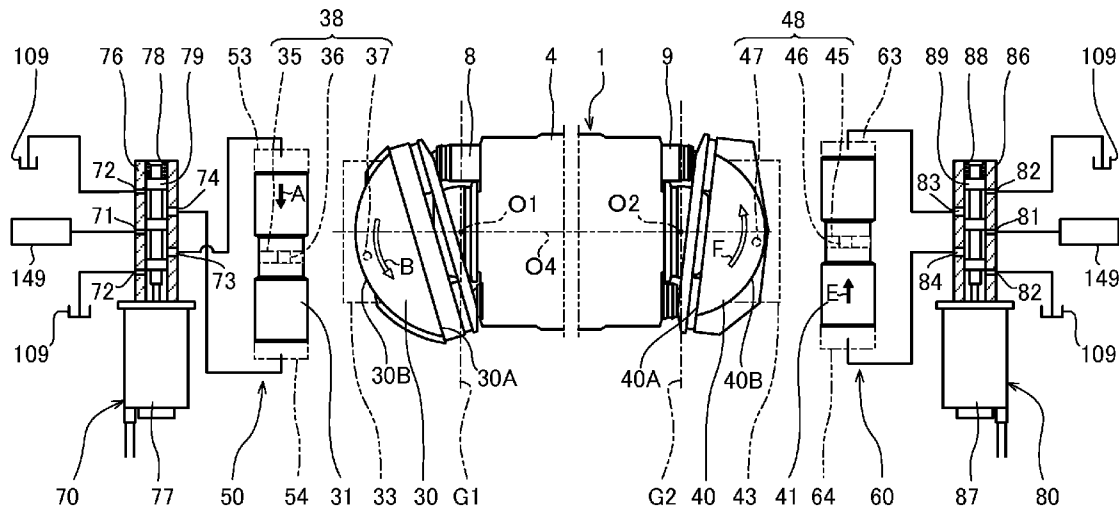
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(57) **ABSTRACT**

An opposed swash plate type fluid pressure rotating machine in which a first piston and a second piston projecting from opposite ends of a rotary cylinder block reciprocate in a cylinder, respectively following a first swash plate and a second swash plate. The first swash plate includes a first tilt bearing for tiltably supporting the first swash plate, a first tilt driving piston for tilting the first swash plate in a direction intersecting with an axis of rotation of the cylinder block, a second tilt bearing for tiltably supporting the second swash plate, and a second tilt driving piston for tilting the second swash plate in a direction intersecting with the axis of rotation of the cylinder block.



