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(54) **TILTING PLATE TYPE COMPRESSOR**

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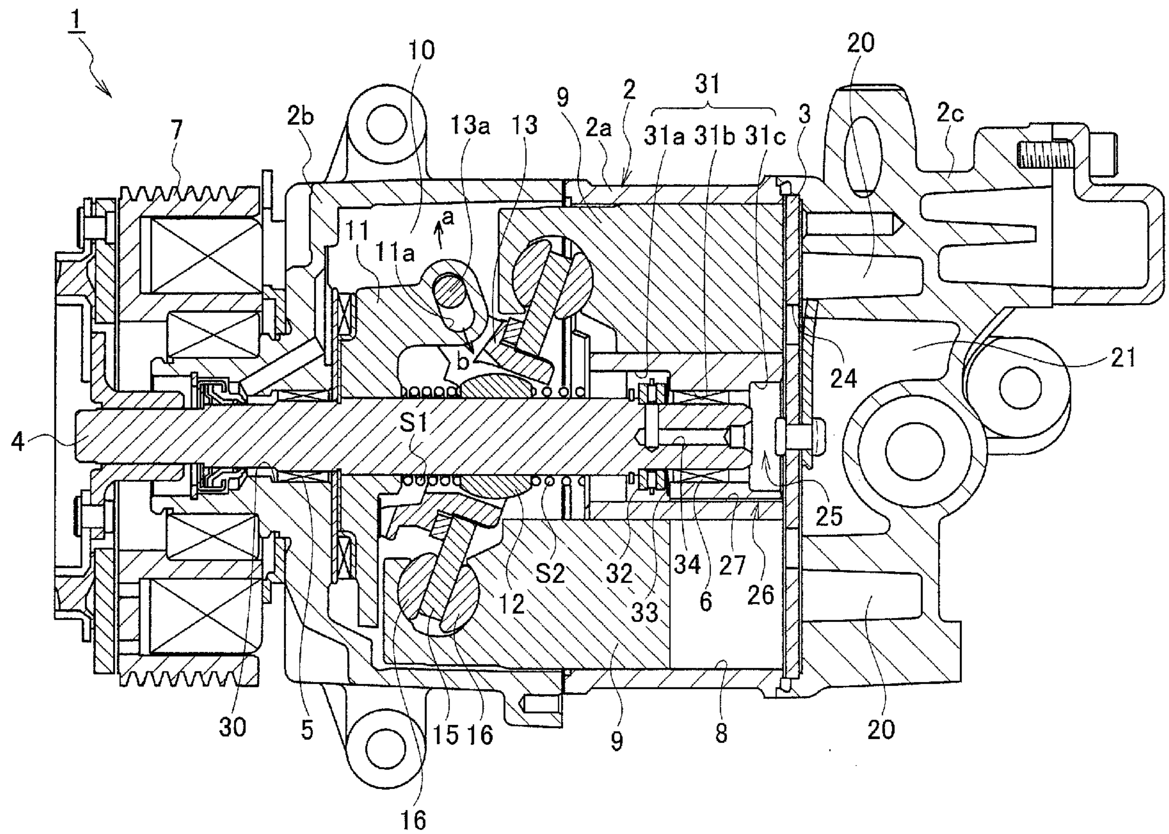
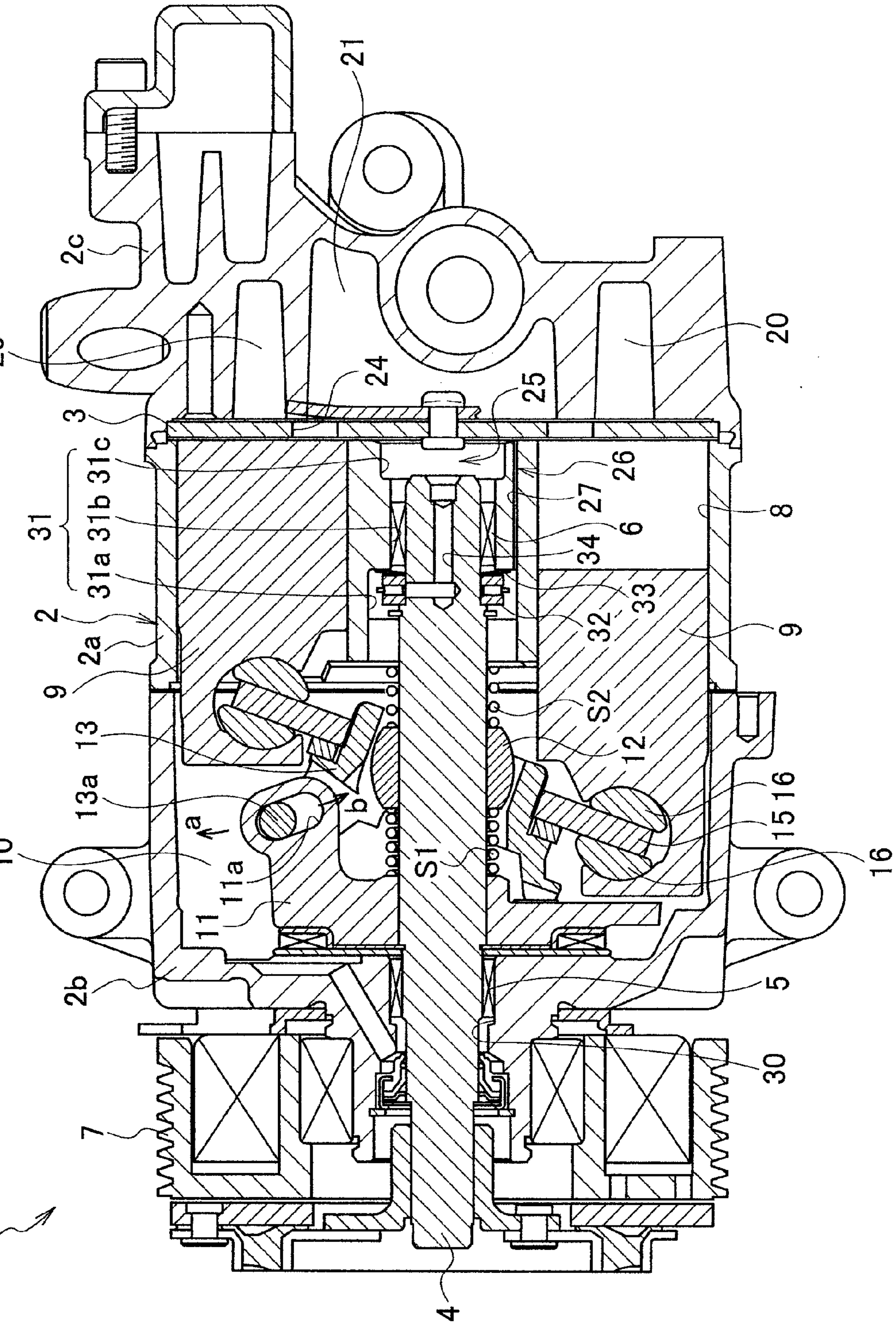
(57) **ABSTRACT**

