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(54) **SCROLL COMPRESSOR**

SPIRALVERDICHTER

COMPRESSEUR À SPIRALE

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EP 3 779 195 B1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a scroll compressor.

BACKGROUND ART

[0002] A scroll compressor typically includes a casing, and a compression mechanism disposed in an upper portion of the interior of the casing. A motor is disposed below the compression mechanism. The motor and the compression mechanism are connected together via a drive shaft. For example, a scroll compressor of Patent Document 1 has its drive shaft supported by a rolling bearing below a coupling portion of the drive shaft coupled to a compression mechanism.

[0003] A lubricant supplied to the rolling bearing is returned from a lower portion of the rolling bearing through an oil discharge passage to an oil sump portion provided in a lower portion of a casing. Patent Document 2 discloses a scroll compressor according to the preamble of claim 1.

CITATION LIST

PATENT DOCUMENTS

[0004]

Patent Document 1: Japanese Unexamined Patent Publication No. 2013-036409
Patent Document 2: JP 2017 223150 A

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0005] The scroll compressor of Patent Document 1 is configured such that the lubricant that has lubricated the rolling bearing is discharged to a high-pressure space in the casing filled with refrigerant. The casing is provided with a discharge pipe communicating with the high-pressure space.

[0006] According to this configuration, the lubricant that is returning to the oil sump portion in the lower portion of the casing may be discharged through the discharge pipe while mixing with a high-pressure discharge gas refrigerant. As a result, the amount of the lubricant in the casing may decrease (oil loss may occur), and the performance and reliability of the scroll compressor may deteriorate.

[0007] An object of the present disclosure is to make it difficult to discharge a lubricant which has lubricated a rolling bearing and which mixes with a discharge gas, through a discharge pipe, and to reduce the degree to which the performance and reliability of a scroll compressor deteriorate.

SOLUTION TO THE PROBLEM

[0008] A first aspect of the present invention directed to a scroll compressor according to claim 1.

[0009] In the first aspect, the lubricant that has lubricated the rolling bearing (62) in the first space (54) serving as a high-pressure space flows out of the oil collection member (70) below the rolling bearing (62) through the oil collection path (71) into the second space (80, 31b) having a lower pressure than the first space (54). Since the lubricant that has passed through the oil collection path (71) does not flow into the first space (16, 54) having a high pressure, the lubricant is less likely to flow from the first space to the outside of the scroll compressor. This can reduce the degree to which the performance and reliability of the scroll compressor deteriorate.

[0010] A second aspect of the present invention is an embodiment of the first aspect. In the second aspect, the scroll compressor may further include:

a pin bearing (61) provided in a coupling portion (38) of the compression mechanism (30) coupled to the drive shaft (23), the pin bearing (61) being configured to support a crank pin (25) of the drive shaft (23); and
a main oil supply path (27) through which the lubricant is supplied to the pin bearing (61).

[0011] The bearing oil supply path (78, 79) may be a passage through which the lubricant is supplied from the main oil supply path (27) to the rolling bearing (62).

[0012] In the second aspect, the lubricant supplied through the main oil supply path (27) and the bearing oil supply paths (78, 79) to the pin bearing (61) and the rolling bearing (62) passes through the oil collection path (71), and is collected in the second space (80, 31b). The lubricant that has passed through the main oil supply path (27) does not flow out into the first space (16, 54). This can effectively reduce the lubricant flowing from the first space (16, 54) to the outside of the scroll compressor.

[0013] A third aspect of the present invention is an embodiment of the first or second aspect. In the third aspect, the scroll compressor may further include:

an oil sump portion (17) formed in a lower space in the casing (11) to store the lubricant, the pressure of the high-pressure fluid acting on the oil sump portion (17); and
an oil discharge passage (90) through which the lubricant having a high pressure and existing in the coupling portion (38) of the compression mechanism (30) coupled to the drive shaft (23) is discharged via the first space (16) in the casing (11) to the oil sump portion (17).

[0014] In the third aspect, in a situation where the amount of the lubricant supplied to the rolling bearing

(62) is larger than the amount of the lubricant collected through the oil collection path (71), the lubricant is discharged via the first space (16) through the oil discharge passage (90) to the oil sump portion (17). This allows the amount of the lubricant supplied to be balanced with the amount of the lubricant discharged (collected).

[0015] A fourth aspect of the present invention is an embodiment of any one of the first to third aspects. In the fourth aspect, the second space (80, 31b) may be configured as a space (80) in which an anti-rotation mechanism (84) is disposed, the anti-rotation mechanism (84) being configured to prevent an orbiting scroll (35) from rotating on an axis of the orbiting scroll (35) and allow the orbiting scroll (35) to orbit around a fixed scroll (40) of the compression mechanism (30).

[0016] A fifth aspect of the present invention is an embodiment of the fourth aspect. In the fifth aspect, the anti-rotation mechanism (84) may include an Oldham ring (85), and the oil collection path (71) may have an opening (72a) formed through an Oldham ring sliding surface (88) on which the Oldham ring (85) slides.

[0017] In the fourth and fifth aspects, the lubricant that has lubricated the rolling bearing (62) is supplied to the second space (80) in which the anti-rotation mechanism (84), such as the Oldham ring (85), is provided. Thus, the anti-rotation mechanism (84) operates smoothly.

[0018] A sixth aspect of the present invention is an embodiment of the fifth aspect. In the sixth aspect, the opening (72a) of the oil collection path (71) may be formed within a region of the Oldham ring sliding surface (88) where the Oldham ring (85) is movable, and may be covered with the Oldham ring (85) in operation.

[0019] In the sixth aspect, the lubricant flows out through the opening (72a) of the oil collection path (71) covered with the Oldham ring (85) in operation into the second space (80), and is directly supplied to the sliding surface of the Oldham ring (85). Thus, the Oldham ring (85) operates smoothly.

[0020] A seventh aspect of the present invention is an embodiment of any one of the first to third aspects. In the seventh aspect, the first and second spaces (54) and (80) may be formed between a fixed member (50) of the compression mechanism (30) and orbiting and fixed scrolls (35) and (40), the compression mechanism (30) may include a sealing member (55) separating the first space (54) from the second space (80), and a seal recess (56) housing the sealing member (55), and the oil collection path (71) may have a communication path (77) communicating with the seal recess (56).

[0021] In the seventh aspect, the lubricant that has lubricated the rolling bearing (62) is supplied through the communication path (77) of the oil collection path (71) to the seal recess (56). The lubricant flows out of the seal recess (56) into the second space (80) having a lower pressure than the first space (54). Also in the seventh aspect, since the lubricant that has lubricated the bearing (62) is less likely to flow through the oil collection member (70) below the bearing (62) into the first space having a high pressure, the lubricant is less likely to flow from the first space to the outside of the scroll compressor. This can reduce the degree to which the performance and reliability of the scroll compressor deteriorate.

[0022] An eighth aspect of the present invention is an embodiment of the seventh aspect. In the eighth aspect, the seal recess (56) may have a first surface (57) closer to the first space (54) than the sealing member (55) housed therein is, and a second surface (58) closer to the second space (80) than the sealing member (55) is, and the communication path (77) may communicate with the second surface (58) of the seal recess (56).

[0023] In the eighth aspect, the communication path (77) communicates with the second surface (58) of the seal recess (56). This makes it easy for the lubricant to flow out through the seal recess (56) into the second space (80). Thus, the lubricant is less likely to flow from the oil collection member (70) into the first space (54) and in turn to the outside of the scroll compressor. This can reduce the degree to which the performance and reliability of the scroll compressor deteriorate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

[FIG. 1] FIG. 1 is a vertical cross-sectional view of a scroll compressor according to a first embodiment.

[FIG. 2] FIG. 2 illustrates a portion of a compression mechanism illustrated in FIG. 1 on an enlarged scale.

[FIG. 3] FIG. 3 is a plan view of a housing.

[FIG. 4] FIG. 4 illustrates a portion of a compression mechanism according to a variation of the first embodiment on an enlarged scale.

[FIG. 5] FIG. 5 is a vertical cross-sectional view of a scroll compressor according to a first example not belonging to the present invention.

[FIG. 6] FIG. 6 is a vertical cross-sectional view of a scroll compressor according to a second embodiment.

[FIG. 7] FIG. 7 illustrates a portion of a compression mechanism illustrated in FIG. 6 on an enlarged scale.

DESCRIPTION OF EMBODIMENTS

«First Embodiment»

[0025] A first embodiment will be described below.

[0026] FIG. 1 is a vertical cross-sectional view illustrating a configuration of a scroll compressor according to the first embodiment. A scroll compressor (10) is connected to, for example, a refrigerant circuit that performs a vapor compression refrigeration cycle in an air conditioner. The scroll compressor (10) includes a casing (11), a rotary compression mechanism (30), and a drive mechanism (20) configured to rotate the compression mechanism (30). The compression mechanism (30) and the drive mechanism (20) are housed in the casing (11).

[0027] The casing (11) is configured as a hermetically-sealed container formed into a vertically oriented cylindrical shape with both ends closed. The interior of the casing (11) is partitioned into upper and lower portions by a housing (50) joined to the inner peripheral surface of the casing (11). A space above the housing (50) constitutes an upper space (15), and a space below the housing (50) constitutes a lower space (first space) (16). In this embodiment, the first space represents a space having a pressure equal to the pressure of a high-pressure fluid discharged from the compression mechanism (30), and a second space described below represents a space having a lower pressure than the first space. The lower space (16) forms a high-pressure space filled with a high-pressure refrigerant (high-pressure fluid) discharged from the compression mechanism (30), as will be described below. That is to say, the scroll compressor (10) is a high-pressure dome type (high-pressure chamber type) scroll compressor.

[0028] An oil sump portion (17) is provided at the bottom of the lower space (16) in the casing (11) to store a lubricant functioning to lubricate sliding components of the scroll compressor (10). Since the lower space (16) forms the high-pressure space, the pressure of the high-pressure refrigerant also acts on the lubricant stored in the oil sump portion (17) of the lower space (16).