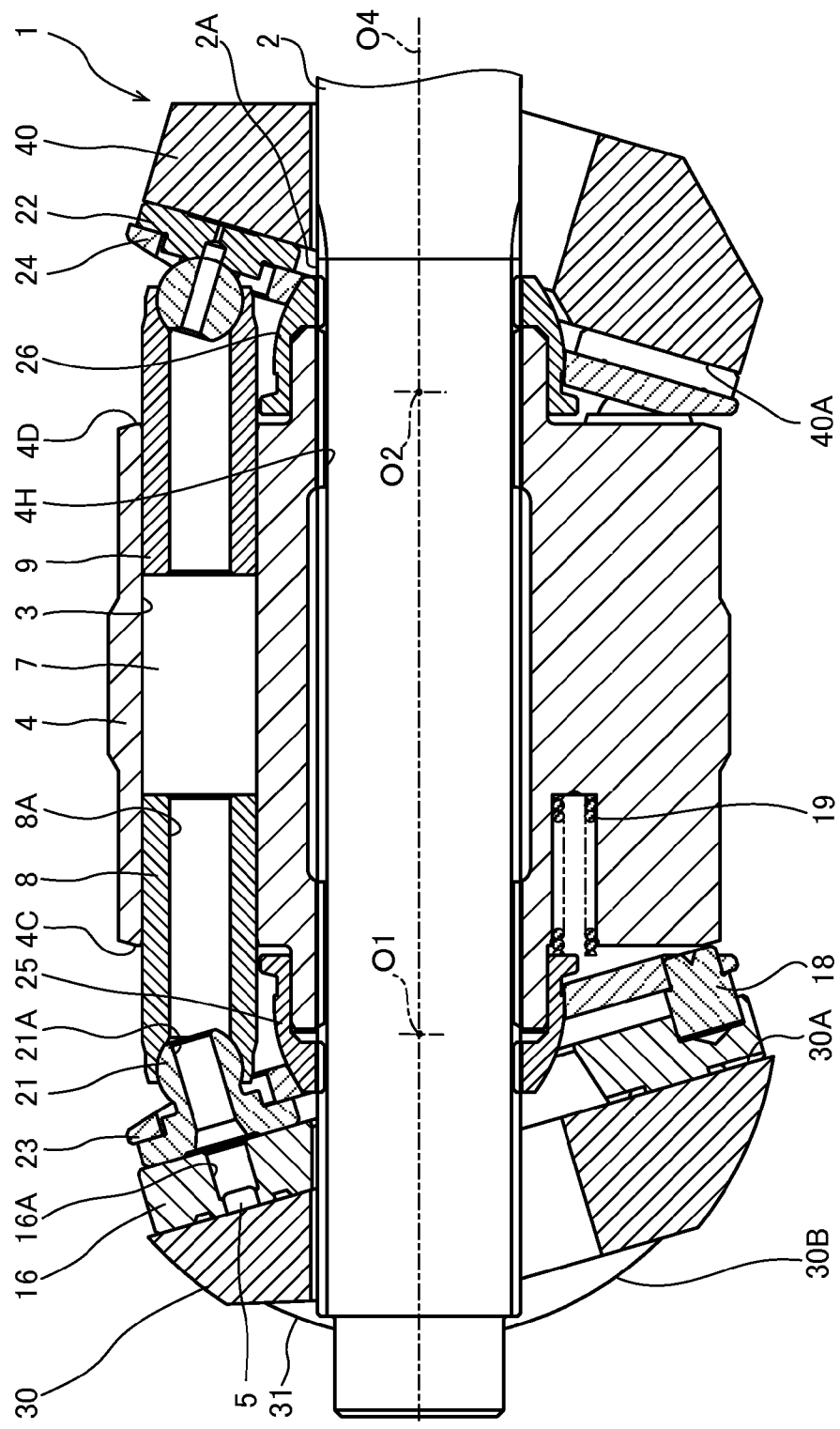


FIG. 1

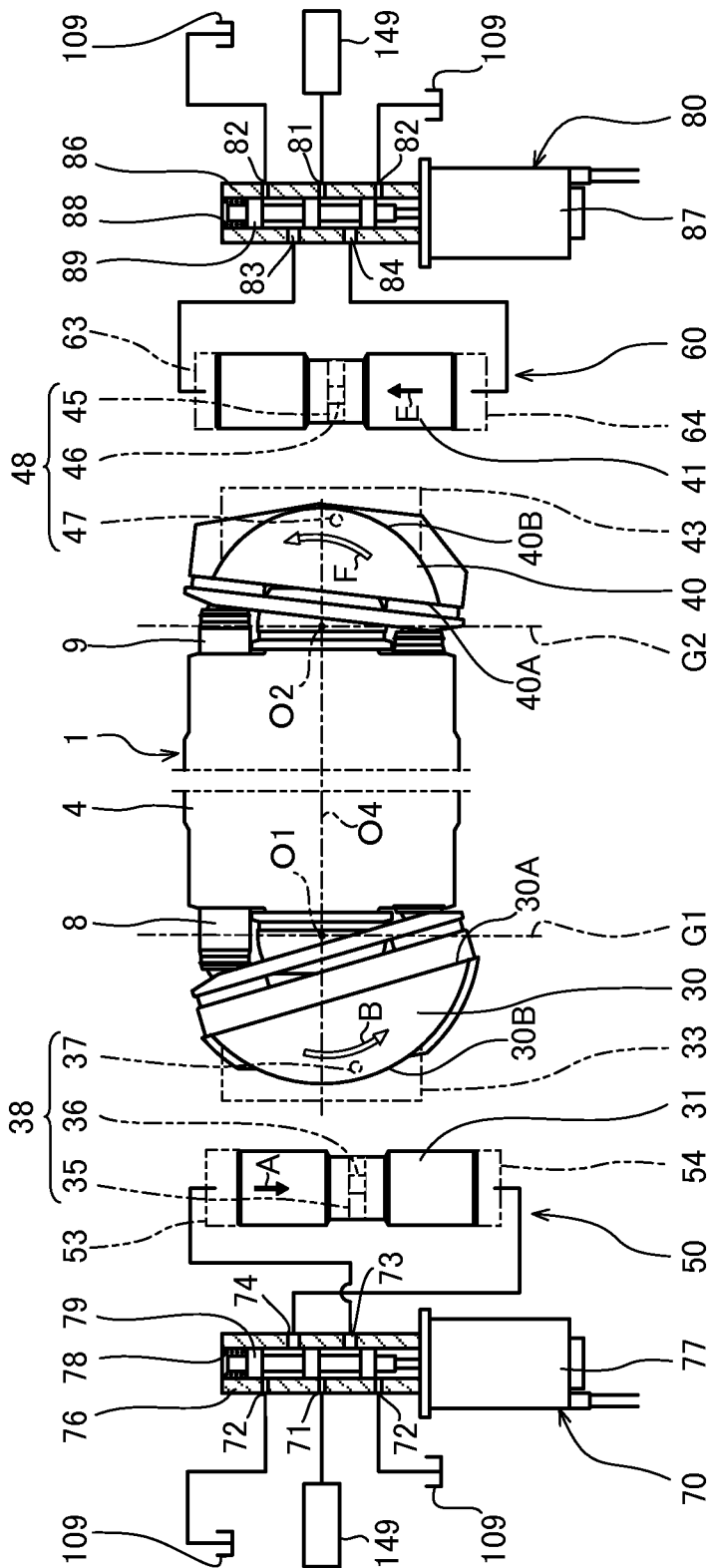


FIG. 2

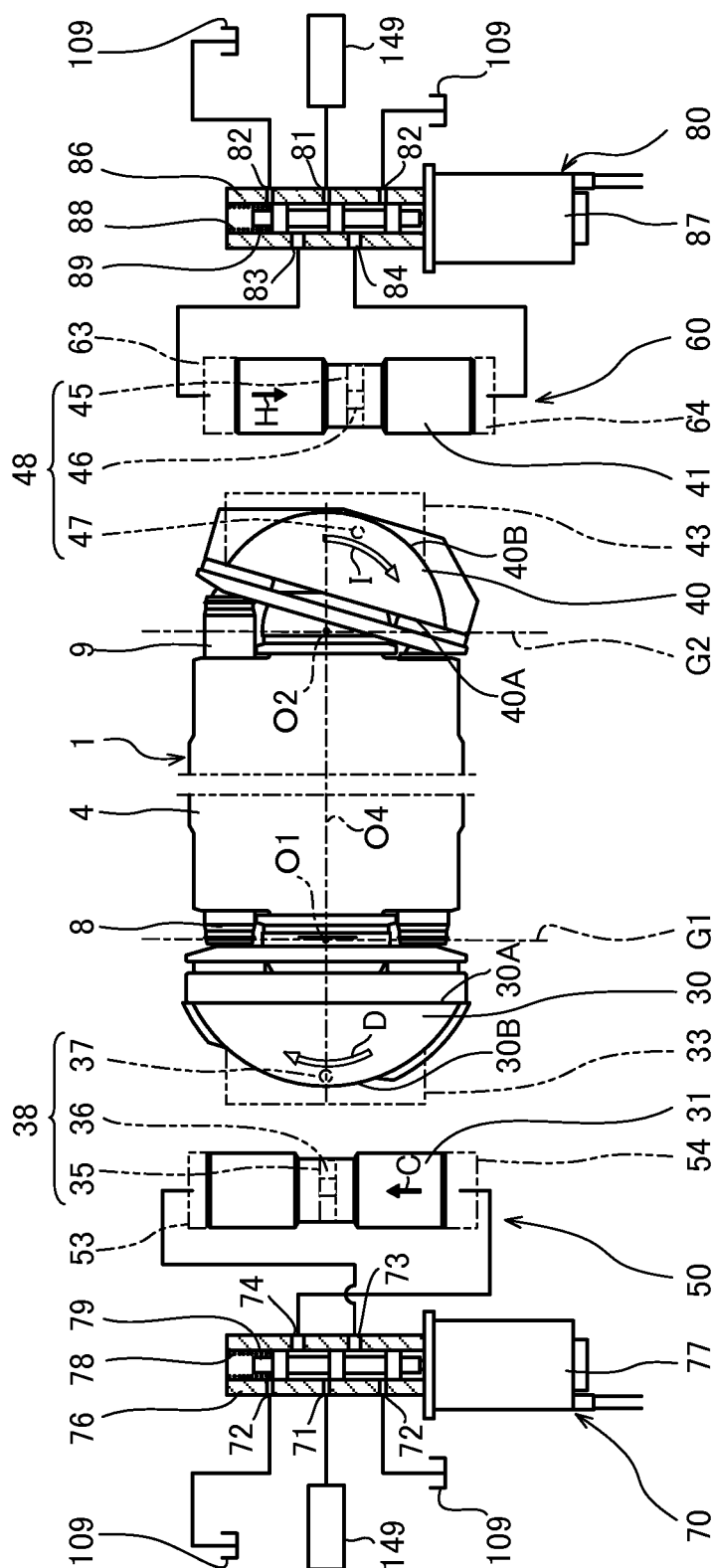


FIG. 3

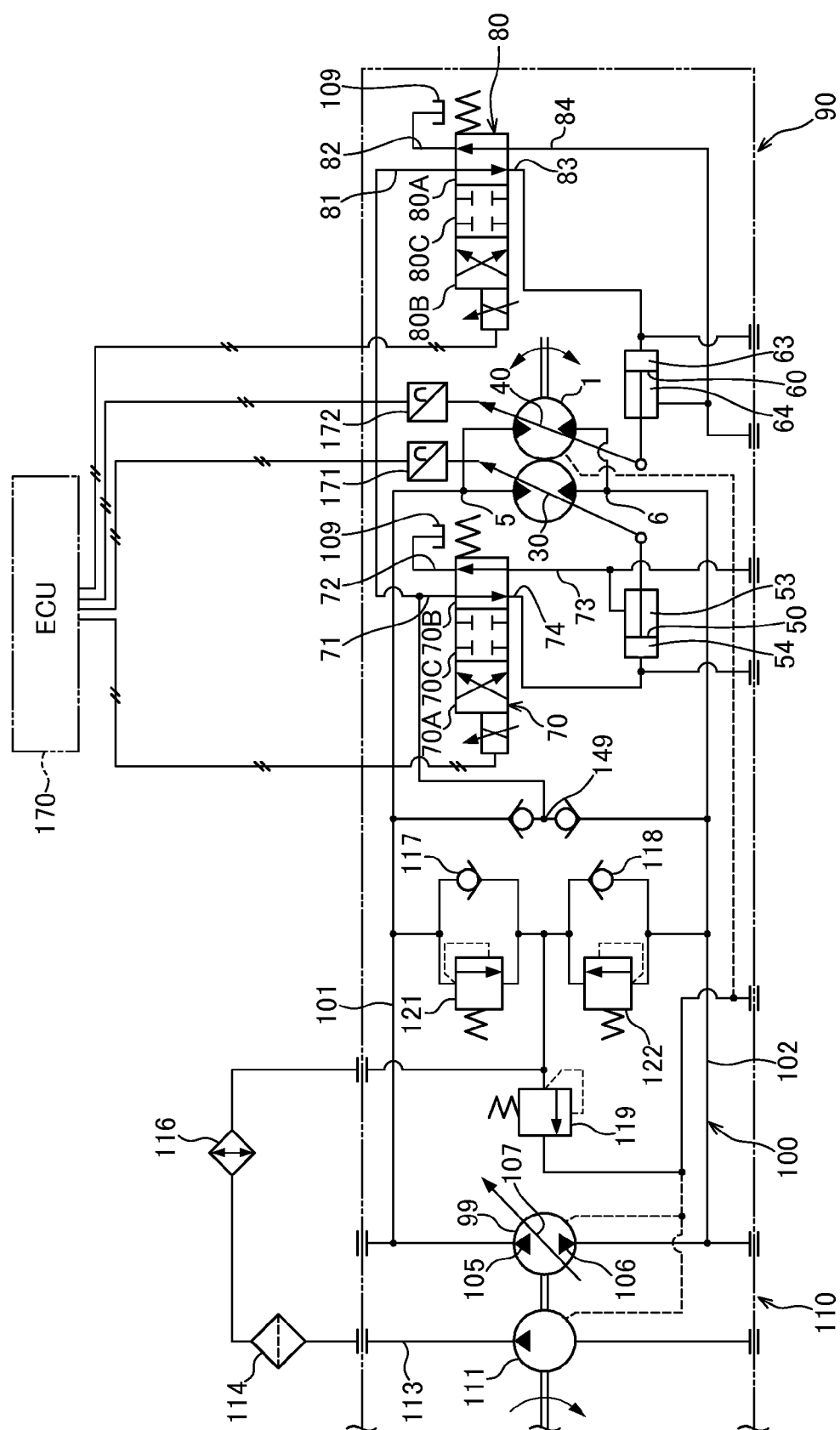


FIG. 4

OPPOSED SWASH PLATE TYPE FLUID PRESSURE ROTATING MACHINE

TECHNICAL FIELD

[0001] The present invention relates to an opposed swash plate type fluid pressure rotating machine in which a first swash plate and a second swash plate are tilted while facing opposite ends of a cylinder block.

BACKGROUND ART

[0002] JP2008-231924A discloses an opposed swash plate type fluid pressure rotating machine provided with a cylinder block including a plurality of cylinders, first pistons and second pistons projecting from opposite ends of the cylinders and a first swash plate and a second swash plate with which projecting ends of the first and second pistons respectively slide in contact.

[0003] In the fluid pressure rotating machine, according to the rotation of the cylinder, the first pistons reciprocate in the cylinders, following the first swash plate, and the second pistons reciprocate in the cylinders, following the second swash plate, whereby working fluid is supplied to and discharged from volume chambers in the cylinders.

[0004] A tilt driving piston for tilting the first swash plate is coupled to one side of the first swash plate and a tilt interlocking mechanism for transmitting the inclination of the first swash plate to the second swash plate is coupled to the other side of the first swash plate. When the first swash plate is tilted by the tilt driving piston, the second swash plate is also tilted via the tilt interlocking mechanism.

SUMMARY OF INVENTION

[0005] In the opposed swash plate type fluid pressure rotating machine disclosed in JP2008-231924A, a floating phenomenon in which a tilt shaft part of the first swash plate is separated from a tilt bearing provided on a casing when the first swash plate is driven to tilt may occur.