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.




1
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20
21
24
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S1
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a
b

FIG. 1

FIG. 2

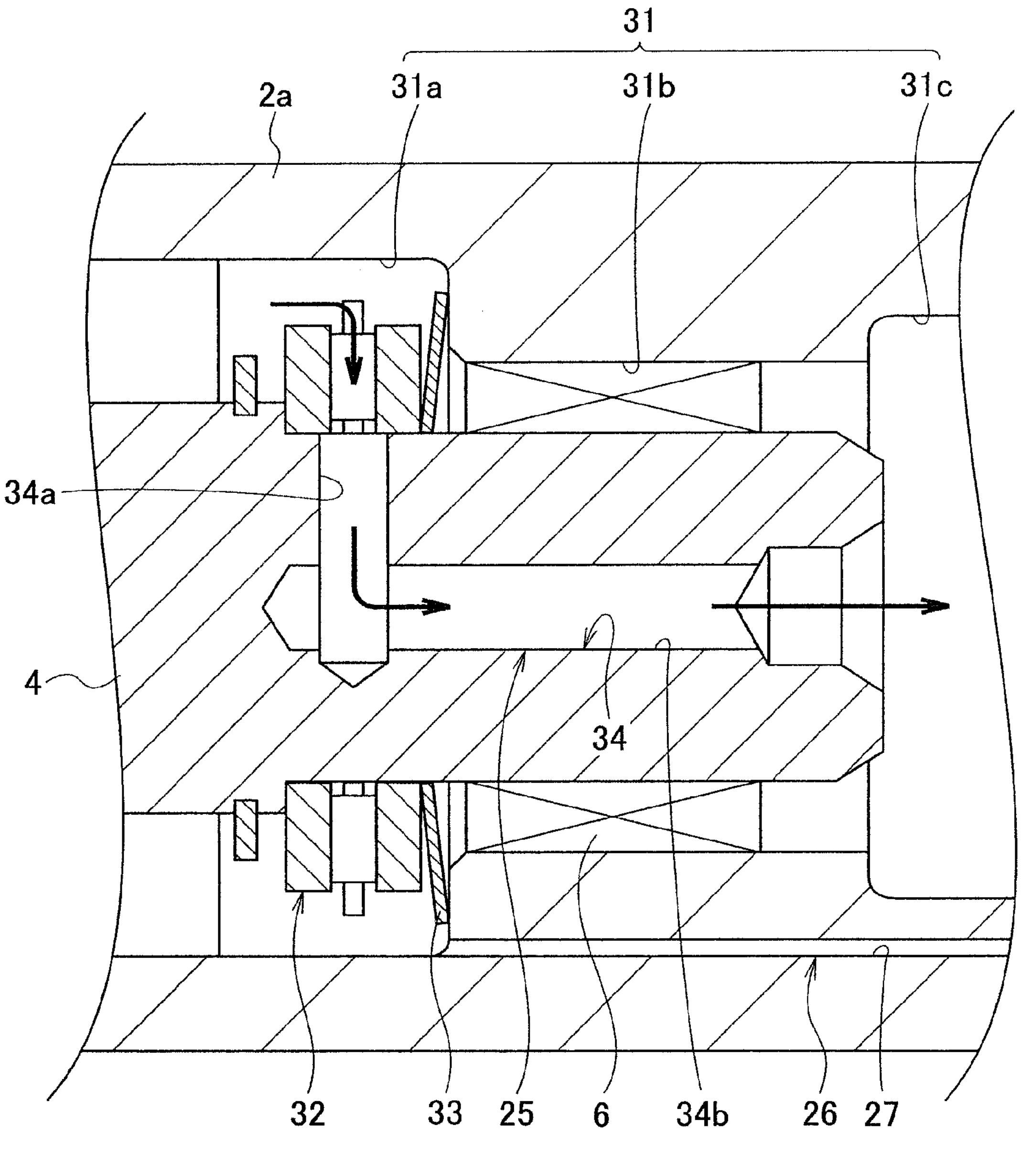