[0029] A suction pipe (18) and a discharge pipe (19) are attached to the casing (11). One end of the suction pipe (18) is connected to a suction pipe fitting (47). The discharge pipe (19) penetrates a barrel (12) at a position different from that of the cross section of the scroll compressor (10) shown in FIG. 1, and is indicated by the phantom line in FIG. 1. An end of the discharge pipe (19) in the casing (11) is open in the lower space (16) of the casing (11).

[0030] The drive mechanism (20) includes a motor (21) and a drive shaft (23). The motor (21) is housed in the lower space (16) of the casing (11). The motor (21) includes a stator (21a) and a rotor (21b), both of which are formed in a cylindrical shape. The stator (21a) is fixed to the inner peripheral surface of the casing (11).

[0031] The rotor (21b) is disposed in a hollow portion of the stator (21a). In the hollow portion of the rotor (21b), the drive shaft (23) is fixed to pass through the rotor (21b) so that the rotor (21b) and the drive shaft (23) rotate together.

[0032] The compression mechanism (30) is a so-called scroll compression mechanism, which includes an orbiting scroll (35), a fixed scroll (40), and the housing (50). The housing (50) and the fixed scroll (40) are fastened to each other using bolts (not shown). The orbiting scroll (35) is housed in a space between the housing (50) and the fixed scroll (40) so as to be capable of rotating eccentrically.

[0033] The orbiting scroll (35) has an orbiting scroll end plate portion (36) having a substantially disk shape. An orbiting scroll wrap (37) stands on an upper surface of the orbiting scroll end plate portion (36). The orbiting scroll wrap (37) is a wall body extending radially outward from the vicinity of the center of the orbiting scroll end plate portion (36) in a spiral manner. Further, a boss portion (38) protrudes from a lower surface of the orbiting scroll end plate portion (36).

[0034] The fixed scroll (40) has a fixed scroll end plate portion (41) having a substantially disk shape. A fixed scroll wrap (42) stands on a lower surface of the fixed scroll end plate portion (41). The fixed scroll wrap (42) is a wall body extending radially outward from the vicinity of the center of the fixed scroll end plate portion (41) in a spiral form, and meshing with the orbiting scroll wrap (37) of the orbiting scroll (35). A fluid chamber (31) is formed between the fixed scroll wrap (42) and the orbiting scroll wrap (37). The fluid chamber (31) includes a plurality of first fluid chambers and a plurality of second fluid chambers between the fixed scroll wrap (42) and the orbiting scroll wrap (37). The first fluid chambers are formed along the inner periphery of the fixed scroll wrap (42), and the second fluid chambers are formed along the outer periphery of the fixed scroll wrap (37). Each of the first and second fluid chambers alternately switch between a suction chamber (31a) and a compression chamber (31b). The suction chamber (31a) is formed during a suction stroke in which a fluid flows from the suction pipe (18) into the suction chamber (31a). The compression chamber (31b) is formed during a period from the end of the suction stroke and in turn, the start of a compression stroke to the end of a discharge stroke.

[0035] The fixed scroll (40) has an outer edge portion (43) that extends continuously radially outward from the outermost peripheral wall of the fixed scroll wrap (42). A lower end surface of the outer edge portion (43) is fixed to an upper end surface of the housing (50). The outer edge portion (43) has a suction port (34) connected to the suction pipe fitting (47) described above. The suction port (34) opens at the position where the fluid chamber (31) sucks the fluid, and communicates with the suction chambers (31a).

[0036] Further, the fixed scroll end plate portion (41) of the fixed scroll (40) has a discharge port (32) that is located near the center of the fixed scroll wrap (42) and passes therethrough in a vertical direction, and a relief port (33) through which an excessive increase in the pressure of the compression chambers (31b) causes the refrigerant to be released. A relief valve (33a) is fitted to the relief port (33). A lower end of the discharge port (32) opens at the position where the fluid is discharged from the compression chambers (31b). An upper end of the discharge port (32) opens to a discharge chamber (46) defined in an upper portion of the fixed scroll (40). Although not shown, the discharge chamber (46) communicates with the lower space (16) of the casing (11) through a discharge passage formed inside the fixed scroll (40) and the housing (50). Thus, during the operation of the scroll compressor (10), the lower space (16) has a pressure substantially equal to that of the high-pressure refrigerant discharged from the compression mechanism (30).

[0037] The housing (50) is formed into a substantially cylindrical shape. The outer peripheral surface of the housing (50) forms a tubular portion having an upper portion with a larger diameter than a lower portion of the tubular portion. The upper portion of the outer peripheral surface is fixed to the inner peripheral surface of the casing (11).

[0038] The drive shaft (23) is inserted into a hollow portion of the housing (50), which is a member that partitions the interior of the casing (11) into upper and lower portions, and serves as a bearing retainer member. As shown also in FIG. 2, which is a partially enlarged view of FIG. 1, the hollow portion forms a hole such that a portion of the hole facing a lower portion of the housing (50) has a larger diameter than a portion of the hole facing an upper portion of the housing (50). The larger-diameter lower portion of the hollow portion forms an upper bearing holder (53). A rolling bearing (62) is fitted, as an upper bearing (main bearing), to the upper bearing holder (53). The rolling bearing (62) supports the drive shaft (23) inside the high-pressure space (first space).

[0039] FIG. 3 is a plan view of the housing. A sealing member (55) is fitted to the upper surface of the housing (50), and seals a space between the upper surface of the housing (50) and the back surface of the orbiting scroll (35). The upper portion of the hollow portion of the housing (50) forms a crank chamber (first space) (54) defined by the sealing member (55).

[0040] The crank chamber (54) faces the back surface of the orbiting scroll (35). The boss portion (38) of the orbiting scroll (35) is located in the crank chamber (54). The boss portion (38) constitutes a coupling portion of the compression mechanism (30) coupled to the drive shaft (23). A first sliding bearing (pin bearing) (61) is fitted into the boss portion (38). The first sliding bearing (61) rotatably supports an eccentric portion (crank pin) (25) of the drive shaft (23) in the boss portion (38) serving as the coupling portion of the compression mechanism (30) coupled to the drive shaft (23).

[0041] A back pressure space (second space) (80) having an intermediate pressure is formed between the fixed scroll (40) and the housing (50) near the outer periphery of the sealing member (55). An Oldham ring (85) is disposed in the back pressure space (80), and functions as an anti-rotation mechanism that regulates the rotation of the orbiting scroll (35) on its own axis and allows the orbiting scroll (35) to orbit. The Oldham ring (85) has a plurality of keys each engaged in an associated one of orbiting scroll key grooves (86) of the orbiting scroll (35) and fixed scroll key grooves (87) of the housing (50). The keys include two orbiting scroll keys (85a) formed on an upper surface of the Oldham ring (85) to respectively engage with the orbiting scroll key grooves (86), and two housing keys (85b) formed on a lower surface of the Oldham ring (85) to respectively engage with the fixed scroll key grooves (87).

[0042] In this embodiment, the back pressure space (80) includes the Oldham ring (85) that prevents the orbiting scroll (35) from rotating on its own axis and allows the orbiting scroll (35) to orbit around the fixed scroll (40), and corresponds to the second space having a lower pressure than the first space.

[0043] In FIG. 1, a lower bearing holder (28) is fixed to a portion of the casing (11) adjacent to the lower end of the barrel (12). A second sliding bearing (63) is fitted, as a lower bearing (subsidiary bearing), into the lower bearing holder (28).

[0044] The drive shaft (23) has a vertically extending main shaft (24), and the above-described eccentric portion (25) adjacent to the upper end of the main shaft (24). The main shaft (24) and the eccentric portion (25) are integrated together. The eccentric portion (25) has a diameter that is smaller than a maximum diameter of the main shaft (24), and has its axial center decentered by a predetermined distance with respect to the axial center of the main shaft (24). The eccentric portion (25) engages with the first sliding bearing (61) in the boss portion (38). As a result, the rotation of the drive shaft (23) causes an orbital motion of the orbiting scroll (35). In this case, the Oldham ring (85) prevents the orbiting scroll (35) from rotating on its own axis.

[0045] The drive shaft (23) internally has a main oil supply path (27) extending along an axial direction. The main oil supply path (27) is configured to supply the lubricant from a first bearing oil supply path (pin shaft bearing oil supply path) (78) formed between the upper end surface of the drive shaft (23) and the orbiting scroll end plate portion (36) to the first sliding bearing (61). Although not shown, the main oil supply path (27) branches halfway toward the second sliding bearing (63).

[0046] A lower end portion of the drive shaft (23) is provided with an oil supply nozzle (26). A suction port of the oil supply nozzle (26) opens to the oil sump portion (17) of the casing (11). A discharge port of the oil supply nozzle (26) is connected to the main oil supply path (27) inside the drive shaft (23). The lubricant sucked up from the oil sump portion (17) of the casing (11) through the oil supply nozzle (26) is supplied to sliding components such as the second sliding bearing (63), the first sliding bearing (61), and the compression mechanism (30).

[0047] An upper end portion of the main shaft (24) of the drive shaft (23) is rotatably supported by the rolling bearing (62) in the upper bearing holder (53) of the housing (50). A lower end portion of the main shaft (24) is rotatably supported by the second sliding bearing (63) in the lower bearing holder (28). A balance weight (29) is fixed to the main shaft (24). An upper end portion of the balance weight (29) is configured as a bearing support portion (retainer) (29a) having substantially the same outside diameter as that of an inner ring of the rolling bearing (62). An oil collection ring (oil collection member) (70) is fitted to the bearing support portion (29a).

[0048] The oil collection ring (oil collection member) (70) is disposed below the rolling bearing (62). The oil collection ring (70) has a fitted portion (70a) fitted to the bearing support portion (29a), and a ring body portion (70b) formed on the outer peripheral surface of the fitted portion (70a), and is configured as a substantially flat, ring-shaped member as a whole. The oil collection ring (70) is disposed in the high-pressure space (first space) below the rolling bearing (62), and is a member that receives, and collects, the lubricant that has lubricated the rolling bearing (62).