[0006] The floating phenomenon is a phenomenon in which the first swash plate rotates about a rotary shaft of the cylinder block and the tilt shaft part of the first swash plate is separated from the tilt bearing by the action of a force of the tilt driving piston received by the one side of the first swash plate and a reaction force of the tilt interlocking mechanism received by the other side of the first swash plate when the first swash plate is tilted as a torque in the same rotating direction.

[0007] The present invention aims to prevent a floating phenomenon in an opposed swash plate type fluid pressure rotating machine.

[0008] According to one aspect of the present invention, an opposed swash plate type fluid pressure rotating machine in which a first piston and a second piston projecting from opposite ends of a rotary cylinder block reciprocate in a cylinder, respectively following a first swash plate and a second swash plate is provided. The opposed swash plate type fluid pressure rotating machine includes a first tilt bearing for tiltably supporting the first swash plate, a first tilt driving piston for tilting the first swash plate in a direction intersecting with an axis of rotation of the cylinder block, a second tilt bearing for tiltably supporting the second swash plate, and a second tilt driving piston for tilting the second swash plate in a direction intersecting with the axis of rotation of the cylinder block.

BRIEF DESCRIPTION OF DRAWINGS

[0009] FIG. 1 is a sectional view of an opposed swash plate type piston motor according to an embodiment of the present invention,

[0010] FIG. 2 is a diagram showing a configuration for tilting a first swash plate and a second swash plate,