FIG. 3

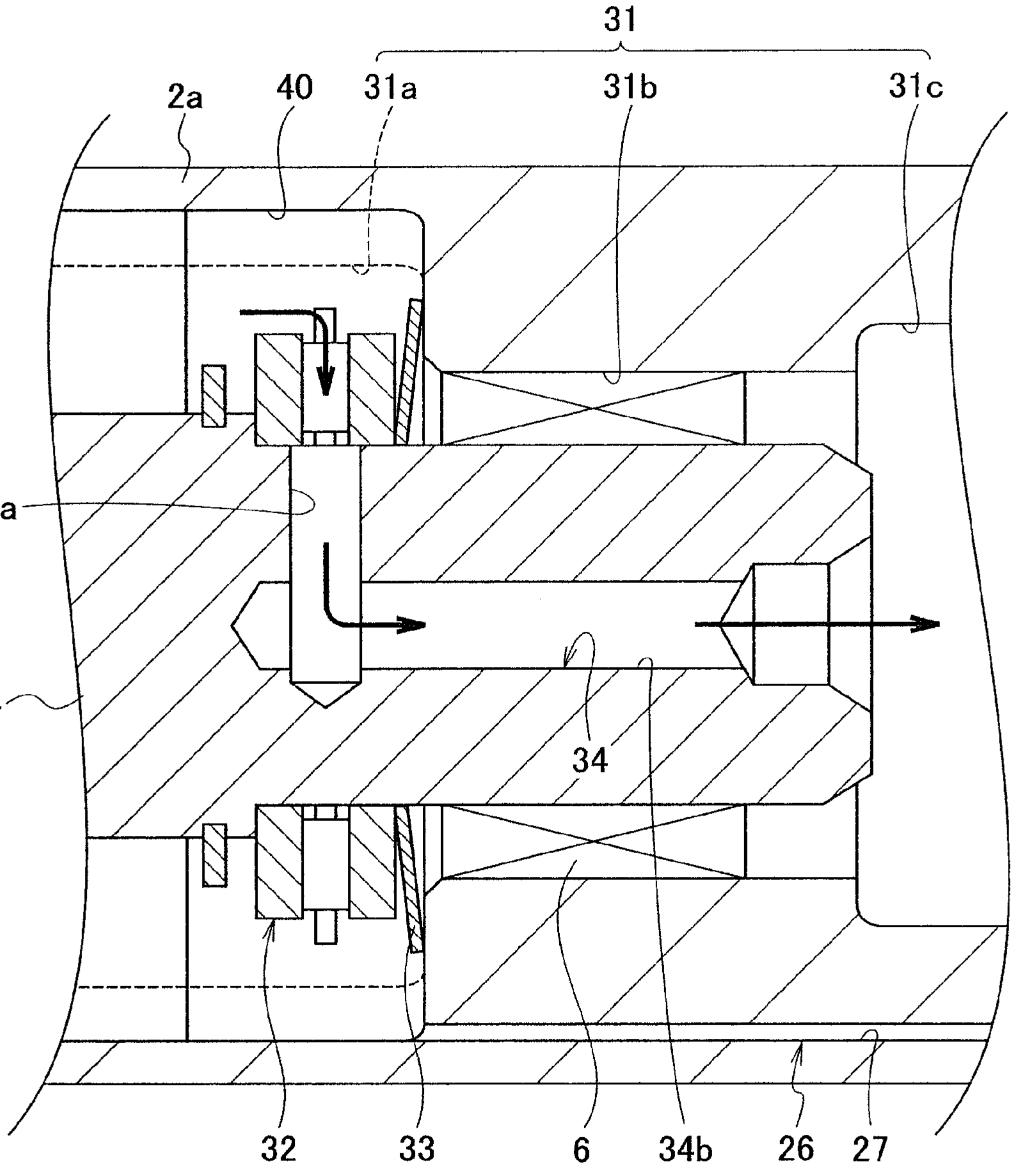
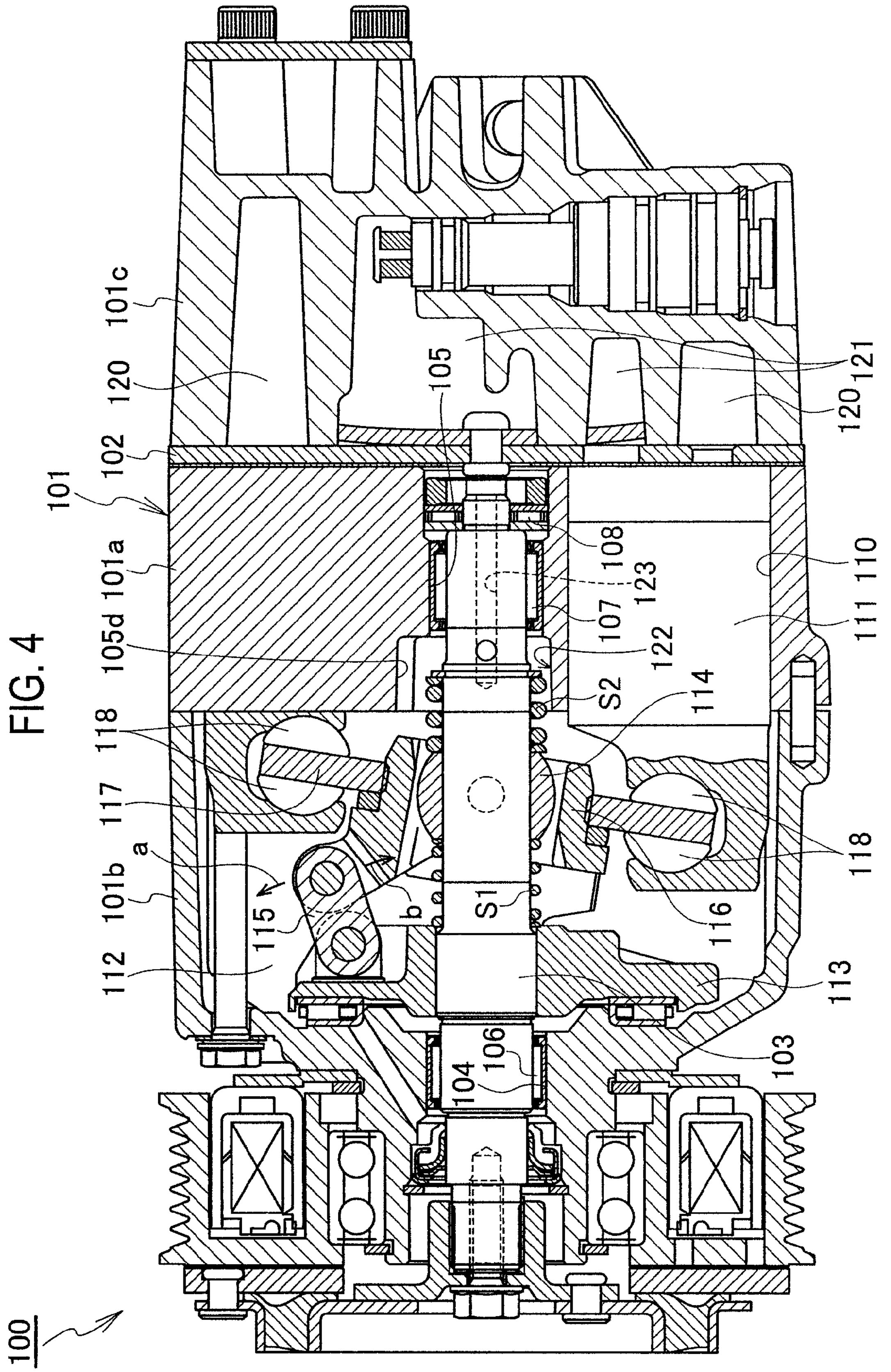
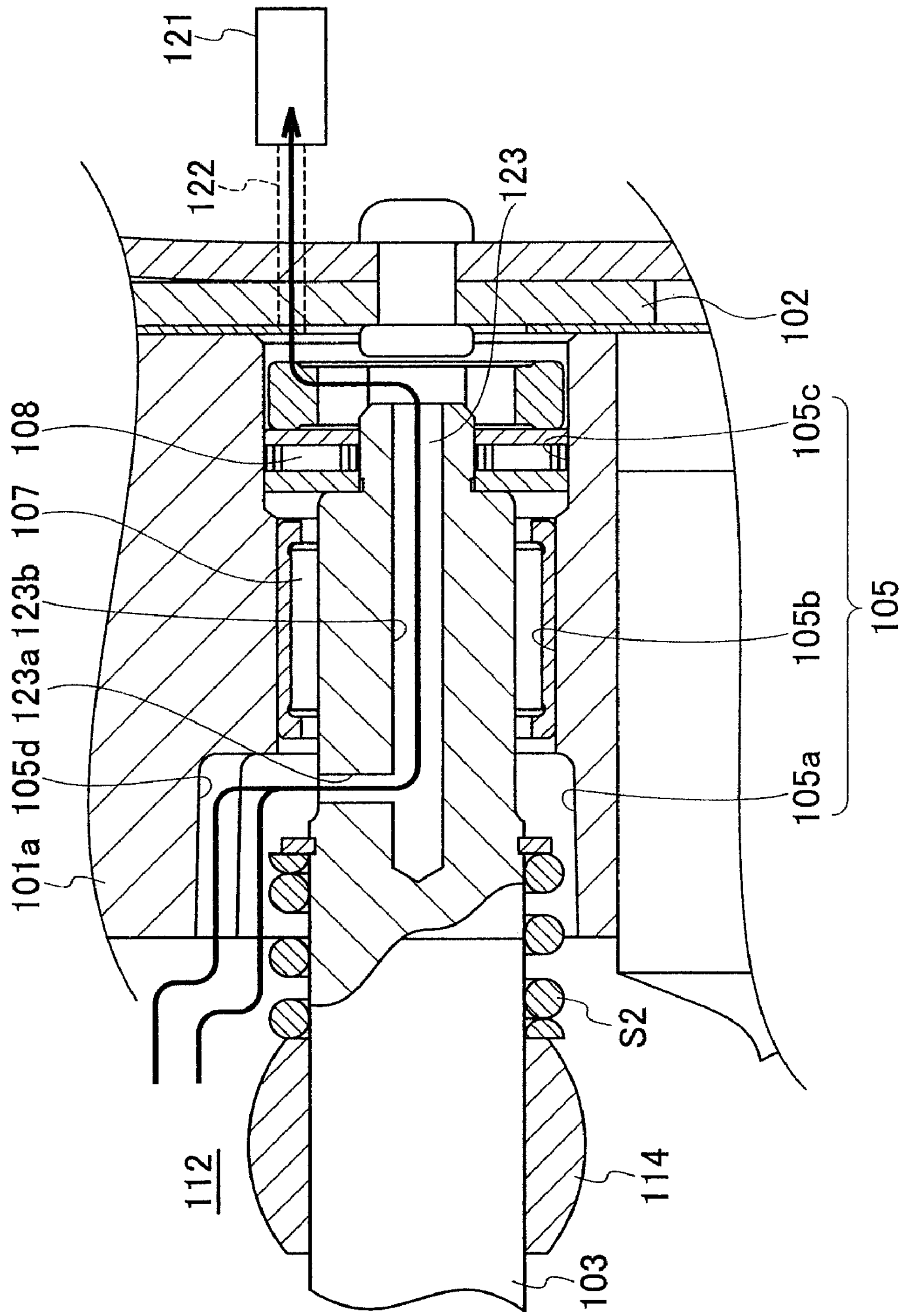