[0049] The housing (50) has an oil collection path (71) communicating with a space (under-bearing space (53a)) above the oil collection ring (70). The oil collection path (71) is a path through which the lubricant is introduced from the oil collection ring (70) into the back pressure space (second space) (80). The oil collection path (71) has a main passage (72) and an introduction passage (73). The main passage (72) is a passage having an opening (72a) formed through an Oldham ring sliding surface (88) of the housing (50) on which the Oldham ring (85) slides with an oil coating between the Oldham ring (85) and the Oldham ring sliding surface (88). The introduction passage (73) is a passage through which the lubricant is introduced from the under-bearing space (53a) located below the rolling bearing (62) into the main passage (72). The opening (72a) of the oil collection path (71) is formed within a region of the Oldham ring sliding surface (88) where the Oldham ring (85) is movable, and is always covered with the Oldham ring (85) in operation.

[0050] A throttle member (74) having a helical groove (74a) that forms a minute helical passage between the main passage (72) and the throttle member (74) is fitted into the main passage (72). Fitting the throttle member (74) into the main passage (72) allows the lubricant in the under-bearing space (53a) to flow out of the under-bearing space (53a) serving as the high-pressure space through the helical groove (74a) into the back pressure space (80) serving as an intermediate-pressure space.

[0051] In this embodiment, the lubricant that has lubricated the first sliding bearing (61) is supplied from the lower end of the crank pin (61) to the rolling bearing (62) (see a second bearing oil supply path (79) in FIG. 2). The second bearing oil supply path (79) is a passage through which the lubricant supplied from the main oil supply path (27) through the pin shaft bearing oil supply path (78) to the first sliding bearing (61) further flows from the first sliding bearing (61) to the rolling bearing (62) in the crank chamber (54).

[0052] The lubricant supplied from the main oil supply path (27) to the first sliding bearing (61) flows into the crank chamber (54) when being supplied to the rolling bearing (62). Thus, the crank chamber (54) serves as a high-pressure space having a pressure equal to that of the lower space (16) of the casing (11). The pressure of the crank chamber (54) acts on the back surface of the orbiting scroll (35) together with the pressure of the back pressure space. This allows the orbiting scroll (35) to be pressed against the fixed scroll (40).

[0053] The housing (50) has an oil discharge passage (90) through which the lubricant accumulated in the crank chamber (54) is discharged to the oil sump portion (17) in the lower portion of the casing (11). The oil discharge passage (90) includes a lateral passage (91) extending radially outward from the crank chamber (54) to the outer peripheral portion of the housing (50), and a vertical passage (92) extending downward from the outer peripheral end of the lateral passage (91). The lubricant that has flowed out of the lower end of the vertical passage (92) of the oil discharge passage (90) is guided to a core cut (22) by a guide plate (93) disposed below the housing (50). The core cut (22) extends vertically and continuously on the outer peripheral surface of the rotor (21b). The guided lubricant returns through the core cut (22) to the oil sump portion (17) in the lower portion of the casing (11).

-Operation-

[0054] Next, it will be described how the scroll compressor (10) stated above operates. In FIG. 1, energizing the motor (21) of the scroll compressor (10) allows the drive shaft (23) to rotate together with the rotor (21b), and allows the orbiting scroll (35) to perform an orbital motion. Along with the orbital motion of the orbiting scroll (35), volumes of the suction and compression chambers (31a) and (31b) of the fluid chamber (31) increase and decrease repeatedly and periodically.

[0055] Specifically, the rotation of the drive shaft (23) allows the refrigerant to be sucked into the suction chamber (31a) through the suction port (34). Along with the rotation of the drive shaft (23), the suction chamber (31a) are closed, and the suction chamber (31a) turn into the compression chamber (31b). Further, if the rotation of the drive shaft (23) progresses, the volumes of the compression chamber (31b) start decreasing, and the compression of the refrigerant in the compression chamber (31b) is started.

[0056] Then, the volumes of the compression chamber (31b) is further reduced. When the volume of the compression chamber (31b) is reduced to a predetermined volume, the compression chamber (31b) communicates with the discharge port (32). The high-pressure refrigerant compressed in the compression chamber (31b) is discharged through the discharge port (32) to the discharge chamber (46) of the fixed scroll (40). The refrigerant in the discharge chamber (46) flows out to the lower space (16) of the casing (11), and then is discharged through the discharge pipe (19) to the outside of the compressor.

- Flow of Oil in Oil Supply Operation -

[0057] During operation of the scroll compressor (10), the lubricant sucked up from the oil sump portion (17) of the casing (11) by the oil supply nozzle (26) ascends through the main oil supply path (27), and flows out of the upper end of the eccentric portion (25). The lubricant is supplied through the first bearing oil supply path (78) to the first sliding bearing (61), and then flows into the crank chamber (54). The lubricant flows along the second bearing oil supply path (79) indicated by the arrow in FIG. 2 in the crank chamber (54) to lubricate the rolling bearing (62), and then flows out to the upper surface of the oil collection ring (70).

[0058] A space on the upper surface of the oil collection ring (70) is the high-pressure under-bearing space (53a) that serves as an oil sump space. The under-bearing space (53a) communicates with the back pressure space (second space) (80) having an intermediate pressure via the oil collection path (71). Thus, the pressure difference between these two spaces allows the lubricant to flow out of the under-bearing space (53a) through the helical groove (74a) of the throttle member (74) into the back pressure space (80). The lubricant in the back pressure space (80) spreads over the sliding surface of the Oldham ring (85), and lubricates the Oldham ring (85). Further, the lubricant in the back pressure space (80) spreads also over a thrust sliding surface (45) on which the fixed scroll (40) and the orbiting scroll (35) slide, and thus lubricates, and seals, the thrust sliding surface (45). This reduces the refrigerant leaking from the fluid chamber (31).

[0059] Meanwhile, the lubricant flows continuously through the main oil supply path (27) into the crank chamber (54). Thus, if the amount of the lubricant flowing into the crank chamber (54) is larger than the amount of the lubricant flowing out of the oil collection path (71) into the back pressure space (80), the compressor may malfunction. In this embodiment, in such a case, the lubricant accumulated in the crank chamber (54) is pushed into the lower space (16) through the oil discharge passage (90). The lubricant that has flowed out of the lower end of the vertical passage (92) of the oil discharge passage (90) returns through the guide plate (93) disposed below the housing (50) and the core cut (22) of the rotor (21b) to the oil sump portion (17) in the lower portion of the casing (11).

- Advantages of First Embodiment -

[0060] In the first embodiment, the high-pressure dome type scroll compressor (10) is provided with the oil collection member (70) and the oil collection path (71). The oil collection member (70) is disposed below the rolling bearing (62) on which the pressure of the crank chamber (54) serving as the first space having a high pressure acts, and is configured to collect the lubricant that has lubricated the rolling bearing (62). The oil collection path (71) is configured to introduce the lubricant from the oil collection member (70) in a high-pressure atmosphere into the intermediate-pressure back pressure chamber (80) serving as the second space.

[0061] A known scroll compressor is configured such that a lubricant that has lubricated a rolling bearing is discharged to a high-pressure space in a casing filled with a refrigerant. The casing includes a discharge pipe communicating with the high-pressure space. This may cause the lubricant that is returning to an oil sump portion in a lower portion of the casing to be discharged from the discharge pipe while mixing with a high-pressure discharge gas refrigerant. As a result, the amount of the lubricant in the casing may decrease, and the performance and reliability of the scroll compressor may deteriorate.

[0062] In contrast, according to the above-described configuration of the first embodiment, the pressure difference between the under-bearing space (53a) and the back pressure chamber (80) allows the lubricant that has lubricated the rolling bearing (62) provided in the lower portion of the crank chamber (54), which is the high-pressure space, to flow out of the under-bearing space (oil sump portion) (53a) on the upper surface of the oil collection ring (70) disposed below the rolling bearing (62) through the oil collection path (71) into the back pressure chamber (80) having a lower pressure than the crank chamber (54). In other words, the lubricant in the under-bearing space (53a) is forcibly collected in the back pressure space (80).

[0063] Since the lubricant that has passed through the oil collection path (71) does not flow into the lower space (16), which is the high-pressure first space, the amount of the lubricant leaking from the oil collection ring (70) decreases. This makes it difficult for the lubricant to flow from the lower space (16) serving as the discharge space through the discharge pipe (19) to the outside of the scroll compressor (10). This can reduce the rate of oil loss in the scroll compressor (10) to a low degree, and can reduce the degree to which the performance of the scroll compressor (10) deteriorates and the degree to which oil loss reduces the reliability of the scroll compressor (10).

[0064] In the first embodiment, the main oil supply path (27) through which the lubricant is supplied to the first sliding bearing (61), and the first and second bearing oil supply paths (78, 79) through which the lubricant is supplied through the main oil supply path (27) to the rolling bearing (62) are provided. Thus, the lubricant supplied through the main oil supply path (27) and the bearing oil supply paths (78, 79) to the first sliding bearing (61) and the rolling bearing (62) passes through the oil collection path (71), and is collected in the back pressure space (80). As can be seen, the lubricant supplied through the main oil supply path (27) to the rolling bearing (62) does not flow out into the lower space (16). This can effectively reduce the lubricant flowing from the lower space (16) to the outside of the scroll compressor (10).

[0065] Meanwhile, in the first embodiment, the lower space in the casing (11) includes the oil sump portion (17) in which the lubricant is stored and on which the pressure of the high-pressure refrigerant acts. The housing (50) includes the oil discharge passage (90) through which the high-pressure lubricant in the boss portion (38) serving as a coupling portion of the compression mechanism (30) coupled to the drive shaft (23) is discharged through the lower space (16) in the casing (11) to the oil sump portion (17).

[0066] According to this configuration, in a situation where the amount of the lubricant supplied to the rolling bearing (62) is larger than the amount of the lubricant collected through the oil collection path (71), or in any other similar situation, the lubricant is discharged from the lower space (16) through the oil discharge passage (90) to the oil sump portion (17). Thus, the amount of the lubricant supplied is balanced with the amount of the lubricant discharged (collected). This can reduce malfunctions caused by an insufficient amount of the lubricant collected through the oil collection path (71).