[0011] FIG. 3 is a diagram showing the configuration for tilting the first and second swash plates, and

[0012] FIG. 4 is a hydraulic circuit diagram for tilting the first and second swash plates.

DESCRIPTION OF EMBODIMENT

[0013] An opposed swash plate type piston motor 1 according to an embodiment of the present invention is described with reference to the drawings.

[0014] The opposed swash plate type piston motor 1 shown in FIG. 1 is applied to a hydrostatic transmission 90 (see FIG. 4; hereinafter, merely referred to as an "HST 90") mounted as a continuously variable transmission in a working vehicle or the like.

[0015] As shown in FIG. 1, the opposed swash plate type piston motor 1 includes a shaft 2 which rotates about an axis of rotation O4, a cylinder block 4 which is supported on the shaft 2 and a first swash plate 30 and a second swash plate 40 which are tilted while facing opposite ends of the cylinder block 4.

[0016] The cylinder block 4 is formed into a cylindrical tube including a hollow part, and the shaft 2 is inserted thereto. The cylinder block 4 is formed by arranging a plurality of cylinders 3 side by side in a circumferential direction. The cylinders 3 are formed to extend in an axial direction and open on opposite end surfaces 4C, 4D of the cylinder block 4.

[0017] A first piston 8 and a second piston 9 are respectively inserted into the cylinder 3 from opposite opening ends. The first and second pistons 8, 9 include tip parts projecting from the opening ends of the cylinder 3 and a first shoe 21 and a second shoe 22 are slidably coupled to the respective tip parts.

[0018] When the cylinder block 4 rotates, the first piston 8 reciprocates following an end surface 30A of the first swash plate 30 via the first shoe 21 and a port plate 16, and the second piston 9 reciprocates following an end surface 40A of the second swash plate 40 via the second shoe 22.

