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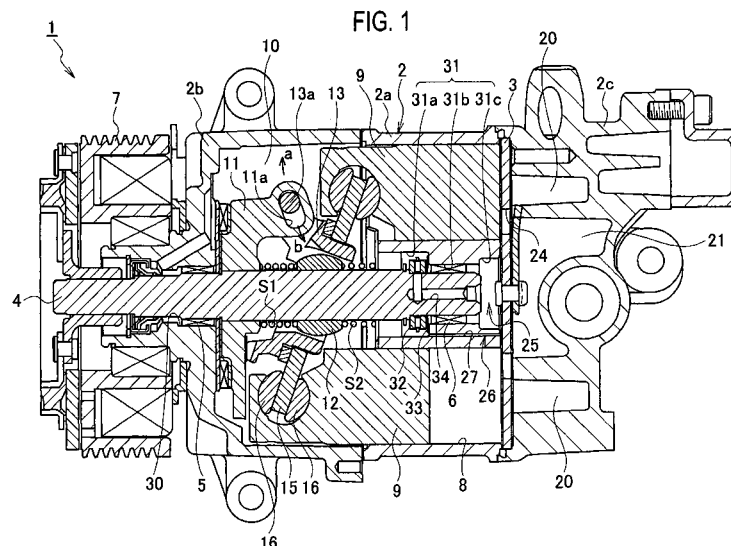
AL BA MK RS• **Sakurai, Yasuhiro****Saitama-shi****Saitama 331-8501 (JP)**• **Usui, Keigo****Saitama-shi****Saitama 331-8501 (JP)**(30) Priority: **06.12.2007 JP 2007315992**(71) Applicant: **Calsonic Kansei Corporation****Saitama-shi****Saitama 331-8501 (JP)**

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• **Kawachi, Masaki****Saitama-shi****Saitama 331-8501 (JP)**(74) Representative: **Grünecker, Kinkeldey,****Stockmair & Schwanhäusser****Anwaltssozietät****Leopoldstrasse 4****80802 München (DE)****(54) Tilting plate type compressor**

(57) A tilting plate type compressor includes: cylinder bores; a crank chamber; a drive shaft rotatably supported by a bearing provided within a bearing cavity; a tilting plate provided within the crank chamber and capable of swingably rotating due to a rotation of the drive shaft; and pistons capable of reciprocating within the cylinder bores due to swingably rotating of the tilting plate; an extraction path communicating between the crank chamber and a

suction chamber; and an intake path communicating between the crank chamber and a discharge chamber. The extraction path includes an intra-axis path provided within the drive shaft and opens into the bearing cavity. The intake path opens into the bearing cavity and communicates with the crank chamber via the bearing cavity. According to the compressor, it can be prevented much as possible that oil leaks from the crank chamber through the extraction path.



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a tilting plate type compressor for reciprocating pistons by a swinging rotation of a tilting plate (swash plate, wobble plate).

2. Description of Related Art

[0002] A conventional tilting plate type compressor is disclosed in Japanese Patent Application Laid-Open Number 2007-127084. As shown in Fig. 4, the tilting plate type compressor 100 includes a housing 101. The housing 101 is assembled primarily of a cylinder block 101a, a front head 101b provided at one end of the cylinder block 101a and a rear head 101c provided at another end of the cylinder block 101a via a valve plate 102.

[0003] A drive shaft 103 is provided at the center of the housing 101. Bearing cavities 104 and 105 is formed near both ends of the drive shaft 103 within the front head 101b and the cylinder block 101a. The bearing cavity 105 in the cylinder block 101a is configured of an inside cavity 105a opening into an after-mentioned crank chamber 112, a center cavity 105b having a smaller inner diameter and an outside cavity 105c provided on the side of the valve plate 102 as shown in Fig. 5 in detail. A radial bearing 106 is provided within the bearing cavity 104 in the front head 101b. Another radial bearing 107 is provided within the center cavity 105b of the bearing cavity 105 in the cylinder block 101a. The drive shaft 103 is rotatably supported by the housing 101 via the bearings 106 and 107. In addition, a thrust bearing 108 is provided within the outside cavity 105c of the bearing cavity 105. The drive shaft 103 is supported in its axial direction by the thrust bearing 108.

[0004] Within the cylinder block 101a, cylinder bores 110 are formed on a circumference with the drive shaft 103 as the center. A piston 111 capable of reciprocating is provided in each of the cylinder bores 110. A crank chamber 112 is provided within the front head 101a, which communicates with the cylinder bores 110. Within the crank chamber 112, provided are a rotor 113 fixed on an outer circumferential surface of the drive shaft 103, a sleeve 114 provided slidably on the outer circumferential surface of the drive shaft 103, a journal 116 provided outside the sleeve 114 and linked with the rotor 113 via a link 115 and a tilting plate 117 fixed on an outer circumferential surface of the journal 116. The pistons 111 are coupled to an outer circumference of the tilting plate 117 via pairs of shoes 118.

[0005] First and second springs S1 and S2 are provided at both sides of the sleeve 114. The tilting plate 117 will be returned to its initial position due to a balance between elastic forces of the first and second springs S1 and S2 after a shutdown.

[0006] On the drive shaft 103 rotating, the pistons 111 are reciprocated within the cylinder bores 110, respectively, due to the rotor 113, the tilting plate 117 and so on. A reciprocating stroke amount of the pistons 111 is varied due to a tilted angle of the tilting plate 117.

[0007] A suction chamber 120 and a discharge chamber 121 are provided within the rear head 101c.

[0008] The valve plate 102 is interposed between the cylinder head 101a and the rear head 101c. Therefore, the cylinder bores 110 and the chambers 120 and 121 are partitioned by the valve plate 102.

[0009] In addition, an extraction path 122 communicating the crank chamber 112 with the suction chamber 120 and an intake path (not shown) communication the crank chamber 112 with the discharge chamber 121 are provided in the housing 101 and so on. The extraction path 122 includes the inside cavity 105a and an intra-axis path 123 provided in the drive shaft 103 as its path. The intra-axis path 123 is configured of a radial path 123a extending a radial direction of the drive shaft 103 and an axial path 123b extending an axial direction of the drive shaft 103 as shown in Fig. 5 in detail.