[0067] In the first embodiment, the Oldham ring (85) is provided as the anti-rotation mechanism (84) to prevent the orbiting scroll (35) from rotating on its own axis and allow the orbiting scroll (35) to orbit around the fixed scroll (40) of the compression mechanism (30). The oil collection path (71) is configured as a passage having the opening (72a) through the Oldham ring sliding surface (88) on which the Oldham ring (85) slides. The opening (72a) of the oil collection path (71) opens to the back pressure space (second space) (80).

[0068] According to this configuration, the lubricant that has lubricated the rolling bearing (62) is supplied to the back pressure space (80) in which the Oldham ring (85) constituting the anti-rotation mechanism (84) is provided. Thus, the Oldham ring (85) operates smoothly. Further, the lubricant spreads from the back pressure space (80) also to the thrust sliding surface (45) on which the fixed scroll (40) and the orbiting scroll (35) slide, and thus lubricates, and seals, the thrust sliding surface (45). This reduces the leakage of the refrigerant, and stabilizes operation of the compression mechanism (30).

[0069] In particular, in the first embodiment, the opening (72a) of the oil collection path (71) is formed within a region of the Oldham ring sliding surface (88) where the Oldham ring (85) is movable, and is covered with the Oldham ring (85) in operation. Thus, the lubricant is directly supplied to the sliding surface of the Oldham ring (85). This can further stabilize the operation of the Oldham ring (85), and improve the reliability of the compression mechanism (30).

-Variation of First Embodiment-

[0070] The oil collection path may have the configuration shown in FIG. 4.

[0071] In the variation shown FIG. 4, the introduction passage (73) for the oil collection path (71) is configured as a groove extending from the under-bearing space (53a) to the main passage (72) in a direction perpendicular to the main passage (72). This variation has the same configuration as the first embodiment shown in FIG. 2, except the shape of the introduction passage (73).

[0072] Using the configuration of this variation also provides the same advantages as provided by the foregoing embodiment.

<<First example>>

[0073] A first example not belonging to the present invention will be described.

[0074] The first example shown in FIG. 5 is an example in which the configuration of an oil collection path (71) is different from that in the first embodiment. A space used as a second space into which a lubricant collected by an oil collection member is introduced is also different from that in the first embodiment.

[0075] In the first example, the second space is configured as a compression chamber (31b) where a fluid is being compressed and which is included in a fluid chamber (31) defined between a fixed scroll (40) and an orbiting scroll (35) of a compression mechanism (30). The oil collection path (71) includes a housing collection path (75) and a fixed scroll collection path (76) communicating with each other. The housing collection path (75) has an inlet communicating with an under-bearing space (53a), and has a portion communicating with the fixed scroll collection path (76) and configured as a throttle passage portion (75a) with a small diameter. The fixed scroll collection path (76) has an outflow port (76a) through which the fluid flows out and which communicates with the compression chamber (31b).

[0076] Specifically, the outflow port (76a) communicates with the second space in the fluid chamber (31) where a suction stroke, a compression stroke, and a discharge stroke are repeated. This second space is the compression chamber (31b) where the suction stroke has finished and the compression stroke has just started.

[0077] The first example has the same configuration as the first embodiment except that the oil collection path (71) include, not the main passage (72), the introduction passage (73), and the throttle member (74) all shown in FIG. 2, but the housing collection path (75) and the fixed scroll collection path (76). Thus, the configurations of the other components will not be specifically described.

[0078] In the first example, the lubricant that has lubricated the rolling bearing (62) is collected from the oil collection ring (70) through the housing collection path (75) and the fixed scroll collection path (76) to the compression chamber (31b) where the fluid has just started being compressed and which has a relatively low pressure. The lubricant that has flowed into the compression chamber (31b) is used to lubricate sliding components of the fixed scroll (40) and the orbiting scroll (35) in the compression chamber (31b).

[0079] As described above, in the first example, the compression chamber (31b) which is included in the fluid chamber (31) defined between the fixed scroll (40) and the orbiting scroll (35) and where the fluid is being compressed is used as the second space (31) into which the lubricant collected from the rolling bearing (62) by the oil collection ring (70) is introduced, and the oil collection path (71) includes the housing collection path (75) and the fixed scroll collection path (76).

[0080] According to this configuration, the lubricant that has lubricated the rolling bearing (62) is introduced into the compression chamber (31b) which has a lower pressure than the under-bearing space (53a) and where the fluid is being compressed. Thus, since, just like the first embodiment, the lubricant does not flow into the lower space (16), which is the high-pressure first space, the amount of the lubricant leaking from the oil collection ring (70) decreases. This makes it difficult for the lubricant to flow from the lower space (16) serving as the discharge space through the discharge pipe (19) to the outside of the scroll compressor (10). This can reduce the rate of oil loss in the scroll compressor (10) to a low degree, and can reduce the degree to which the performance of the scroll compressor (10) deteriorates and the degree to which oil loss reduces the reliability of the scroll compressor (10). Further, according to the first example, the lubricant is supplied to the sliding surfaces of the fixed scroll (40) and the orbiting scroll (35), and the compression mechanism (30) operates smoothly.

[0081] In particular, in the first example, the compression chamber (31b) which is included in the fluid chamber (31) and where the suction stroke has finished and the compression stroke has just started is used as the second space (31b). Thus, the lubricant that has lubricated the rolling bearings (62) is introduced into the compression chamber (31b) immediately after the start of the compression stroke, i.e., at the timing when the compression chamber (31b) has the lowest pressure. At this time, the pressure difference between the first and second spaces is great. This allows a sufficient amount of lubricant to be introduced into the compression chamber (31b). As a result, the operation of the compression mechanism (30) can be further stabilized.

[0082] In the first example, the lubricant is introduced from the oil collection ring (70) into the second space that is the compression chamber (31b) where the suction stroke has finished and the compression stroke has just started. However, as long as the compression chamber (31b) used as the second space has a lower pressure than the first space (16, 54) having a high pressure during the operation of the scroll compressor (10), the lubricant does not have to be introduced into the compression chamber (31b) where the compression stroke has just started.

<<Second embodiment>>

[0083] A second embodiment will be described below.

[0084] The second embodiment shown in FIGS. 6 and 7 is an example in which an oil collection path (71) is configured to be different from that in the variation of the first embodiment shown in FIG. 4. In the second third embodiment, oil is supplied through the oil collection path (71) to a sealing member (55).

[0085] In the second embodiment, a crank chamber (54) defined between a housing (bearing housing) (50) serving as a fixed member of a compression mechanism (30) inside a casing (11) and a combination of orbiting and fixed scrolls (35) and (40) functions as a first space having a pressure equal to the pressure of a high-pressure fluid discharged from the compression mechanism (30). Further, a back pressure space (80) having a lower pressure than the crank chamber (54) functions as a second space.

[0086] The compression mechanism (30) includes the sealing member (55) that separates the crank chamber (54) serving as the first space from the back pressure space (80) serving as the second space, just like the first embodiment and the variation thereof. Although not described in the first embodiment and the variation thereof, a seal recess (56) that houses the sealing member (55) is formed in the second embodiment. The seal recess (56) is formed on the upper surface of the housing (50).

[0087] The sealing member (55) is a ring-shaped elastic member. The seal recess (56) is an annular groove into which the sealing member (55) is placed. The seal recess (56) has a first surface (57) closer to the crank chamber (54) than the sealing member (55) housed therein is, and a second surface (58) closer to the back pressure space (80) than the sealing member (55) is.

[0088] In the second embodiment, third the oil collection path (71) is configured as a non-penetrating hole having an upper end that does not reach an Oldham ring sliding surface (88). In other words, the oil collection path (71) of the second third embodiment does not have the opening (72a) shown in FIGS. 2 and 4. The oil collection path (71) of the second third embodiment includes a communication path (77) communicating with the seal recess (56). More specifically, the communication path (77) communicates with the second surface (58) of the seal recess (56).

[0089] The other configurations of the second third embodiment are the same as, or similar to, those of the variation of the first embodiment.

[0090] In the second embodiment, the lubricant that has lubricated the rolling bearing (62) is supplied from the oil collection ring (70) below the rolling bearing (62) through the communication path (77) of the oil collection path (71) to the seal recess (56). This is because the back pressure space (80) near the outer periphery of the seal recess (56) has a lower pressure than the first space (54), and the pressure difference between the under-bearing space (53a) above the oil collection ring (70) and the back pressure space (80) allows the lubricant to be drawn into the seal recess (56). The lubricant that has flowed into the seal recess (56) spreads over entire high- and low-pressure sealing portions (portions of the sealing member (55) near the outer peripheral surface and upper surface thereof) that seal the first and second spaces (54) and (80), and further over sliding portions including the upper surface of the housing (50) and a lower surface of the orbiting scroll (35) (orbiting scroll end plate portion (36)), and lubricates the high- and low-pressure sealing portions and the sliding portions.

[0091] The lubricant in the seal recess (56) flows out of the seal recess (56) and the sliding portions of the housing (50) and the orbiting scroll (35) into the low-pressure back pressure space (80). As can be seen, the lubricant flows from the oil collection ring (70) into the seal recess (56). Thus, the lubricant is less likely to leak from the oil collection ring (70) to the lower space (16) in the casing (11). This makes it difficult for the lubricant to flow from the lower space (16) to the outside of the scroll compressor (10). As a result, reducing the amount of oil discharged enhances the performance of the scroll compressor (10), and reduces the degree to which oil loss in the casing (11) reduces the reliability of the compressor (10). Further, since the lubricant is supplied to the high- and low-pressure sealing portions and the sliding portions, the operation of the compression mechanism (30) is stabilized, and the reliability of the compressor (10) is improved.

[0092] In addition, in this second embodiment, the communication path (77) communicates with the second surface (58) of the seal recess (56). This makes it easy for the lubricant that has flowed into the seal recess (56) to flow out into the back pressure space (80), and makes it difficult for the lubricant to flow out into the crank chamber (54). The lubricant flows more easily into the low-pressure back pressure space (80) than into the first space (16, 54) as described above. Thus, the lubricant is less likely to flow out of the compressor. As a result, a simple configuration reduces the degree to which the performance and reliability of the scroll compressor (10) deteriorate.