[0019] In the cylinder 3, a volume chamber 7 is defined between the first and second pistons 8, 9. The volume chamber 7 expands and contracts by the reciprocation of the first and second pistons 8, 9 in the cylinder 3, whereby hydraulic oil is supplied to and discharged from the volume chamber 7 through a pair of supply/discharge passages 5, 6 (see FIG. 4).

[0020] Although the piston motor 1 uses the hydraulic oil (oil) as the working fluid, water-soluble alternative liquid or the like may be, for example, used instead of the hydraulic oil.

[0021] Opposite end parts of the cylindrical shaft 2 are rotatably supported on a casing (not shown) via bearings (not shown).

[0022] The casing includes a tubular case (not shown) and a first cover and a second cover (not shown) in the form of lids for closing opposite opening ends of the case. The cylinder block 4 is housed in the case, the first swash plate 30 is housed in the first cover and the second swash plate 40 is housed in the second cover.

[0023] A spline 2A is formed on the outer periphery of the shaft 2. A spline 4H is formed on the inner periphery of the

cylinder block 4. By slidably fitting the spline 4H of the cylinder block 4 to the spline 2A of the shaft 2, the rotation of the cylinder block 4 relative to the shaft 2 is regulated and the cylinder block 4 can move in the axial direction relative to the shaft 2.

[0024] A first retainer plate 23 and a first retainer holder 25 are interposed side by side in the axial direction between the first swash plate 30 and the cylinder block 4.

[0025] The disk-shaped port plate 16 which rotates together with the cylinder block 4 is provided between the first shoe 21 and the first swash plate 30. The port plate 16 is coupled to the first retainer plate 23 via a plurality of pins 18.

[0026] A plurality of center springs 19 are interposed side by side in the circumferential direction between the first retainer holder 25 and the cylinder block 4. The cylinder block 4 is biased rightward in FIG. 1 by the center springs 19 and pressed against the end surface 40A of the second swash plate 40 via a second retainer holder 26, a second retainer plate 24 and the second shoe 22. As a result, the axial position of the cylinder block 4 relative to the second swash plate 40 is determined.

[0027] Next, a configuration for respectively tilting the first and second swash plates 30, 40 is described based on FIGS. 2 and 3.

[0028] The first swash plate 30 includes a pair of tilt shaft parts (half log parts) 30B projecting on a rear surface side. The tilt shaft parts 30B are tiltably supported by a first tilt bearing 33 formed on the casing (not shown). The first swash plate 30 rotates about a first tilt axis O1. The second swash plate 40 includes a pair of tilt shaft parts (half log parts) 40B projecting on a rear surface side. The tilt shaft parts 40B are tiltably supported by a second tilt bearing 43 formed on the casing. The second swash plate 40 rotates about a second tilt axis O2. The first and second tilt axes O1, O2 are orthogonal to the axis of rotation O4 of the cylinder block 4.

[0029] The piston motor 1 includes a first tilt driving mechanism 50 for tilting the first swash plate 30 and a second tilt driving mechanism 60 for tilting the second swash plate 40. By tilting the first swash plate 30, a reciprocating stroke length of the first piston 8 in the cylinder 3 changes. By tilting the second swash plate 40, a reciprocating stroke length of the second piston 9 in the cylinder 3 changes. By changing the stroke lengths, a displacement volume per rotation of the cylinder block 4 changes and an output rotation speed of the piston motor 1 changes.

[0030] The first tilt driving mechanism 50 includes a first tilt driving piston 31 which is moved by a working hydraulic pressure and a translating mechanism 38 for translating a movement of the first tilt driving piston 31 into a rotational movement of the first swash plate 30 about the first tilt axis O1.

[0031] In FIGS. 2 and 3, a line G1 is orthogonal to the axis of rotation O4 and the first tilt axis O1. The first tilt driving piston 31 is arranged to move in a direction parallel to the line G1. Without limitation to this, the first tilt driving piston 31 may be arranged to move in a direction intersecting at a small angle with the line G1.

[0032] The translating mechanism 38 is configured by a slide metal 36 which is slidably engaged with a guide groove 35 of the first tilt driving piston 31 and a pin 37 which projects from an end part of the first swash plate 30 in a direction of the first tilt axis O1 and is slidably inserted into a hole of the slide metal 36. When the first tilt driving piston 31 moves in the axial direction (direction parallel to the line G1), the slide

metal 36 and the pin 37 move along an arc centered on the first tilt axis O1 while sliding along the guide groove 35. As a result, the first swash plate 30 rotates about the first tilt axis O1.

[0033] A first push-side piston pressure chamber 53 and a first pull-side piston pressure chamber 54 are respectively defined on opposite ends of the first tilt driving piston 31. A first tilt control valve 70 is provided which switches working hydraulic pressures introduced to these piston pressure chambers 53, 54. The first tilt driving piston 31 is moved by a working hydraulic pressure difference between the piston pressure chambers 53, 54.

[0034] The second tilt driving mechanism 60 includes a second tilt driving piston 41 which is moved by the working hydraulic pressure and a translating mechanism 48 for translating a movement of the second tilt driving piston 41 into a rotational movement of the second swash plate 40 about the second tilt axis O2.

[0035] In FIGS. 2 and 3, a line G2 is orthogonal to the axis of rotation O4 and the second tilt axis O2. The second tilt driving piston 41 is arranged to move in a direction parallel to the line G2. Without limitation to this, the second tilt driving piston 41 may be arranged to move in a direction intersecting at a small angle with the line G2.