FIG. 4



101c
120
105
121
120
102
101
108
110
101a
123
105d
107
111
122
114
S2
118
117
118
a
101b
115
b
S1
116
112
113
103
106
104
100

FIG. 5


121
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107
123b
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105d
101a
105c
105b
105a
105
S2
112
114
103

TILTING PLATE TYPE COMPRESSOR

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] 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).

[0003] 2. Description of Related Art

[0004] 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 **101***a*, a front head **101***b* provided at one end of the cylinder block **101***a* and a rear head **101***c* provided at another end of the cylinder block **101***a* via a valve plate **102**.

[0005] 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 **101***b* and the cylinder block **101***a*. The bearing cavity **105** in the cylinder block **101***a* is configured of an inside cavity **105***a* opening into an after-mentioned crank chamber **112**, a center cavity **105***b* having a smaller inner diameter and an outside cavity **105***c* 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 **101***b*. Another radial bearing **107** is provided within the center cavity **105***b* of the bearing cavity **105** in the cylinder block **101***a*. 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 **105***c* of the bearing cavity **105**. The drive shaft **103** is supported in its axial direction by the thrust bearing **108**.

[0006] Within the cylinder block **101***a*, 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 **101***a*, 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**.

[0007] 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.

[0008] 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**.

[0009] A suction chamber **120** and a discharge chamber **121** are provided within the rear head **101***c*.

[0010] The valve plate **102** is interposed between the cylinder head **101***a* and the rear head **101***c*. Therefore, the cylinder bores **110** and the chambers **120** and **121** are partitioned by the valve plate **102**.

[0011] 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 **105***a* and an intra-axis path **123** provided in the drive shaft **13** as its path. The intra-axis path **123** is configured of a radial path **123***a* extending a radial direction of the drive shaft **103** and an axial path **123***b* extending an axial direction of the drive shaft **103** as shown in FIG. **5** in detail.

[0012] 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**.

[0013] 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 titled 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.

[0014] 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.

[0015] 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**.

[0016] In addition, the oil in the refrigerant flowing into the radial path **123***a* 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

[0017] 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.

[0018] In the above-mentioned example, an expanded recess **105***d* 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 **105***d* 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 **105***d*.

[0019] An object of the present invention is to provide a titling plate type compressor that can prevent oil from flowing-out from a crank chamber through an extraction path as much as possible.

[0020] 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.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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).

[0025] 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.

[0026] 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.

[0027] 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

[0028] FIG. **1** is an overall cross-sectional view of a tilting plate type compressor according to an embodiment of the present invention;

[0029] FIG. **2** is an enlarged cross-sectional view of main elements in the embodiment of the present invention;

[0030] FIG. **3** is an enlarged cross-sectional view of main elements in a modified embodiment of the present invention;

[0031] FIG. **4** is an overall cross-sectional view of a conventional tilting plate type compressor; and

[0032] FIG. **5** is an enlarged cross-sectional view of main elements in the conventional tilting plate type compressor.

DETAILED DESCRIPTION OF THE EMBODIMENT

[0033] Hereinafter, one embodiment according to the present invention will be explained with reference to drawings.