-Variation of second embodiment-

[0093] In the foregoing embodiment, the oil collection path (71) does not have the opening (72a) shown in FIGS. 2 and 4. However, the oil collection path (71) may have both the opening (72a) shown in FIGS. 2 and 4 and the communication path (77) communicating with the seal recess (56).

«Other Embodiments»

[0094] The foregoing embodiments may be modified as follows.

[0095] In the foregoing embodiments, the lubricant that has lubricated the first sliding bearing (61) is supplied to the rolling bearing (62). However, the lubricant to be collected by the oil collection ring (70) after being supplied to the rolling bearing (62) may be oil supplied to the rolling bearing (62) through another path. For example, the main oil supply path (27) may be configured to branch halfway, and the lubricant may be supplied separately to the first sliding bearing (61) and the rolling bearing (62). In this case, the lubricant that has lubricated the rolling bearing may be collected.

[0096] In the foregoing embodiments, the Oldham ring (85) is used as the anti-rotation mechanism (84). However, instead of the Oldham ring (85), an anti-rotation pin or any other similar member may be used.

[0097] In the foregoing embodiments, the housing (50) has the oil discharge passage (90). However, if the amount of the lubricant collected only through the oil collection path (71) is balanced with the amount of the lubricant supplied, the oil discharge passage (90) is not necessarily provided.

[0098] In the first embodiment, the oil collection path (71) opens through the Oldham ring sliding surface (88). However, the oil collection path (71) merely needs to be a space that allows the under-bearing space (53a) to communicate with the back pressure space (80), and does not have to open through the Oldham ring sliding surface (88). Even if the oil collection path (71) is configured to open through the Oldham ring sliding surface (88), the oil collection path (71) is not necessarily positioned so as to be always closed by the Oldham ring (85).

[0099] While the embodiments and variations thereof have been described above, it will be understood that various changes in form and details may be made without departing from the scope of the claims.

INDUSTRIAL APPLICABILITY

[0100] As described above, the present disclosure is useful for a scroll compressor.

DESCRIPTION OF REFERENCE CHARACTERS

[0101]

10	Scroll Compressor
11	Casing
16	Lower Space (First Space)
17	Oil Sump Portion
23	Drive Shaft
25	Eccentric Portion (Crank Pin)
27	Main Oil Supply Path
30	Compression Mechanism
31	Fluid Chamber
31b	Compression Chamber
35	Orbiting Scroll
40	Fixed Scroll
50	Housing (Fixed Member)
54	Crank Chamber (First Space)
55	Sealing Member
56	Seal Recess
57	First Surface
58	Second Surface
61	First Sliding Bearing (Pin Bearing)
62	Rolling Bearing (Upper Bearing (Main Bearing))
70	Oil Collection Ring (Oil Collection Member)
71	Oil Collection Path
72a	Opening
78	First Bearing Oil Supply Path
79	Second Bearing Oil Supply Path
80	Back Pressure Space (Second Space)
84	Anti-rotation Mechanism
85	Oldham Ring

88 Oldham Ring Sliding Surface
90 Oil Discharge Passage

Claims

1. A scroll compressor comprising:

a compression mechanism (30) including: a fixed scroll (40) and an orbiting scroll (35); and a housing (50) to which the fixed scroll (40) is fastened;
a casing (11) having first (16, 54) and second (80) spaces, the first space (16, 54) having a pressure equal to a pressure of a high-pressure fluid discharged from the compression mechanism (30), the second space (80) having a lower pressure than the first space (16, 54);
a drive shaft (23) coupled to the compression mechanism (30);
a rolling bearing (62) configured to support the drive shaft (23) inside the first space (54);
a bearing oil supply path (78, 79) through which a lubricant is supplied to the rolling bearing (62); and
an oil collection member (70) disposed below the rolling bearing (62) inside the first space (54) to collect the lubricant that has lubricated the rolling bearing (62);
characterized in that it further comprises
an oil collection path (71) through which the lubricant is introduced from the oil collection member (70) in the first space (54) into the second space (80), wherein the second space (80) is a back pressure space (80) formed between the fixed scroll (40) and the housing (50).

2. The scroll compressor of claim 1 further comprising:

a pin bearing (61) provided in a coupling portion (38) of the compression mechanism (30) coupled to the drive shaft (23), the pin bearing (61) being configured to support a crank pin (25) of the drive shaft (23); and
a main oil supply path (27) through which the lubricant is supplied to the pin bearing (61), wherein
the bearing oil supply path (78, 79) is a passage through which the lubricant is supplied from the main oil supply path (27) to the rolling bearing (62).

3. The scroll compressor of claim 1 or 2 further comprising:

an oil sump portion (17) formed in a lower space in the casing (11) to store the lubricant, the pressure of the high-pressure fluid acting on the oil sump portion (17); and
an oil discharge passage (90) through which the lubricant having a high pressure and existing in the coupling portion (38) of the compression mechanism (30) coupled to the drive shaft (23) is discharged via the first space (16) in the casing (11) to the oil sump portion (17).

4. The scroll compressor of any one of claims 1 to 3, wherein
the second space (80) is configured as a space (80) in which an anti-rotation mechanism (84) is disposed, the anti-rotation mechanism (84) being configured to prevent an orbiting scroll (35) from rotating on an axis of the orbiting scroll (35) and allow the orbiting scroll (35) to orbit around a fixed scroll (40) of the compression mechanism (30).

5. The scroll compressor of claim 4, wherein

the anti-rotation mechanism (84) includes an Oldham ring (85), and
the oil collection path (71) has an opening (72a) formed through an Oldham ring sliding surface (88) on which the Oldham ring (85) slides.

6. The scroll compressor of claim 5, wherein
the opening (72a) of the oil collection path (71) is formed within a region of the Oldham ring sliding surface (88) where the Oldham ring (85) is movable, and is covered with the Oldham ring (85) in operation.

7. The scroll compressor of claim 1, wherein

the first and second spaces (54) and (80) are formed between a fixed member (50) of the compression mechanism (30) and orbiting and fixed scrolls (35) and (40),
the compression mechanism (30) includes a sealing member (55) separating the first space (54) from the second space (80), and a seal recess (56) housing the sealing member (55), and the oil collection path (71) has a communication path (77) communicating with the seal recess (56).

8. The scroll compressor of claim 7, wherein

the seal recess (56) has a first surface (57) closer to the first space (54) than the sealing member (55) housed therein is, and a second surface (58) closer to the second space (80) than the sealing member (55) is, and
the communication path (77) communicates with the second surface (58) of the seal recess (56).

Patentansprüche

1. Spiralverdichter, umfassend:

einen Verdichtungsmechanismus (30) mit: einer festen Spirale (40) und einer umlaufenden Spirale (35); und einem Gehäuse (50), an dem die feste Spirale (40) befestigt ist;
ein Gehäuse (11) mit ersten (16, 54) und zweiten (80) Räumen, wobei der erste Raum (16, 54) einen Druck aufweist, der gleich einem Druck eines Hochdruckfluids ist, das von dem Verdichtungsmechanismus (30) abgegeben wird, und der zweite Raum (80) einen niedrigeren Druck als der erste Raum (16, 54) aufweist;
eine Antriebswelle (23), die mit dem Verdichtungsmechanismus (30) gekoppelt ist;
ein Wälzlager (62), das so konfiguriert ist, dass es die Antriebswelle (23) innerhalb des ersten Raums (54) trägt;
einen Lagerölzufuhrpfad (78, 79), durch den dem Wälzlager (62) ein Schmiermittel zugeführt wird; und
ein Ölsammelelement (70), das unterhalb des Wälzlagers (62) innerhalb des ersten Raums (54) angeordnet ist, um das Schmiermittel zu sammeln, das das Wälzlager (62) geschmiert hat;
dadurch gekennzeichnet, dass es ferner umfasst
einen Ölsammelpfad (71), durch den das Schmiermittel von dem Ölsammelelement (70) in dem ersten Raum (54) in den zweiten Raum (80) eingeleitet wird, wobei der zweite Raum (80) ein Gegendruckraum (80) ist, der zwischen der festen Spirale (40) und dem Gehäuse (50) ausgebildet ist.

2. Spiralverdichter nach Anspruch 1, ferner umfassend:

ein Stiftlager (61), das in einem Kupplungsabschnitt (38) des mit der Antriebswelle (23) gekoppelten Verdichtungsmechanismus (30) vorgesehen ist, wobei das Stiftlager (61) so konfiguriert ist, dass es einen Kurbelzapfen (25) der Antriebswelle (23) stützt; und
einen Hauptölzufuhrpfad (27), durch den das Schmiermittel dem Stiftlager (61) zugeführt wird, wobei
der Lagerölzufuhrpfad (78, 79) ein Durchgang ist, durch den das Schmiermittel von dem Hauptölzufuhrpfad (27) dem Wälzlager (62) zugeführt wird.

3. Spiralverdichter nach Anspruch 1 oder 2, ferner umfassend:

einen Ölsumpfabschnitt (17), der in einem unteren Raum im Gehäuse (11) ausgebildet ist, um das Schmiermittel zu speichern, wobei der Druck des Hochdruckfluids auf den Ölsumpfabschnitt (17) wirkt; und
einen Ölauslasskanal (90), durch den das Schmiermittel, das einen hohen Druck aufweist und in dem Kupplungsabschnitt (38) des mit der Antriebswelle (23) gekoppelten Verdichtungsmechanismus (30) vorhanden ist, über den ersten Raum (16) in dem Gehäuse (11) zu dem Ölsumpfabschnitt (17) ausgelassen wird.