[0010] According to the above-mentioned configuration, the tilting plate 117 swings to reciprocate the pistons 111 on the drive shaft 103 being rotated. Refrigerant is supplied into the cylinder bore 106 from the suction chamber 120 during a suction stroke of the piston 111. The supplied refrigerant is compressed and discharged into the discharge chamber 121 during a compression stroke of the piston 111. The discharged refrigerant is circulated in a refrigerating cycle to be served for air-conditioning or the like and returned to the tilting plate type compressor 100.

[0011] A pressure in the crank chamber 112 is made low when thermal load for the refrigerating cycle becomes large during the tilting plate type compressor 100 driving. As a result, a moment to increase a tilted angle of the tilting plate 117 is applied to the tilting plate 117 and the journal 116 due to a pressure difference between a crank chamber pressure (a back pressure of the pistons 111) and a front pressure of the pistons 111. The link 115 swings in an arrowed direction a in Fig. 4 due to the moment. Such swinging of the link 115 makes the tilted angle of the tilting plate 117 large. The reciprocating stroke amount of the pistons 111 turns to be large when the tilted angle of the tilting plate 117 is made large. Thereby, a discharge amount of the refrigerant is made large, so that a cooling performance or the like is enhanced.

[0012] On the other hand, the pressure in the crank chamber 112 is made high when the thermal load for the refrigerating cycle becomes small. As a result, a moment to decrease the tilted angle of the tilting plate 117 is applied to the tilting plate 117 and the journal 116 due to the pressure difference between the crank chamber pressure (the back pressure of the pistons 111) the front pressure of the pistons 111. The link 115 swings in an arrowed direction b in Fig. 4 due to the moment. Such swinging of the link 115 makes the tilted angle of the tilting plate

117 small. The reciprocating stroke amount of the pistons 111 turns to be small when the tilted angle of the tilting plate 117 is made small. Thereby, the discharge amount of the refrigerant is made small, so that the cooling performance or the like is reduced. The tilting plate type compressor 100 conserves energy according to the above-mentioned operation.

[0013] During the above-mentioned driving operation of the tilting plate type compressor 100, friction parts within the crank chamber 112 (the radial bearings 106 and 107, the sleeve 114, the tilting plate 117, the shoes 118 and so on) are lubricated by oil contained in the refrigerant supplied into the crank chamber 112. Therefore, oil is contained sufficiently in the refrigerant. The refrigerant sufficiently containing oil is discharged into the suction chamber 120 via the extraction path 122 for adjusting the pressure in the crank chamber 120. Specifically, the refrigerant flows from the chamber 120 into the bearing cavity 150 and then finally flows into the suction chamber 120 through the intra-axis path 123 as shown in Fig. 5. The oil is supplied around the radial bearing 107 and the thrust bearing 108 while the refrigerant flows around the bearings 107 and 108 during passing through the intra-axis path 123.

[0014] In addition, the oil in the refrigerant flowing into the radial path 123a of the intra-axis path 123 is scattered toward the bearing cavity 150 by a centrifugal force due to the rotation of the drive shaft 103. This oil scattering prevents the oil contained in the refrigerant from flowing out of the crank chamber 120.

SUMMARY OF THE INVENTION

[0015] However, the oil scattered due to the centrifugal force of the drive shaft 103 attaches onto an inner surface of the bearing cavity 150 and stays therearound. When a much amount of the oil has stayed there, the oil may rush into the intra-axis path 123. As a result, the oil may leak into the suction chamber 120 through the intra-axis path 123 finally.

[0016] In the above-mentioned example, an expanded recess 105d is provided on a circumferential surface of the bearing cavity 105 in order to supply the refrigerant into the bearing cavity 105 as much as possible. However, the expanded recess 105d enlarges a space capacity for the oil staying and flowing-out of the oil through the intra-axis path 123 cannot be prevented by the expanded recess 105d.

[0017] An object of the present invention is to provide a tilting plate type compressor that can prevent oil from flowing-out from a crank chamber through an extraction path as much as possible.

[0018] An aspect of the present invention is to provide a capacity variable compressor that includes a housing within which a plurality of cylinder bores and a crank chamber communicating with the plurality of cylinder bores are provided; a drive shaft rotatably provided within the housing so as to penetrate the crank chamber and

supported by the housing via a bearing provided within a bearing cavity; a tilting plate provided within the crank chamber and capable of swingably rotating due to a rotation of the drive shaft; a plurality of pistons capable of reciprocating within the plurality of cylinder bores, respectively, due to swingably rotating of the tilting plate; an extraction path communicating between the crank chamber and a suction chamber; and an intake path communicating between the crank chamber and a discharge chamber. The extraction path includes an intra-axis path provided within the drive shaft and opens into the bearing cavity. The intake path opens into the bearing cavity and communicates with the crank chamber via the bearing cavity.

[0019] According to the aspect of the present invention, on refrigerant to be extracted flowing into the intra-axis path, oil had attached on an inner surface of the intra-axis path is sprayed outward due to a centrifugal force of the drive shaft and then attached on an inner surface of the bearing cavity and so on. Since the attached oil is returned to the crank chamber due to the refrigerant flowing to be inhaled into the crank chamber, oil leakage from the crank chamber can be prevented as much as possible.

[0020] It is preferable that an expanded cavity communicating with the bearing cavity is provided around the bearing cavity, and the intra-axis path opens into the expanded cavity.

[0021] According to this, since oil is scattered toward not only the bearing cavity but also the expanded cavity due to the centrifugal force of the drive shaft, a space toward which oil is scattered can be increased. As a result, it can be prevented as much as possible that oil staying on the inner surface of the cavities rushes into the intra-axis path and leaks.

[0022] It is also preferable that the intake path opens into the bearing cavity (or the expanded cavity) at a farther position from the crank chamber than an opening position of the intra-axis path into the bearing cavity (or the expanded cavity).

[0023] According to this, since the refrigerant to be inhaled flows into the crank chamber through an area, onto which oil had been scattered due to the centrifugal force of the drive shaft and then on which the oil stays. As a result, returned oil amount to the crank chamber can be increased.

[0024] It is also preferable that the intake path opens at a lower position within the bearing cavity (or the expanded cavity) under an installed condition of the compressor.