[0036] The translating mechanism 48 is configured by a slide metal 46 which is slidably engaged with a guide groove 45 of the second tilt driving piston 41 and a pin 47 which projects from an end part of the second swash plate 40 in a direction of the second tilt axis O2 and is slidably inserted into a hole of the slide metal 46. When the second tilt driving piston 41 moves in the axial direction (direction parallel to the line G2), the slide metal 46 and the pin 47 move along an arc centered on the second tilt axis O2 while sliding along the guide groove 45. As a result, the second swash plate 40 rotates about the second tilt axis O2.

[0037] A second push-side piston pressure chamber 63 and a second pull-side piston pressure chamber 64 are respectively defined on opposite ends of the second tilt driving piston 41. A second tilt control valve 80 is provided which switches working hydraulic pressures introduced to these piston pressure chambers 63, 64. The second tilt driving piston 41 is moved by a working hydraulic pressure difference between the piston pressure chambers 63, 64.

[0038] FIG. 4 is a diagram showing the configurations of a hydraulic circuit and a control system provided in the HST 90.

[0039] The HST 90 includes the piston motor 1, a piston pump 99 and a closed circuit 100 for circulating the hydraulic oil between these.

[0040] The closed circuit 100 includes a first circulation passage 101 and a second circulation passage 102 connecting the piston motor 1 and the piston pump 99. One end of the first circulation passage 101 is connected to the supply/discharge passage 5 of the piston motor 1 and the other end is connected to a supply/discharge passage 105 of the piston pump 99. One end of the second circulation passage 102 is connected to the supply/discharge passage 6 of the piston motor 1 and the other end is connected to a supply/discharge passage 106 of the piston pump 99.

[0041] By feeding the hydraulic oil discharged from the piston pump 99 to the piston motor 1 through the closed circuit 100, the piston motor 1 rotates. Output rotation of the piston motor 1 is transmitted to left and right wheels via unillustrated transmission (gear type transmission), differential gear and the like.

[0042] The piston pump 99 is driven to rotate by an engine (not shown). The piston pump 99 includes two supply/discharge passages 105, 106 for supplying and discharging the hydraulic oil to and from a volume chamber, and a discharging direction of the hydraulic oil from the supply/discharge passages 105, 106 is changed by switching a tilting direction of a swash plate 107. By changing the discharging direction of the piston pump 99, a travel direction (forward or backward) of the vehicle is switched.

[0043] A fluid pressure source 110 includes a fixed displacement charge pump 111 which is driven to rotate by the engine and a charge passage 113 which introduces the hydraulic oil discharged from the charge pump 111. An oil filter 114, an oil filter 116 and a relief valve 119 are disposed in the charge passage 113. The hydraulic oil having passed through the relief valve 119 is returned to a tank 109.

[0044] The charge passage 113 is connected to the first and second circulation passages 101, 102 via check valves 117, 118. If a pressure of the first circulation passage 101 falls below that of the charge passage 113, the check valve 117 is opened and the hydraulic oil is filled into the first circulation passage 101 from the charge passage 113. On the other hand, if a pressure of the second circulation passage 102 falls below that of the charge passage 113, the check valve 118 is opened and the hydraulic oil is filled into the second circulation passage 102 from the charge passage 113. Thus, the pressures of the first and second circulation passages 101, 102 are kept not lower than a predetermined value.

[0045] Relief valves 121, 122 are interposed side by side with the check valves 117, 118 in the charge passage 113. If the pressure of the first circulation passage 101 increases beyond the predetermined value relative to that of the charge passage 113, the relief valve 121 is opened and the working hydraulic pressure of the first circulation passage 101 is allowed to escape into the charge passage 113. On the other hand, if the pressure of the second circulation passage 102 increases beyond the predetermined value relative to that of the charge passage 113, the relief valve 122 is opened and the working hydraulic pressure of the second circulation passage 102 is allowed to escape into the charge passage 113. Thus, increases of the pressures of the first and second circulation passages 101, 102 beyond the predetermined value are suppressed.

[0046] A high-pressure selector valve 149 is provided between the first and second circulation passages 101, 102. The working hydraulic pressure taken out via the high-pressure selector valve 149 is introduced to the first and second tilt control valves 70, 80.

[0047] The first tilt control valve 70 includes an inlet port 71 communicating with the high-pressure selector valve 149, an outlet port 72 communicating with the tank 109, a first push-side port 73 communicating with the first push-side piston pressure chamber 53 and a first pull-side port 74 communicating with the first pull-side piston pressure chamber 54.

[0048] As shown in FIGS. 2 and 3, the first tilt control valve 70 includes a valve housing 76 disposed in the casing, a spool valve 79 slidably housed in the valve housing 76, a spring 78 for biasing the spool valve 79 toward one side in an axial direction of the spool valve 79 and a solenoid 77 for moving the spool valve 79 in the axial direction of the spool valve 79 against the spring 78.

[0049] By a movement of the spool valve 79 to a position where a thrust force of the solenoid 77 and a biasing force of

the spring 78 are balanced, the first tilt control valve 70 is switched to three positions 70A, 70B and 70C.

[0050] If a predetermined thrust force is generated in the solenoid 77 by an excitation current fed from a controller 170, the spool valve 79 moves upward in FIG. 2 against the biasing force of the spring 78 due to the thrust force and the first tilt control valve 70 is switched to the push-side position 70A.