4. Spiralverdichter nach einem der Ansprüche 1 bis 3, wobei
der zweite Raum (80) als ein Raum (80) konfiguriert ist, in dem ein Anti-Rotations-Mechanismus (84) angeordnet ist, wobei der Anti-Rotations-Mechanismus (84) konfiguriert ist, um zu verhindern, dass sich eine umlaufende Spirale (35) um eine Achse der umlaufenden Spirale (35) dreht, und es der umlaufenden Spirale (35) zu ermöglichen, um eine feste Spirale (40) des Verdichtungsmechanismus (30) zu kreisen.

5. Spiralverdichter nach Anspruch 4, wobei

der Anti-Rotations-Mechanismus (84) einen Oldham-Ring (85) umfasst, und
der Ölsammelpfad (71) eine Öffnung (72a) aufweist, die durch eine Oldham-Ring-Gleitfläche (88) gebildet ist, auf der der Oldham-Ring (85) gleitet.

6. Spiralverdichter nach Anspruch 5, wobei
die Öffnung (72a) des Ölsammelpfads (71) innerhalb eines Bereichs der Oldham-Ring-Gleitfläche (88) ausgebildet ist, in dem der Oldham-Ring (85) beweglich ist, und im Betrieb mit dem Oldham-Ring (85) bedeckt ist.

7. Spiralverdichter nach Anspruch 1, wobei

die ersten und zweiten Räume (54) und (80) zwischen einem festen Element (50) des Verdichtungsmechanismus (30) und den umlaufenden und festen Spiralen (35) und (40) gebildet sind, der Verdichtungsmechanismus (30) ein Dichtungselement (55), das den ersten Raum (54) vom zweiten Raum (80) trennt, und eine Dichtungsaussparung (56) umfasst, die das Dichtungselement (55) aufnimmt, und
der Ölsammelpfad (71) einen Verbindungsweg (77) aufweist, der mit der Dichtungsaussparung (56) in Verbindung steht.

8. Spiralverdichter nach Anspruch 7, wobei

die Dichtungsaussparung (56) eine erste Oberfläche (57), die näher an dem ersten Raum (54) liegt als das darin untergebrachte Dichtungselement (55), und eine zweite Oberfläche (58) aufweist, die näher an dem zweiten Raum (80) liegt als das Dichtungselement (55), und
der Verbindungspfad (77) mit der zweiten Oberfläche (58) der Dichtungsaussparung (56) in Verbindung steht.

Revendications

1. Compresseur à spirales comprenant :

un mécanisme de compression (30) incluant :

une spirale fixe (40) et une spirale orbitale (35) ; et
un logement (50) auquel la spirale fixe (40) est assujettie ;

un boîtier (11) ayant un premier espace (16, 54) et un deuxième espace (80), le premier espace (16, 54) ayant une pression égale à la pression d'un fluide à pression élevée, évacué du mécanisme de compression (30), le deuxième espace (80) ayant une pression plus basse que le premier espace (16, 54) ;
un arbre d'entraînement (23) accouplé au mécanisme de compression (30) ;
un palier à rouleaux (62) configuré pour soutenir l'arbre d'entraînement (23) à l'intérieur du premier espace (54) ;
un trajet d'alimentation en huile pour palier (78, 79) à travers lequel un lubrifiant est amené au palier à rouleaux (62) ; et
un élément de collecte d'huile (70) disposé audessous du palier à rouleaux (62) à l'intérieur du premier espace (54) pour collecter le lubrifiant qui a lubrifié le palier à rouleaux (62) ;
caractérisé en ce qu'il comprend en outre
un trajet de collecte d'huile (71) à travers lequel le lubrifiant est introduit depuis l'élément de collecte d'huile (70) du premier espace (54) dans le deuxième espace (80),
dans lequel le deuxième espace (80) est un espace de contre-pression (80) formé entre la spirale fixe (40) et le logement (50).

2. Compresseur à spirales selon la revendication 1, comprenant en outre :

un palier de tourillon (61) fourni dans une partie accouplement (38) du mécanisme de compression (30) accouplé à l'arbre d'entraînement (23), le palier de tourillon (61) étant configuré pour soutenir un tourillon de vilebrequin (25) de l'arbre d'entraînement (23) ; et
un trajet d'alimentation en huile principal (27) à travers lequel le lubrifiant est amené au palier de tourillon (61), dans lequel
le trajet d'alimentation en huile pour palier (78, 79) est un passage à travers lequel le lubrifiant est amené du trajet d'alimentation en huile principal (27) au palier à rouleaux (62).

3. Compresseur à spirales selon la revendication 1 ou 2, comprenant en outre :

une partie carter d'huile (17) formée dans un espace plus bas dans le boîtier (11) pour stocker le lubrifiant, la pression du fluide à pression élevée agissant sur la partie carter d'huile (17) ; et
un passage d'évacuation d'huile (90) à travers lequel le lubrifiant ayant une pression élevée et existant dans la partie accouplement (38) du mécanisme de compression (30) accouplé à l'arbre d'entraînement (23) est évacué via le premier espace (16) dans le boîtier (11) vers la partie carter d'huile (17).

4. Compresseur à spirales selon l'une quelconque des revendications 1 à 3, dans lequel
le deuxième espace (80) est configuré comme un espace (80) dans lequel un mécanisme anti-rotation (84) est disposé, le mécanisme anti-rotation (84) étant configuré pour empêcher une spirale orbitale (35) de tourner sur un axe de la spirale orbitale (35) et pour permettre à la spirale orbitale (35) d'orbiter autour d'une spirale fixe (40) du mécanisme de compression (30).

5. Compresseur à spirales selon la revendication 4, dans lequel

le mécanisme anti-rotation (84) inclut une bague d'Oldham (85), et
le trajet de collecte d'huile (71) a une ouverture (72a) formée à travers une surface de glissement de bague d'Oldham (88) sur laquelle glisse la bague d'Oldham (85).

6. Compresseur à spirales selon la revendication 5, dans lequel
l'ouverture (72a) du trajet de collecte d'huile (71) est formée dans une région de la surface de glissement de bague d'Oldham (88) où la bague d'Oldham (85) est mobile, et est couverte par la bague d'Oldham (85) lors de l'utilisation.

7. Compresseur à spirales selon la revendication 1, dans lequel

les premier et deuxième espaces (54) et (80) sont formés entre un élément fixe (50) du mé-

canisme de compression (30) et les spirales orbitale et fixe (35) et (40),
le mécanisme de compression (30) inclut un élément d'étanchéité (55) séparant le premier espace (54) du deuxième espace (80), et un renfoncement d'étanchéité (56) abritant l'élément d'étanchéité (55), et
le trajet de collecte d'huile (71) a un trajet de communication (77) communiquant avec le renfoncement d'étanchéité (56).

8. Compresseur à spirales selon la revendication 7, dans lequel

le renfoncement d'étanchéité (56) a une première surface (57) plus proche du premier espace (54) que l'élément d'étanchéité (55) y étant abrité, et une deuxième surface (58) plus proche du deuxième espace (80) que ne l'est l'élément d'étanchéité (55), et
le trajet de communication (77) communique avec la deuxième surface (58) du renfoncement d'étanchéité (56).

FIG.1

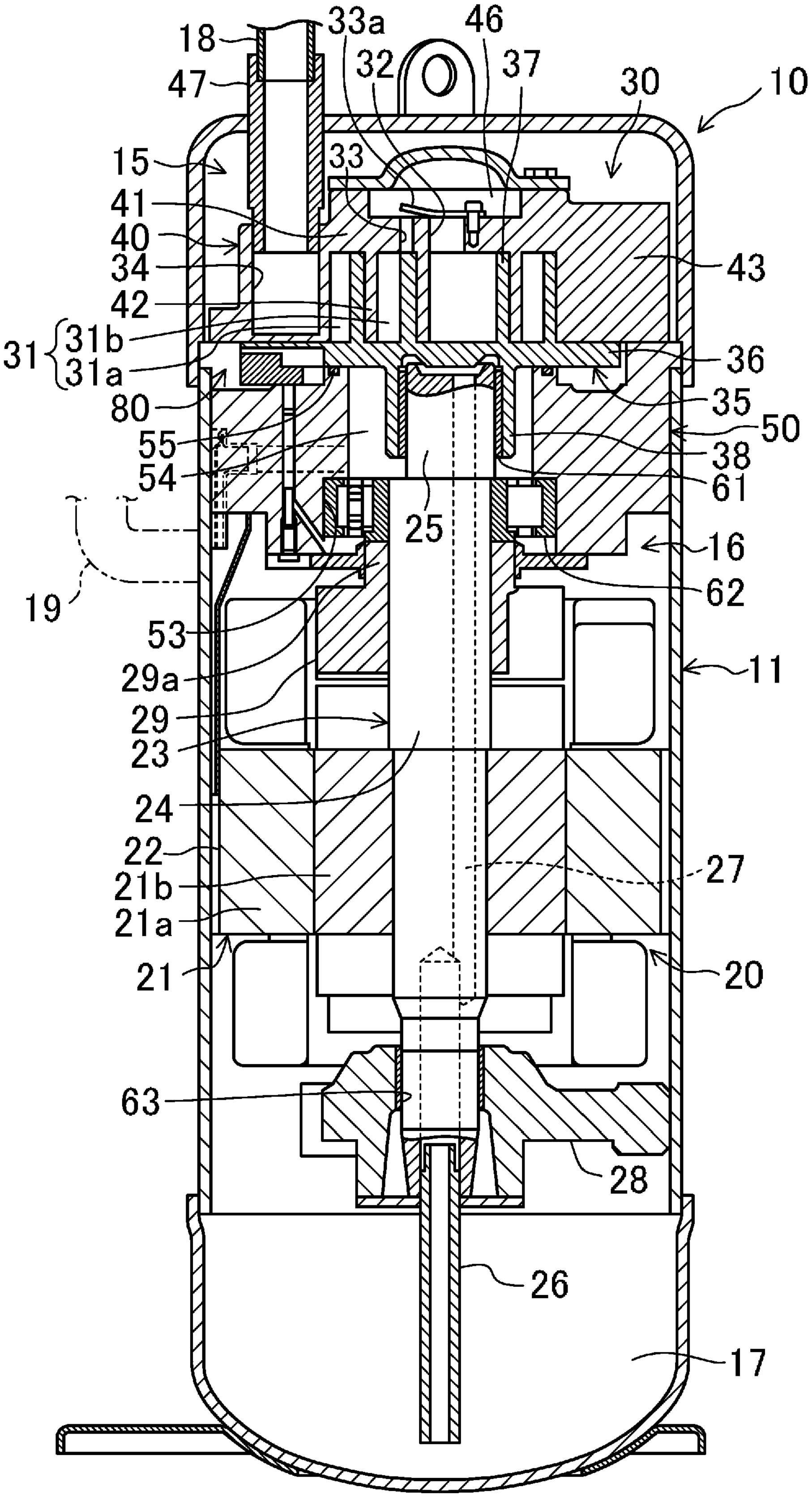
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FIG.2