[0025] According to this, oil had attached onto the inner surface of the bearing cavity (or the expanded cavity) may drop due to its weight and then stay at a lower area on the inner surface. Since the refrigerant to be inhaled flows into the crank chamber through the area where the oil stays, the returned oil amount to the crank chamber can be further increased.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 is an overall cross-sectional view of a tilting plate type compressor according to an embodiment of the present invention;

Fig. 2 is an enlarged cross-sectional view of main elements in the embodiment of the present invention;

Fig. 3 is an enlarged cross-sectional view of main elements in a modified embodiment of the present invention;

Fig. 4 is an overall cross-sectional view of a conventional tilting plate type compressor; and

Fig. 5 is an enlarged cross-sectional view of main elements in the conventional tilting plate type compressor.

DETAILED DESCRIPTION OF THE EMBODIMENT

[0027] Hereinafter, one embodiment according to the present invention will be explained with reference to drawings.

[0028] As shown in Fig. 1, a tilting plate type compressor 1 includes a housing 2. The housing 2 is configured to be assembled of a cylinder block 2a, a front head 2b provided at one end of the cylinder block 2a and a rear head 2c provided at another end of the cylinder block 2a via a valve plate 3.

[0029] A drive shaft 4 is provided at the center of the housing 2. One end of the drive shaft 4 is projected outward from the front head 2b and a pulley 7 is fixed on the projected end to receive engine rotation. The drive shaft 4 is configured to rotate by receiving a drive force from the pulley 7 fixed on its one end.

[0030] Bearing cavities 30 and 31 is formed near both ends of the drive shaft 4 within the front head 2b and the cylinder block 2a. The bearing cavity 31 in the cylinder block 2a is configured of an inside cavity 31a opening into an after-mentioned crank chamber 10, a center cavity 31b having a smaller inner diameter and an outside cavity 31c provided on the side of the valve plate 3 as shown in Fig. 2 in detail. A radial bearing 5 is provided within the bearing cavity 30 in the front head 2b. Another radial bearing 6 is provided within the center cavity 31b of the bearing cavity 31 in the cylinder block 2a. The drive shaft 4 is rotatably supported by the housing 2 via the bearings 30 and 31. In addition, a thrust bearing 32 and a disc spring 33 are provided within the inside cavity 31c of the bearing cavity 31. The drive shaft 103 is supported in its axial direction by the thrust bearing 108. The drive shaft 4 is pushed along its axial direction by an elastic force of the disc spring 33 to cancel its looseness along the axial direction and supported in the axial direction by the thrust bearing 32.

[0031] Cylinder bores 8 are formed within the cylinder block 2a. The cylinder bores 8 are formed at even intervals on a circumference with the drive shaft 4 as the cent-

er. A piston 9 capable of reciprocating is provided in each of the cylinder bores 8.

[0032] The crank chamber 10 is provided within the front head 2b, which communicates with the cylinder bores 8. Within the crank chamber 10, provided are a rotor 11 fixed on an outer circumferential surface of the drive shaft 4, a sleeve 12 provided slidably on the outer circumferential surface of the drive shaft 4, a journal 13 provided outside the sleeve 12 and rotating along with the rotor 11, a tilting plate 15 fixed on an outer circumferential surface of the journal 13 and rear ends of the pistons 9, each coupled to an outer circumference of the tilting plate 15 via a pair of shoes 16.

[0033] An outer circumferential surface of the sleeve 12 is formed almost spherical to smoothly guide a transition of the tilted angle of the tilting plate 13. First and second springs S1 and S2 are provided at both sides of the sleeve 12. The tilting plate 15 will be returned to its initial position due to a balance between elastic forces of the first and second springs S1 and S2 after a shutdown. The journal 13 and the rotor 11 are linked by a guide pin 13a which is fixed on the journal 13 and inserted into a guide hole 11a of the rotor 11.

[0034] On the drive shaft 4 rotating, its rotation is transmitted to the tilting plate 15 by the rotor 11 and the journal 13 to reciprocate the pistons 9 within the cylinder bores 8. In addition, each stroke of the pistons 9 is varied due to the tilted angle of the tilting plate 15 to change a discharge amount of refrigerant. Mechanism for adjusting the tilted angle of the tilting plate 15 will be explained later.

[0035] A suction chamber 20 and a discharge chamber 21 for refrigerant gas are provided within the rear head 2c. The suction chamber 20 is connected to an outlet of an evaporator in a refrigerating cycle via a suction port (not shown). The discharge chamber 21 is connected to an inlet of a condenser in the refrigerating cycle via a discharge port (not shown). In addition, the cylinder bores 8 and the chambers 20 and 21 are partitioned by the valve plate 3. Discharge holes 24 are provided on the valve plate 3 within partitioning areas between the bores 8 and the discharge chamber 21. A discharge valve is provided at each of the discharge holes 22. Suction holes (not shown) are provided on the valve plate 3 within partitioning areas between the bores 8 and the suction chamber 20. A suction valve (not shown) is provided at each of the suction holes.

[0036] Further, an extraction path 25 is provided between the crank chamber 10 and the suction chamber 20, which is always opened. An intake path 26 is provided between the crank chamber 10 and the discharge chamber 21. A pressure control valve (not shown) is provided on the intake path 23. The pressure control valve 24 is configured to control a pressure within the crank chamber 10 by adjusting its valve opening.

[0037] As shown in Fig. 2, the extraction path 25 includes a bearing cavity 31, an intra-axis path 34 provided in the drive shaft 4, a hole formed on the valve plate 3 and a refrigerant path (not shown) provided in the rear

head 2c as its path. The intra-axis path 34 is configured of a radial path 34a extending a radial direction of the drive shaft 4 and an axial path 34b communicating with the radial path 34a and extending along an center axis of the drive shaft 4. One end of the radial path 34a opens into an inside cavity 31a of the bearing cavity 31 and positioned at the middle of the thickness of the thrust bearing 32. Therefore, refrigerant to be extracted flows into the intra-axis path 34 through the interior of the thrust bearing 32. One end of the axial path 34b opens into an outside cavity 31c of the bearing cavity 31.