[0034] 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 **2***a*, a front head **2***b* provided at one end of the cylinder block **2***a* and a rear head **2***c* provided at another end of the cylinder block **2***a* via a valve plate **3**.

[0035] 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 **2***b* 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.

[0036] Bearing cavities **30** and **31** is formed near both ends of the drive shaft **4** within the front head **2***b* and the cylinder block **2***a*. The bearing cavity **31** in the cylinder block **2***a* is configured of an inside cavity **31***a* opening into an after-mentioned crank chamber **10**, a center cavity **31***b* having a smaller inner diameter and an outside cavity **31***c* 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 **2***b*. Another radial bearing **6** is provided within the center cavity **31***b* of the bearing cavity **31** in the cylinder block **2***a*. 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 **31***c* 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**.

[0037] Cylinder bores **8** are formed within the cylinder block **2***a*. The cylinder bores **8** are formed at even intervals on a circumference with the drive shaft **4** as the center. A piston **9** capable of reciprocating is provided in each of the cylinder bores **8**.

[0038] The crank chamber **10** is provided within the front head **2***b*, 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**.

[0039] 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 **13***a* which is fixed on the journal **13** and inserted into a guide hole **11***a* of the rotor **11**.

[0040] 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.

[0041] A suction chamber **20** and a discharge chamber **21** for refrigerant gas are provided within the rear head **2***c*. 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.

[0042] 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.

[0043] 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 **2***c* as its path. The intra-axis path **34** is configured of a radial path **34***a* extending a radial direction of the drive shaft **4** and an axial path **34***b* communicating with the radial path **34***a* and extending along an center axis of the drive shaft **4**. One end of the radial path **34***a* opens into an inside cavity **31***a* 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 **34***b* opens into an outside cavity **31***c* of the bearing cavity **31**.

[0044] 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 **2***a* and its one end opens into the bearing cavity **31**. The second refrigerant path is provided in the rear head **2***c*. 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 **31***a* 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 **31***a* under an installed condition of the compressor **1**.

[0045] 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**.

[0046] 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.

[0047] 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 **13***a* 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 **13***a* 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.

[0048] 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 S**1** and the clockwise moment due to the front pressure of the pistons **9** and the elastic force of the second spring S**2**. 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 **13***a* 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.

[0049] 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 **31***a* 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 **31***a* 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 **31***a* through the first refrigerant path **27** of the intake path **26** and then enters into the crank chamber **10** via the inside cavity **31***a*. Therefore, the above-mentioned oil on the inner surface of the inside cavity **31***a* 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.

[0050] 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.

[0051] 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 **31***a*) 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.

[0052] 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 **31***a*) 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.

[0053] A modified embodiment is shown in FIG. **3**. In the modified embodiment, an expanded cavity **40** communicating with the inside cavity **31***a* is provided around the inside cavity **31***a*. 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 **31***a*. Note that the expanded cavity **40** may be provided partially on the circumference of the inside cavity **31***a* (like the expanded recess **105***d* shown in FIGS. **4** and **5**).

[0054] 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**.

[0055] 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**.

[0056] 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.

[0057] 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.

[0058] In the embodiment, the expanded cavity **40** communicating with the inside cavity **31***a* is provided around the inside cavity **31***a* 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.

[0059] 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.

[0060] 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.

[0061] 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 trust bearing **32** and the radial bearing **6** to supply oil to the bearings **32** and **6** sufficiently.

What is claimed is:

1. A tilting plate type compressor comprising:

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; wherein

the extraction path includes an intra-axis path provided within the drive shaft and opens into the bearing cavity, and

the intake path opens into the bearing cavity and communicates with the crank chamber via the bearing cavity.

2. The compressor according to claim **1**, wherein

an expanded cavity communicating with the bearing cavity is provided around the bearing cavity, and

the intra-axis path opens into the expanded cavity.

3. The compressor according to claim **1**, wherein

the intake path opens into the bearing cavity at a farther position from the crank chamber than an opening position of the intra-axis path into the bearing cavity.

4. The compressor according to claim **1**, wherein

the intake path opens at a lower position within the bearing cavity under an installed condition of the compressor.

5. The compressor according to claim **2**, wherein

the intake path opens into the expanded cavity at a farther position from the crank chamber than an opening position of the intra-axis path into the expanded cavity.

6. The compressor according to claim **2**, wherein

the intake path opens at a lower position within the expanded cavity under an installed condition of the compressor.

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