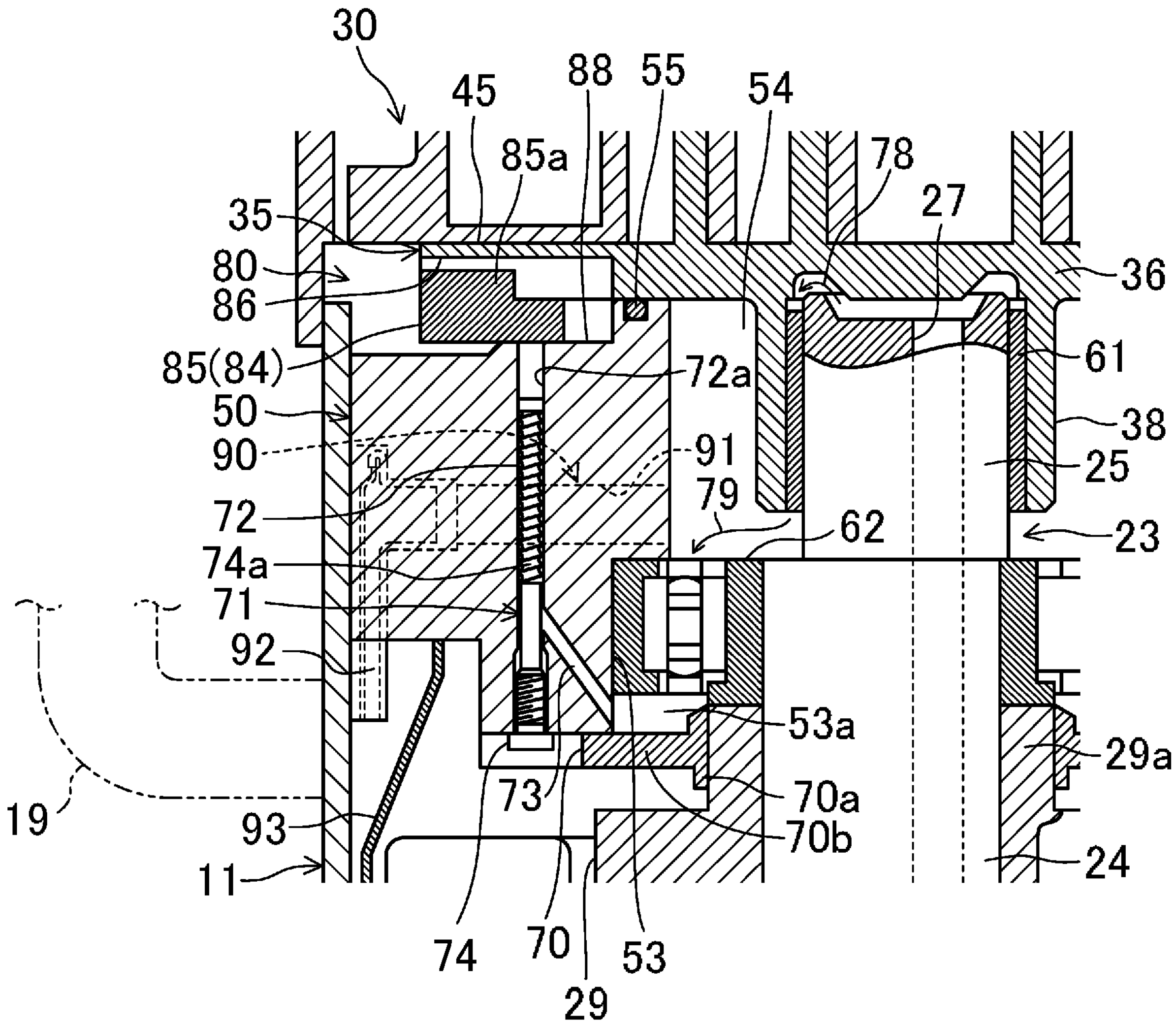
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FIG.3