[0038] The intake path 26 is configured of the bearing cavity 31, a first refrigerant path 27, a hole (not shown) provided on the valve plate 3 and a second refrigerant path (not shown). The first refrigerant path 27 is provided in the cylinder block 2a and its one end opens into the bearing cavity 31. The second refrigerant path is provided in the rear head 2c. One end of the second refrigerant communicates with the hole and another end thereof opens into the discharge chamber 21. In addition, the one end of the first refrigerant path 27 opens into the inside cavity 31a at a farther position from the crank chamber 10 than the opening position of the intra-axis path 34. Furthermore, the one end of the first refrigerant path 27 opens at the lower position within the inside cavity 31a under an installed condition of the compressor 1.

[0039] In the above configuration, on the drive shaft 4 rotating, the tilting plate 15 rotates due to the rotational force of the drive shaft 4. Then, the pistons 9 reciprocate within the cylinder bores 8. During the suction stroke of the pistons 9 (stroke from TDC to BDC), the suction holes 23 are opened due to a pressure reduction within the cylinder bores 8. As a result, the refrigerant gas is supplied from the suction chamber 20 to cylinder bores 8.

[0040] During the compression stroke of the pistons 9 (stroke from BDC to TDC), the suction holes (not shown) are closed and the refrigerant gas within the cylinder bores 8 is compressed adiabatically by the pistons 9. The compressed refrigerant gas with high-temperature and high-pressure is discharged from the discharge holes 24 to the discharge chamber 21. The discharged refrigerant gas with high-temperature and high-pressure is discharged from the tilting plate type compressor 1 via the outlet port (not shown). The discharged refrigerant gas is circulated in the refrigerating cycle to be served for air-conditioning or the like and returned to the tilting plate type compressor 1 again.

[0041] A supplying amount of the refrigerant into the crank chamber 10 through the intake path 26 is reduced by way of the pressure control valve (not shown) to reduce a pressure in the crank chamber 10 when thermal load for the refrigerating cycle becomes large during the tilting plate type compressor 1 driving. As a result, a balance will be disrupted between a counter-clockwise moment (to move the tilting plate 15 in Fig. 1) due to the crank chamber pressure (a back pressure of the pistons 9) and the elastic force of the first spring S1 and a clockwise moment due to a front pressure of the pistons 9 and

the elastic force of the second spring S2. Thereby, the clockwise moment becomes large to increase the tilted angle of the tilting plate 15, so that the tilting plate 15 and the journal 13 swing in an arrowed direction a in Fig. 1 until the both moments are balanced. (The guide pin 13a is moved in the arrowed direction a from the small capacity state toward the large capacity state [Fig. 1]. In Fig. 1, the guide pin 13a is already moved to the limit of the arrowed direction a.) Such swinging of the tilting plate 15 makes its tilted angle large. The reciprocating stroke amount of the pistons 9 is made large when the tilted angle of the tilting plate 15 is made large. Thereby, a discharge amount of the refrigerant is made large, so that a cooling performance or the like is enhanced.

[0042] On the other hand, the supplying amount of the refrigerant into the crank chamber 10 through the intake path 26 is increased by way of the pressure control valve (not shown) to increase a pressure in the crank chamber 10 when the thermal load for the refrigerating cycle becomes small. As a result, the balance will be disrupted between the counter-clockwise moment due to the crank chamber pressure (the back pressure of the pistons 9) and the elastic force of the first spring S1 and the clockwise moment due to the front pressure of the pistons 9 and the elastic force of the second spring S2. Thereby, the counter-clockwise moment becomes large to decrease the tilted angle of the tilting plate 15, so that the tilting plate 15 and the journal 13 swing in an arrowed direction b in Fig. 1 until the both moments are balanced. (The guide pin 13a is moved in the arrowed direction b from the large capacity state [Fig. 1] toward the small capacity state.) Such swinging of the tilting plate 15 makes the tilted angle of the tilting plate 15 small. The reciprocating stroke amount of the pistons 9 is made small when the tilted angle of the tilting plate 15 is made small. Thereby, the discharge amount of the refrigerant is made small, so that the cooling performance or the like is reduced. The tilting plate type compressor 1 conserves energy according to the above-mentioned operation.

[0043] Explained will be the refrigerant flowing into or from the crank chamber 10 during the tilting plate type compressor 1 driving. The refrigerant flows into the suction chamber 20 with a lower pressure from the crank chamber 10 with a higher pressure through the extraction path 25. Specifically, the refrigerant to be extracted enters into the inside cavity 31a and then flows into the intra-axis path 34. On the refrigerant flowing into the intra-axis path 34, oil had attached on the inner surface of the intra-axis path 34 is sprayed outward due to a centrifugal force of the drive shaft 4 and then attached on the inner surface of the inside cavity 31a and so on. On the other hand, the refrigerant to be inhaled flows into the crank chamber 10 through the intake path 26. Specifically, the refrigerant to be inhaled flows into the inside cavity 31a through the first refrigerant path 27 of the intake path 26 and then enters into the crank chamber 10 via the inside cavity 31a. Therefore, the above-mentioned oil on the inner surface of the inside cavity 31a is returned to the

crank chamber 10 due to the inhaled refrigerant flowing. As a result, oil leakage from the crank chamber 10 can be prevented.

[0044] In addition, the refrigerant to be extracted supplies oil to the radial bearing 6 and the thrust bearing 32 by way of passing through the bearing cavity 31 as mentioned above. Especially in the present embodiment, since the refrigerant to be extracted passing through the interior of the thrust bearing 32 and then flows into the intra-axis path 34, oil can be supplied to the thrust bearing 32 sufficiently.

[0045] In the present embodiment, the one end of the intake path 26 (the first refrigerant path 27) opens into the bearing cavity 31 (the inside cavity 31a) at a farther position from the crank chamber 10 than the opening position of the intra-axis path 34. Therefore, the refrigerant to be inhaled flows into the crank chamber 10 through an area, onto which oil had been scattered due to the centrifugal force of the drive shaft 4 and then on which the oil stays. As a result, returned oil amount to the crank chamber 10 can be increased.