[0051] At the push-side position 70A, the hydraulic oil from the high-pressure selector valve 149 is supplied to the first push-side piston pressure chamber 53 through the ports 71, 73 and the hydraulic oil in the first pull-side piston pressure chamber 54 is returned to the tank 109 through the working hydraulic pressure ports 74, 72. Due to an increase in the pressure of the first push-side piston pressure chamber 53, the first tilt driving piston 31 moves in a direction indicated by an arrow A in FIG. 2 (downward direction) and the first swash plate 30 rotates in a direction to increase a tilt angle as indicated by an arrow B. As a result, a displacement volume of the piston motor 1 increases and the travel speed of the vehicle decreases.

[0052] When the excitation current fed from the controller 170 is stopped, no more thrust force is generated in the solenoid 77 and the spool valve 79 is moved in a direction shown in FIG. 3 (downward direction) by the biasing force of the spring 78 and the first tilt control valve 70 is switched to the pull-side position 70B.

[0053] At the pull-side position 70B, the hydraulic oil from the high-pressure selector valve 149 is supplied to the first pull-side piston pressure chamber 54 through the ports 71, 74 and the hydraulic oil in the first push-side piston pressure chamber 53 is returned to the tank 109 through the ports 73, 72. Due to an increase in the pressure of the first pull-side piston pressure chamber 54, the first tilt driving piston 31 moves in a direction indicated by an arrow C in FIG. 3 (upward direction) and the first swash plate 30 rotates in a direction to reduce the tilt angle as indicated by an arrow D. As a result, the displacement volume of the piston motor 1 decreases and the travel speed of the vehicle increases.

[0054] At the neutral position 70C, each port 71 to 74 is closed and the movement of the first tilt driving piston 31 is stopped. Thus, the first swash plate 30 is kept at the tilt angle at that point of time.

[0055] The controller 170 adjusts a flow rate of the hydraulic oil supplied to and discharged from the first tilt driving mechanism 50 and continuously controls a speed ratio of the HST 90 by switching the positions 70A, 70B, 70C of the first tilt control valve 70 from one to another.

[0056] The second tilt control valve 80 includes an inlet port 81 communicating with the high-pressure selector valve 149, an outlet port 82 communicating with the tank 109, a second push-side port 83 communicating with the second push-side piston pressure chamber 63 and a second pull-side port 84 communicating with the second pull-side piston pressure chamber 64.

[0057] As shown in FIGS. 2 and 3, the second tilt control valve 80 includes a valve housing 86 disposed in the casing, a spool valve 89 slidably housed in the valve housing 86, a spring 88 for biasing the spool valve 89 toward one side in an axial direction of the spool valve 89 and a solenoid 87 for moving the spool valve 89 in the axial direction of the spool valve 89 against the spring 88.

[0058] By a movement of the spool valve 89 to a position where a thrust force of the solenoid 87 and a biasing force of

the spring **88** are balanced, the second tilt control valve **80** is switched to three positions **80A**, **80B** and **80C**.

[0059] If a predetermined thrust force is generated in the solenoid **87** by an excitation current fed from the controller **170**, the spool valve **89** moves upward in FIG. 2 against the biasing force of the spring **88** due to the thrust force and the second tilt control valve **80** is switched to the pull-side position **80B**.

[0060] At the pull-side position **80B**, the hydraulic oil from the high-pressure selector valve **149** is supplied to the second pull-side piston pressure chamber **64** through the ports **81**, **84** and the hydraulic oil in the second push-side piston pressure chamber **63** is returned to the tank **109** through the working hydraulic pressure ports **83**, **82**. Due to an increase in the pressure of the second pull-side piston pressure chamber **64**, the second tilt driving piston **41** moves in a direction indicated by an arrow E in FIG. 2 (upward direction) and the second swash plate **40** rotates in a direction to reduce a tilt angle as indicated by an arrow F. As a result, the displacement volume of the piston motor **1** decreases and the travel speed of the vehicle increases.

[0061] When the excitation current fed from the controller **170** is stopped, no more thrust force is generated in the solenoid **87** and the spool valve **89** is moved in a direction shown in FIG. 3 (downward direction) by the biasing force of the spring **88** and the second tilt control valve **80** is switched to the push-side position **80A**.

[0062] At the push-side position **80A**, the hydraulic oil from the high-pressure selector valve **149** is supplied to the second push-side piston pressure chamber **63** through the ports **81**, **83** and the hydraulic oil in the second pull-side piston pressure chamber **64** is returned to the tank **109** through the ports **84**, **82**. Due to an increase in the pressure of the second push-side piston pressure chamber **63**, the second tilt driving piston **41** moves in a direction indicated by an arrow H in FIG. 3 (downward direction) and the second swash plate **40** rotates in a direction to increase the tilt angle as indicated by an arrow I. As a result, the displacement volume of the piston motor **1** increases and the travel speed of the vehicle decreases.

[0063] At the neutral position **80C**, each port **81** to **84** is closed and the movement of the second tilt driving piston **41** is stopped. Thus, the second swash plate **40** is kept at the tilt angle at that point of time.

[0064] The controller **170** adjusts a flow rate of the hydraulic oil supplied to and discharged from the second tilt driving mechanism **60** and continuously controls the speed ratio of the HST **90** by switching the positions **80A**, **80B**, **80C** of the second tilt control valve **80** from one to another.

[0065] Denoted by **171** and **172** are potentiometers for respectively reading the tilt angles of the first and second swash plates **30**, **40**. The controller **170** feedback-controls opening and closing timings of the first and second tilt control valves **70**, **80** according to detection values of the potentiometers **171**, **172**.