[0046] In the present embodiment, the one end of the intake path 26 (the first refrigerant path 27) opens at the lower position within the bearing cavity 31 (the inside cavity 31a) under an installed condition of the compressor 1. Therefore, oil had attached onto the inner surface of the bearing cavity 31 may drop due to its weight and then stay at a lower area on the inner surface. Since the refrigerant to be inhaled flows into the crank chamber 10 through the area where the oil stays, the returned oil amount to the crank chamber 10 can be further increased.

[0047] A modified embodiment is shown in Fig. 3. In the modified embodiment, an expanded cavity 40 communicating with the inside cavity 31a is provided around the inside cavity 31a. The intra-axis path 34 opens into the expanded cavity 40. The expanded cavity 40 is provided along an entire circumference of the inside cavity 31a. Note that the expanded cavity 40 may be provided partially on the circumference of the inside cavity 31a (like the expanded recess 105d shown in Figs. 4 and 5).

[0048] The first refrigerant path 27 of the intake path 26 opens into the expanded cavity 40 at a farther position from the crank chamber 10 than an opening position of the intra-axis path 34.

[0049] In addition, one end of the first refrigerant path 27 opens at a lower position within the expanded cavity 40 under an installed condition of the compressor 1.

[0050] Other components in the present embodiment is the same as or similar to those in the above-mentioned embodiment. Therefore, the same or similar components are allocated with the identical numerals to omit redundant explanations.

[0051] Similarly in the present embodiment, oil had attached on the inner surface of the bearing cavity 31 is returned to the crank chamber 10 due to the inhaled refrigerant flowing into the bearing cavity 31 from the intake path 26. As a result, oil leakage from the crank chamber

10 can be prevented as much as possible.

[0052] In the embodiment, the expanded cavity 40 communicating with the inside cavity 31a is provided around the inside cavity 31a and the intra-axis path 34 opens into the expanded cavity 40. Therefore, since oil is scattered toward not only the bearing cavity 31 but also the expanded cavity 40 due to the centrifugal force of the drive shaft 4, a space toward which oil is scattered can be increased. As a result, it can be prevented as much as possible that oil staying on the inner surface rushes into the intra-axis path 34 and leaks.

[0053] In the present embodiment, the intake path 26 opens into the expanded cavity 40 at a farther position from the crank chamber 10 than the opening position of the intra-axis path 34. Therefore, the refrigerant to be inhaled into the expanded cavity 40 flows into the crank chamber 10 through an area, onto which oil had been scattered due to the centrifugal force of the drive shaft 4 and then on which the oil stays. As a result, returned oil amount to the crank chamber 10 can be increased.

[0054] In the present embodiment, the one end of the intake path 26 (the first refrigerant path 27) opens at the lower position within the expanded cavity 40 under an installed condition of the compressor 1. Therefore, oil had attached onto the inner surface of the bearing cavity 31 may drop due to its weight and then stay at a lower area on the inner surface. Since the refrigerant to be inhaled into the expanded cavity 40 flows into the crank chamber 10 through the area where the oil stays, the returned oil amount to the crank chamber 10 can be further increased.

[0055] Note that, in the above-mentioned modified embodiment, the refrigerant is extracted through the interior of the thrust bearing 32 to supply oil to the thrust bearing 32 sufficiently. However, oil may be extracted through the interior of the radial bearing 6 to supply oil to the radial bearing 6 sufficiently. Alternatively, oil may be extracted through both interiors of the thrust bearing 32 and the radial bearing 6 to supply oil to the bearings 32 and 6 sufficiently.

Claims

1. A tilting plate type compressor (1) comprising:

a housing (2) within which a plurality of cylinder bores (8) and a crank chamber (10) communicating with the plurality of cylinder bores (8) are provided;

a drive shaft (4) rotatably provided within the housing (2) so as to penetrate the crank chamber (10) and supported by the housing (2) via a bearing (32) provided within a bearing cavity (31);

a tilting plate (15) provided within the crank chamber (10) and capable of swingably rotating due to a rotation of the drive shaft (4);

a plurality of pistons (9) capable of reciprocating within the plurality of cylinder bores (8), respectively, due to swingably rotating of the tilting plate (15);

an extraction path (25) communicating between the crank chamber (10) and a suction chamber (20); and

an intake path (26) communicating between the crank chamber (10) and a discharge chamber (21);

wherein

the extraction path (25) includes an intra-axis path (34) provided within the drive shaft (4) and opens into the bearing cavity (31), and
the intake path (26) opens into the bearing cavity (31) and communicates with the crank chamber (10) via the bearing cavity (31).

2. The compressor (1) according to claim 1, wherein an expanded cavity (40) communicating with the bearing cavity (31) is provided around the bearing cavity (31), and the intra-axis path opens into the expanded cavity.

3. The compressor (1) according to claim 1, wherein the intake path (26) opens into the bearing cavity (31) at a farther position from the crank chamber (10) than an opening position of the intra-axis path (34) into the bearing cavity (31).

4. The compressor (1) according to claim 1 or 3, wherein the intake path (26) opens at a lower position within the bearing cavity (31) under an installed condition of the compressor (1).

5. The compressor (1) according to claim 2, wherein the intake path (26) opens into the expanded cavity (40) at a farther position from the crank chamber (10) than an opening position of the intra-axis path (34) into the expanded cavity (40).

6. The compressor (1) according to claim 2 or 5, wherein the intake path (26) opens at a lower position within the expanded cavity (40) under an installed condition of the compressor (1).

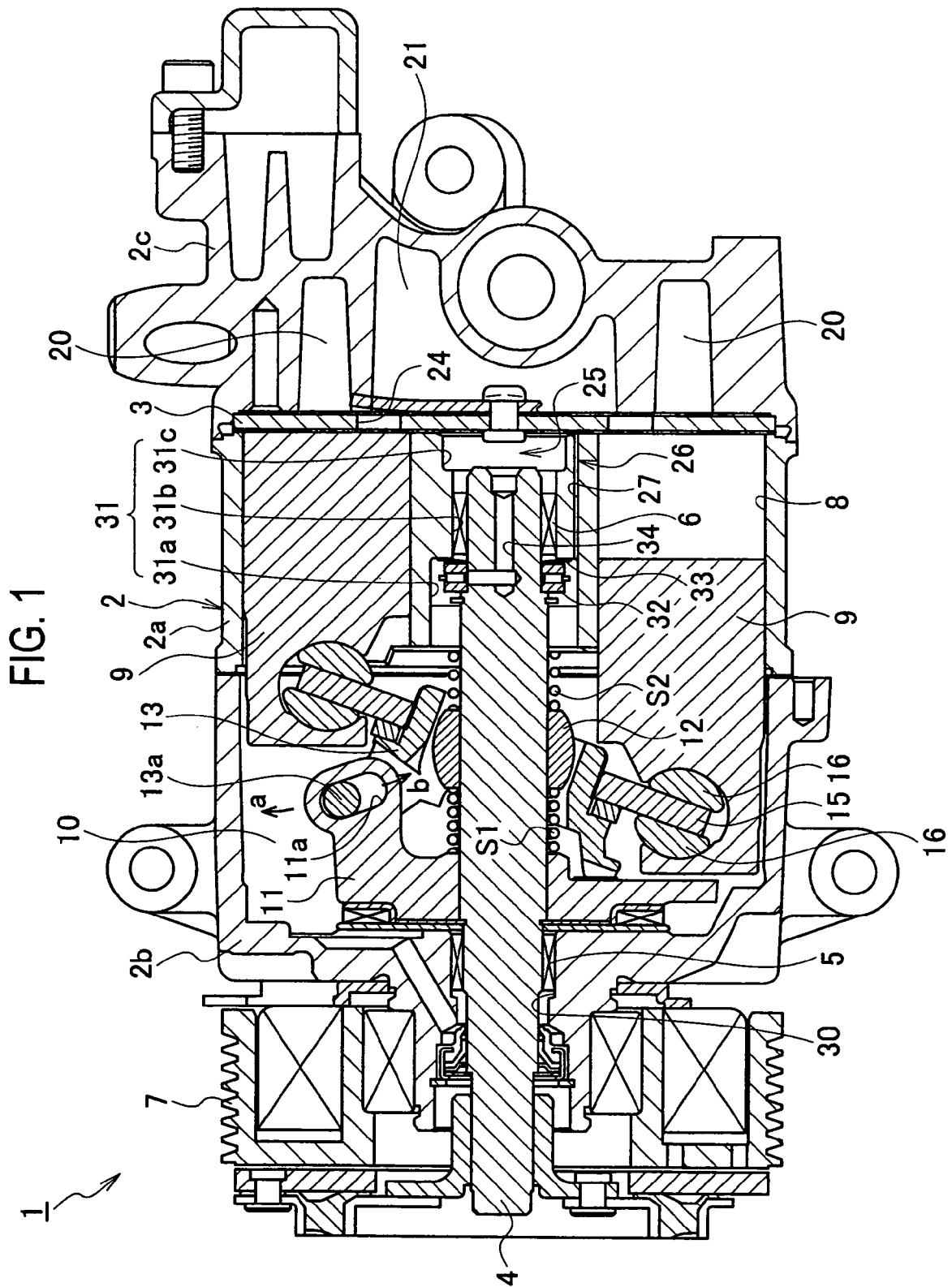


FIG. 2

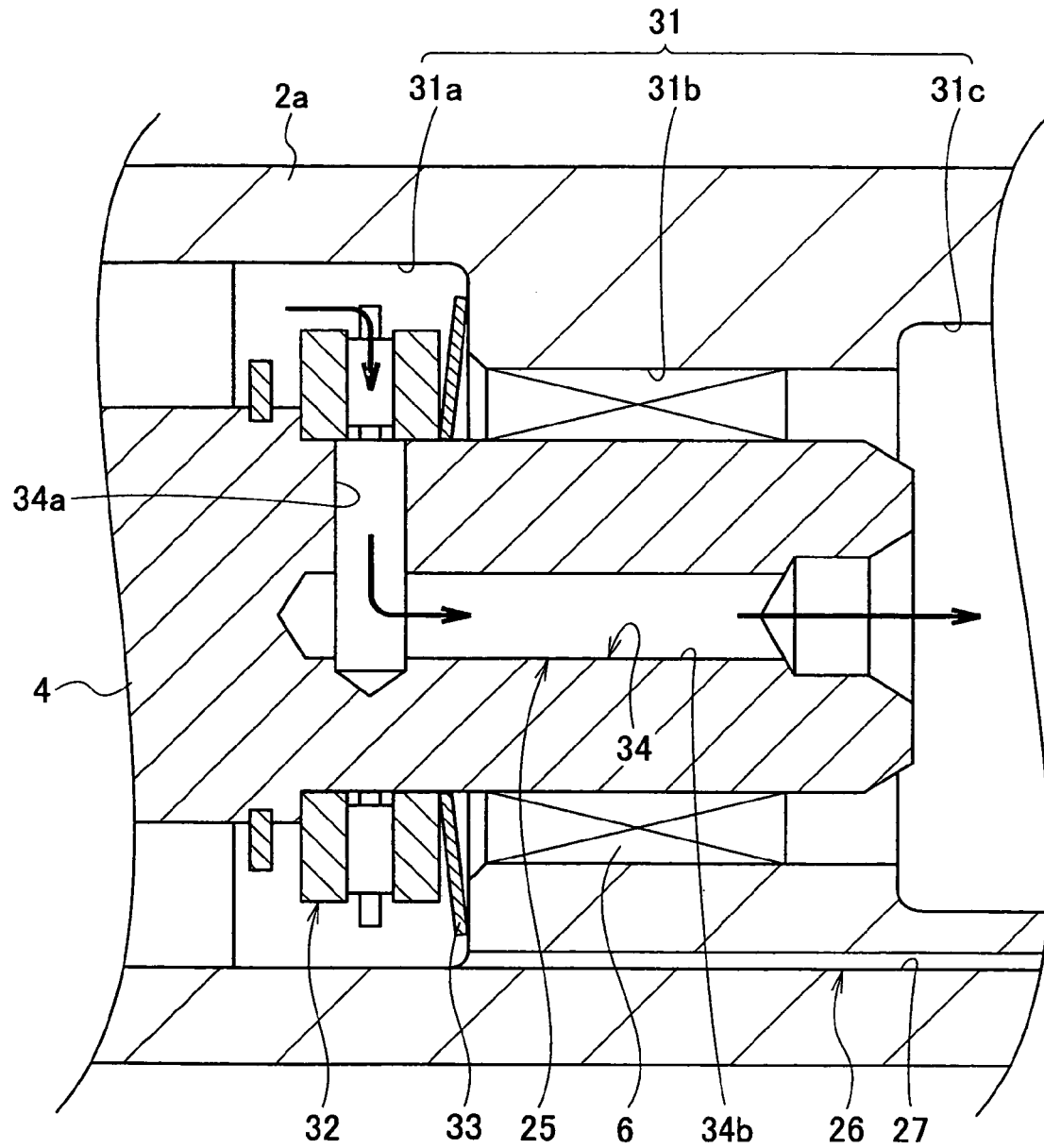


FIG. 3