[0066] The tilt angle of the first swash plate **30** is minimized and that of the second swash plate **40** is maximized when power application to the solenoid **77** of the first tilt control valve **70** is stopped and that to the solenoid **87** of the second tilt control valve **80** is stopped as shown in FIG. 3. At this time, the speed ratio of the piston motor **1** is set at an intermediate value.

[0067] The tilt angles of the first and second swash plates **30**, **40** are both maximized when power is applied to the

solenoid **77** of the first tilt control valve **70** as shown in FIG. 2 and power application to the solenoid **87** of the second tilt control valve **80** is stopped as shown in FIG. 3. At this time, the displacement volume of the piston motor **1** is maximized and the speed ratio of the piston motor **1** is minimized.

[0068] The tilt angles of the first and second swash plates **30**, **40** are both minimized when power application to the solenoid **77** of the first tilt control valve **70** is stopped as shown in FIG. 3 and power is applied to the solenoid **87** of the second tilt control valve **80** as shown in FIG. 2. At this time, the displacement volume of the piston motor **1** is minimized and the speed ratio of the piston motor **1** is maximized.

[0069] As described above, a tilting movement of the first swash plate **30** caused by the first tilt driving piston **31** pushing the end part of the first swash plate **30** in the direction orthogonal to the tilt axis O1 and a tilting movement of the second swash plate **40** caused by the second tilt driving piston **41** pushing the end part of the second swash plate **40** in the direction orthogonal to the tilt axis O2 are respectively independently made.

[0070] Further, the flow rate of the working fluid supplied to and discharged from the first tilt driving mechanism **50** is adjusted by the first tilt control valve **70** and that of the working fluid supplied to and discharged from the second tilt driving mechanism **60** is adjusted by the second tilt control valve **80** different from the first tilt control valve **70**.

[0071] According to the above embodiment, the following functions and effects are achieved.

[0072] The first and second swash plates **30**, **40** are respectively tilted by being pushed in the directions intersecting with the tilt axes O1, O2 by the first and second tilt driving pistons **31**, **41**. Thus, no torque acts to rotate the first and second swash plates **30**, **40** about the axis of rotation O4. Therefore, a floating phenomenon in which the tilt shaft parts **30B**, **40B** are separated from the first and second tilt bearings **33**, **43** can be prevented.

[0073] Further, since actuating strokes of the first and second tilt driving mechanisms **50**, **60** are respectively continuously adjusted by actuating the first and second tilt control valves **70**, **80**, the tilt angles of the first and second swash plates **30**, **40** can be continuously controlled.

[0074] Further, since the flow rate of the working fluid supplied to and discharged from the first tilt driving mechanism **50** and that of the working fluid supplied to and discharged from the second tilt driving mechanism **60** are respectively adjusted by the first and second tilt control valves **70**, **80**, the first tilt driving mechanism **50** can adjust the tilt angle of the first swash plate **30** with good responsiveness and the second tilt driving mechanism **60** can adjust the tilt angle of the second swash plate **40** with good responsiveness.

[0075] Embodiments of the present invention were described above, but the above embodiments are merely examples of applications of the present invention, and the technical scope of the present invention is not limited to the specific constitutions of the above embodiments.

[0076] For example, although the present embodiment relates to the piston motor **1** in which the hydraulic oil is supplied and discharged to rotate the cylinder block, the present invention may be also applied to the piston pump **111** in which the cylinder block is driven to rotate to supply and discharge the hydraulic oil.

[0077] Furthermore, although the piston motor constitutes the hydrostatic transmission (HST) in the present embodiment, it may constitute another machine or facility.

[0078] This application claims priority based on Japanese Patent Application No. 2013-73454 filed with the Japan Patent Office on Mar. 29, 2013, the entire contents of which are incorporated into this specification.

1. An opposed swash plate type fluid pressure rotating machine in which a first piston and a second piston projecting from opposite ends of a rotary cylinder block reciprocate in a cylinder, respectively following a first swash plate and a second swash plate, comprising:

- a first tilt bearing for tiltably supporting the first swash plate;
- a first tilt driving piston for tilting the first swash plate in a direction intersecting with an axis of rotation of the cylinder block;
- a second tilt bearing for tiltably supporting the second swash plate; and
- a second tilt driving piston for tilting the second swash plate in a direction intersecting with the axis of rotation of the cylinder block.

2. The opposed swash plate type fluid pressure rotating machine according to claim 1, comprising:

- a first push-side piston pressure chamber and a first pull-side piston pressure chamber defined on opposite ends of the first tilt driving piston;
- a first tilt control valve for switching the flow of working fluid supplied to and discharged from the first push-side piston pressure chamber and the first pull-side piston pressure chamber from and to a high-pressure selector valve;

a second push-side piston pressure chamber and a second pull-side piston pressure chamber defined on opposite ends of the second tilt driving piston; and

a second tilt control valve for switching the flow of working fluid supplied to and discharged from the second push-side piston pressure chamber and the first pull-side piston pressure chamber from and to the high-pressure selector valve.

3. The opposed swash plate type fluid pressure rotating machine according to claim 1, comprising:

- a first translating mechanism for translating a linear movement of the first tilt driving piston into a rotational movement of the first swash plate; and
- a second translating mechanism for translating a linear movement of the second tilt driving piston into a rotational movement of the second swash plate.

4. The opposed swash plate type fluid pressure rotating machine according to claim 3, wherein:

- the first translating mechanism includes a first guide groove formed on the first tilt driving piston and a first pin member provided on the first swash plate and movable in the first guide groove; and
- the second translating mechanism includes a second guide groove formed on the second tilt driving piston and a second pin member provided on the second swash plate and movable in the second guide groove.

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