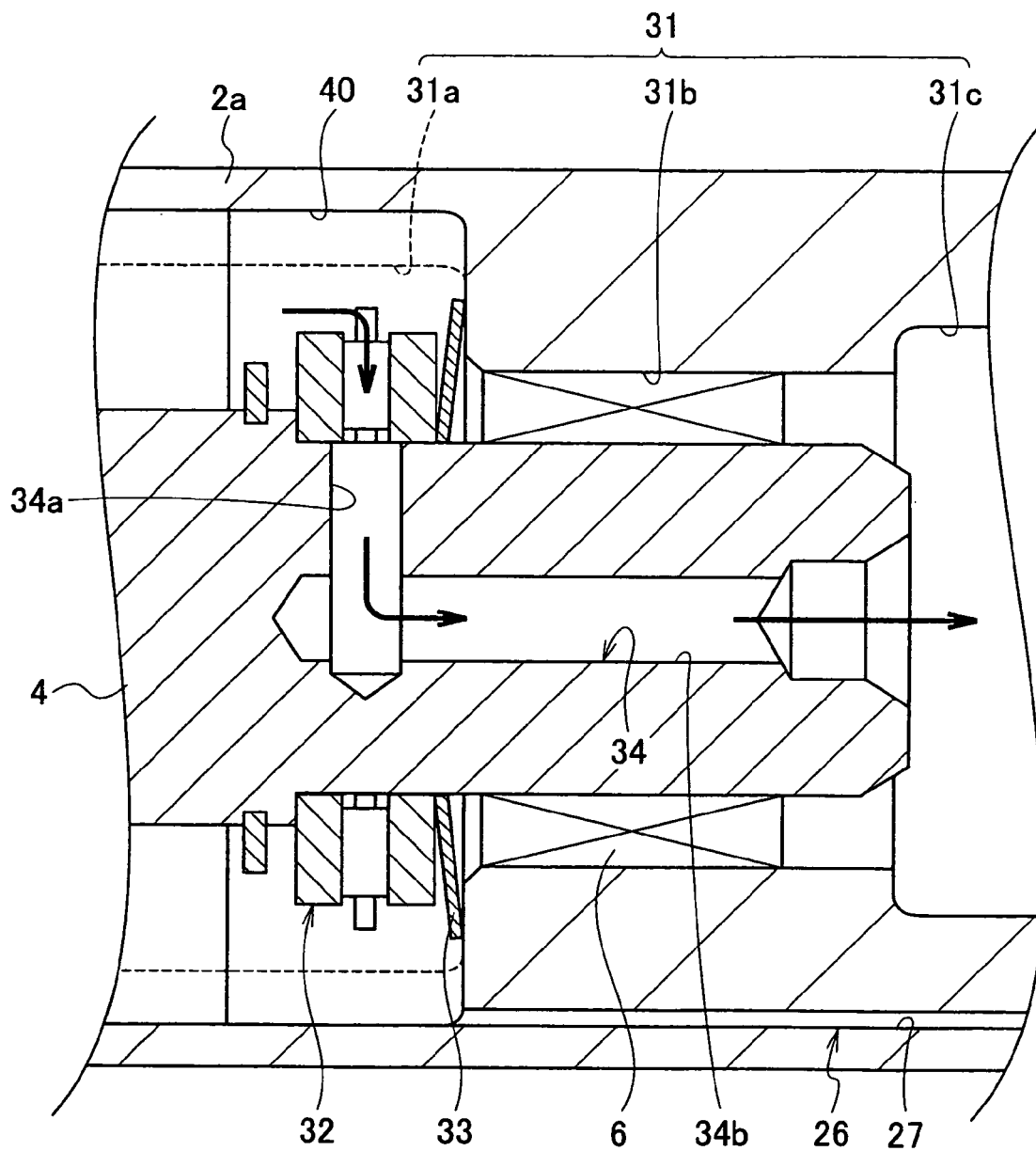


FIG. 4

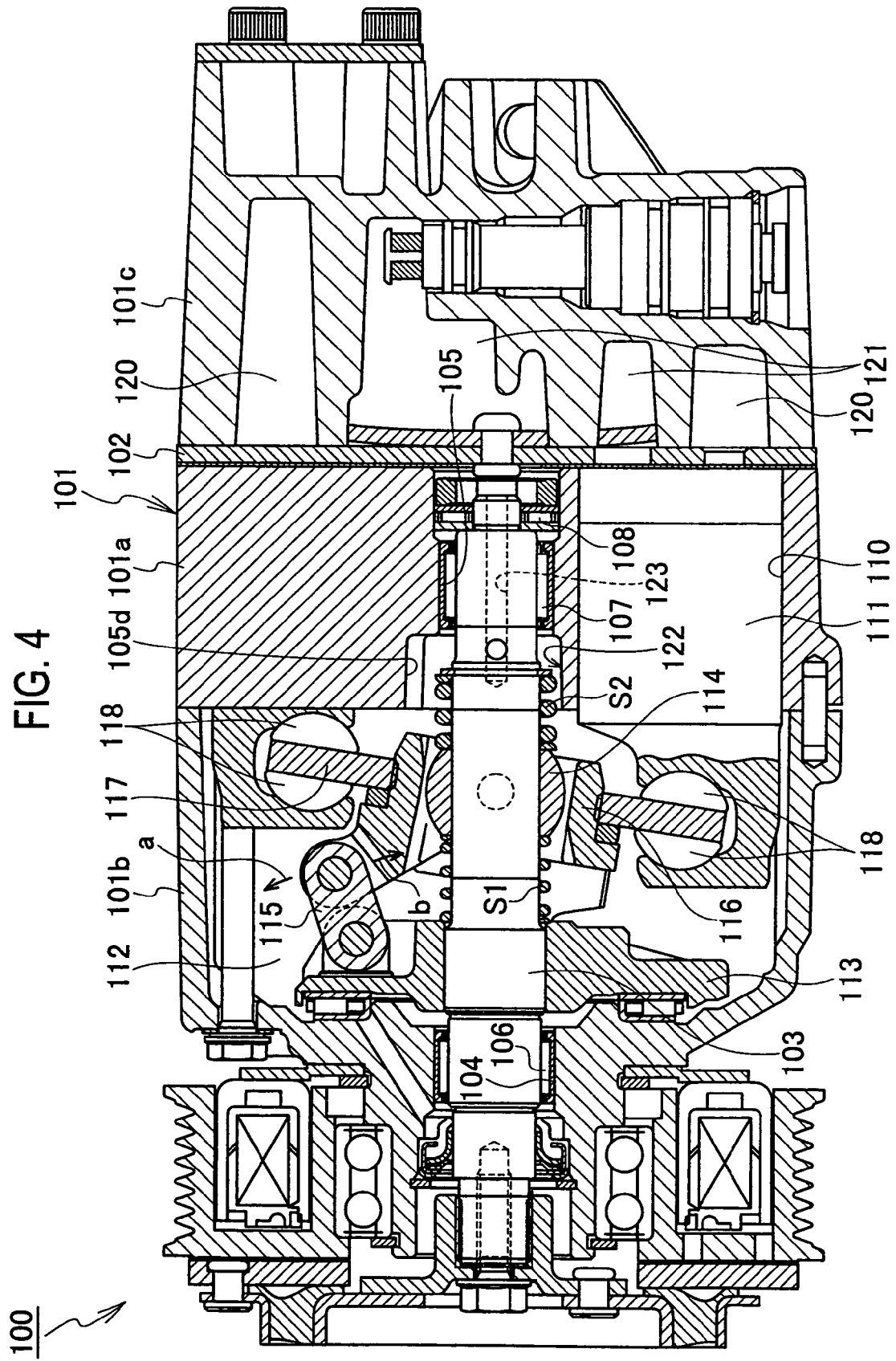
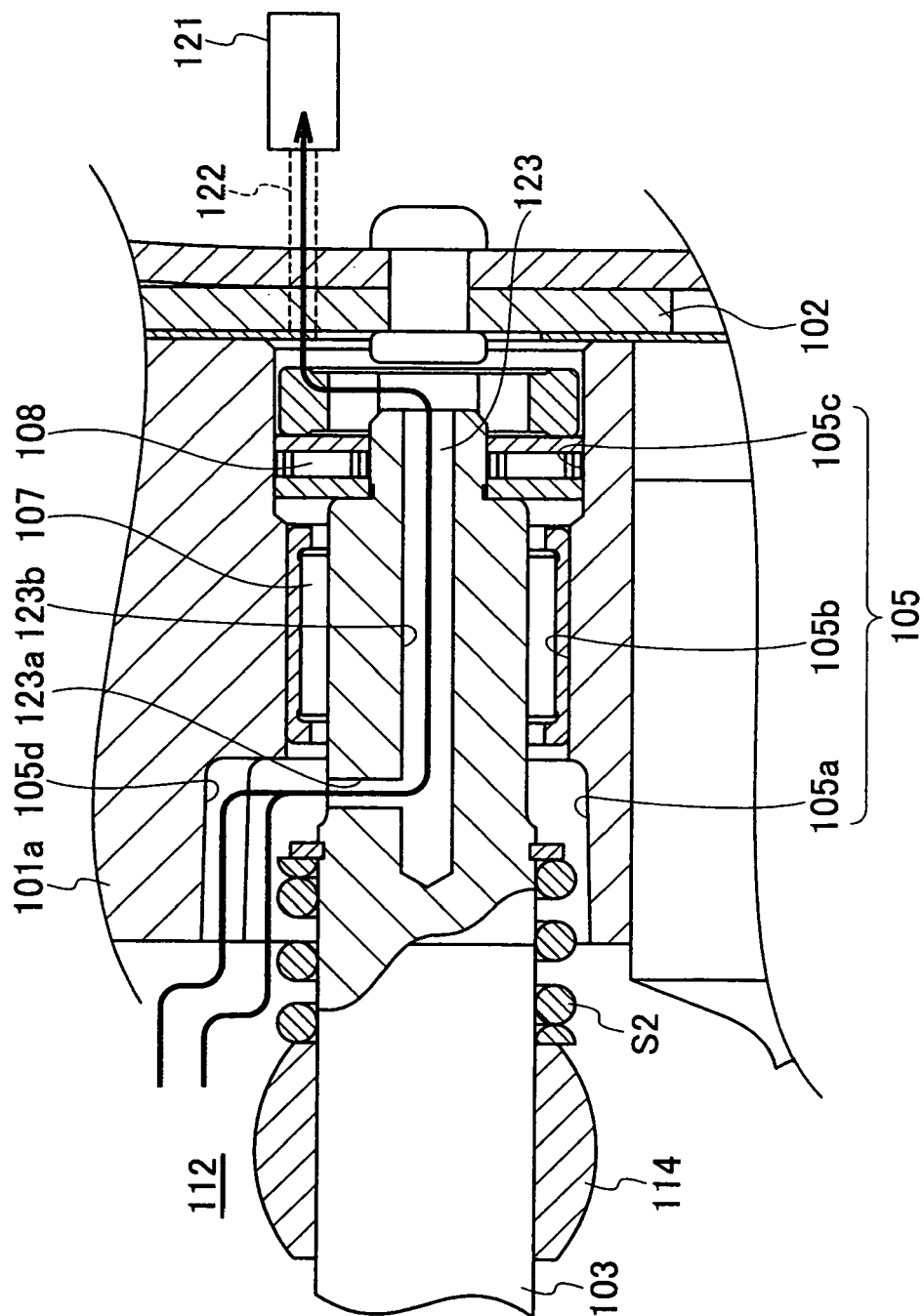


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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