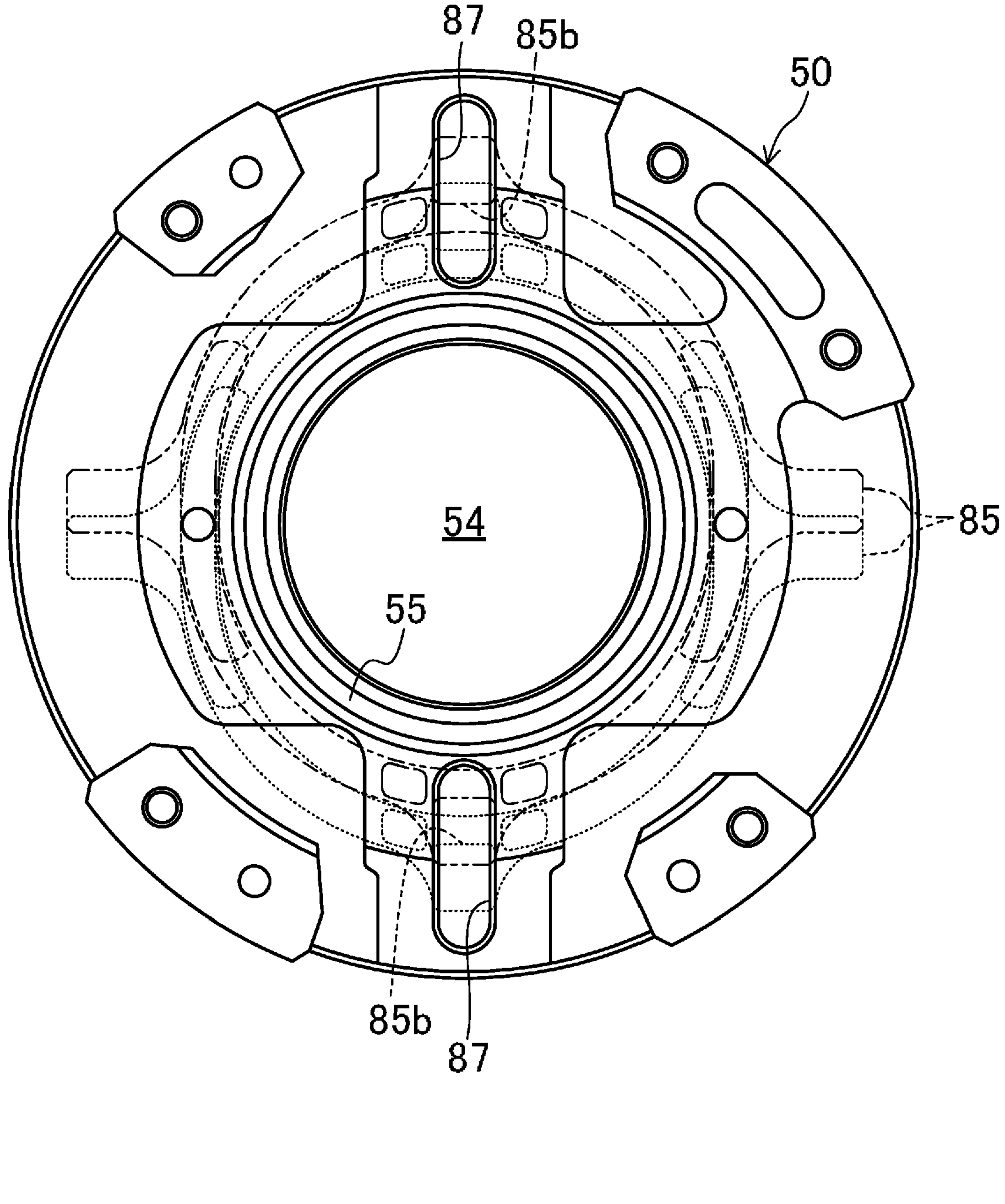

FIG.4

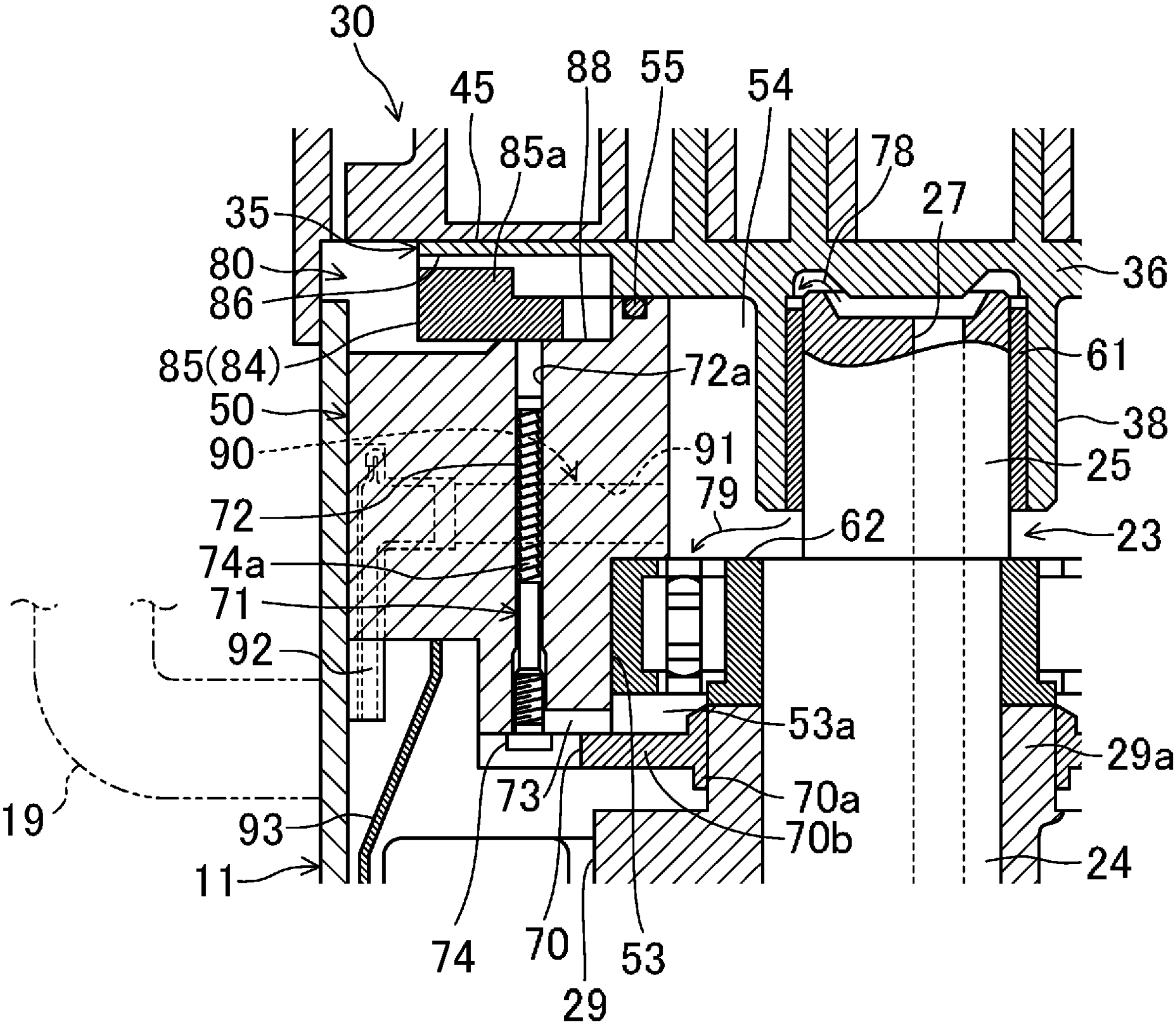
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FIG.5

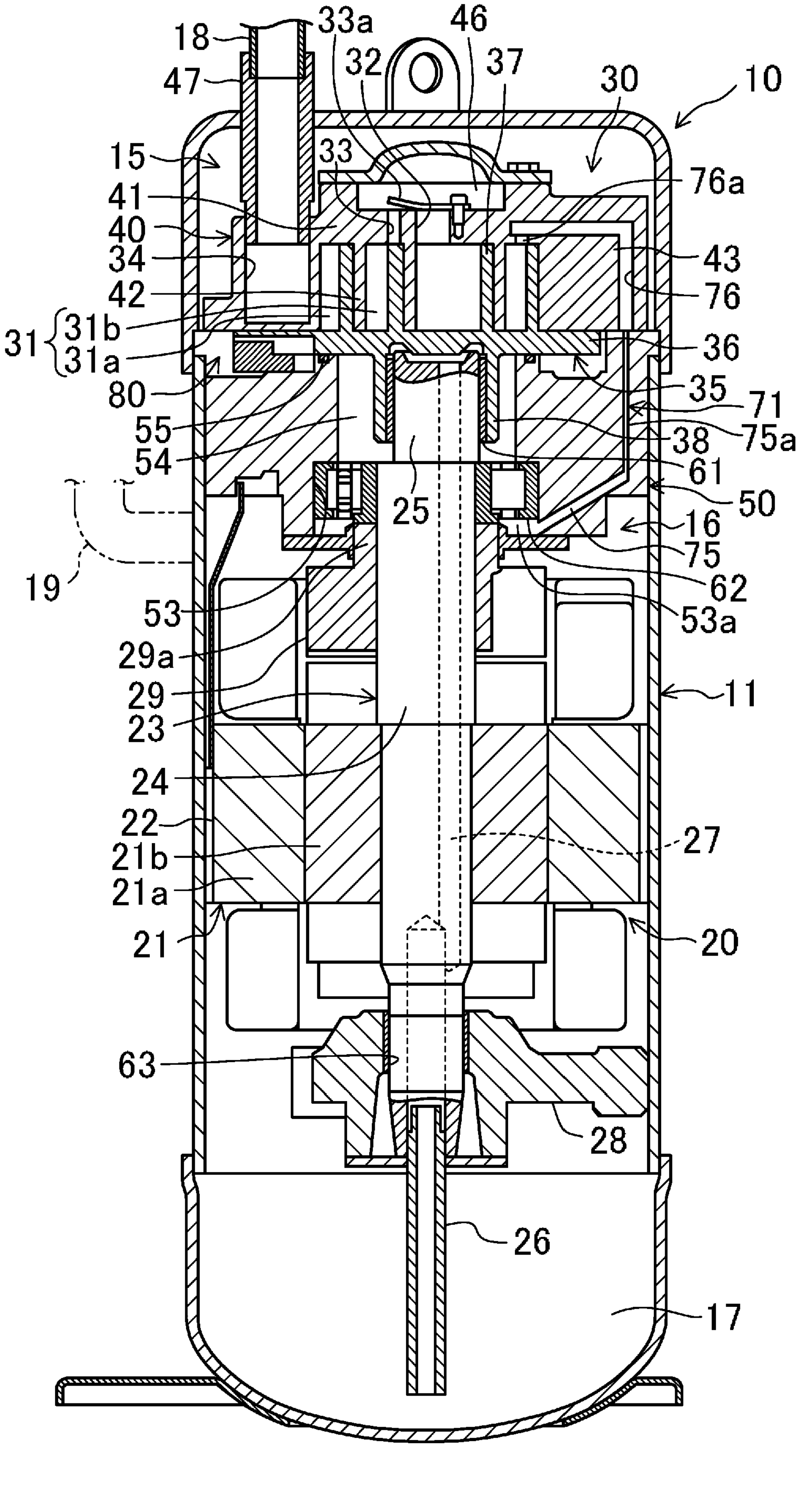
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FIG.6

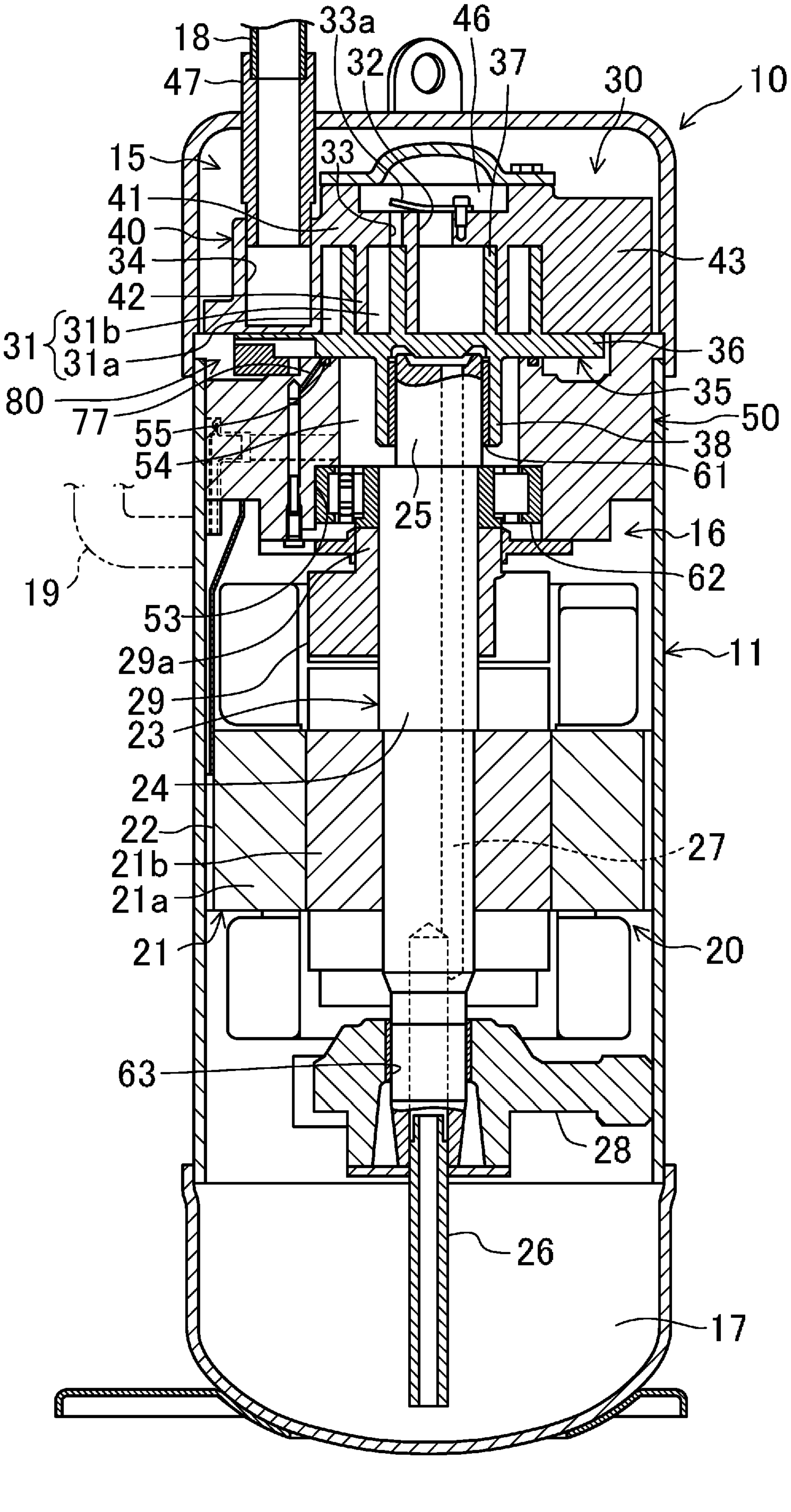
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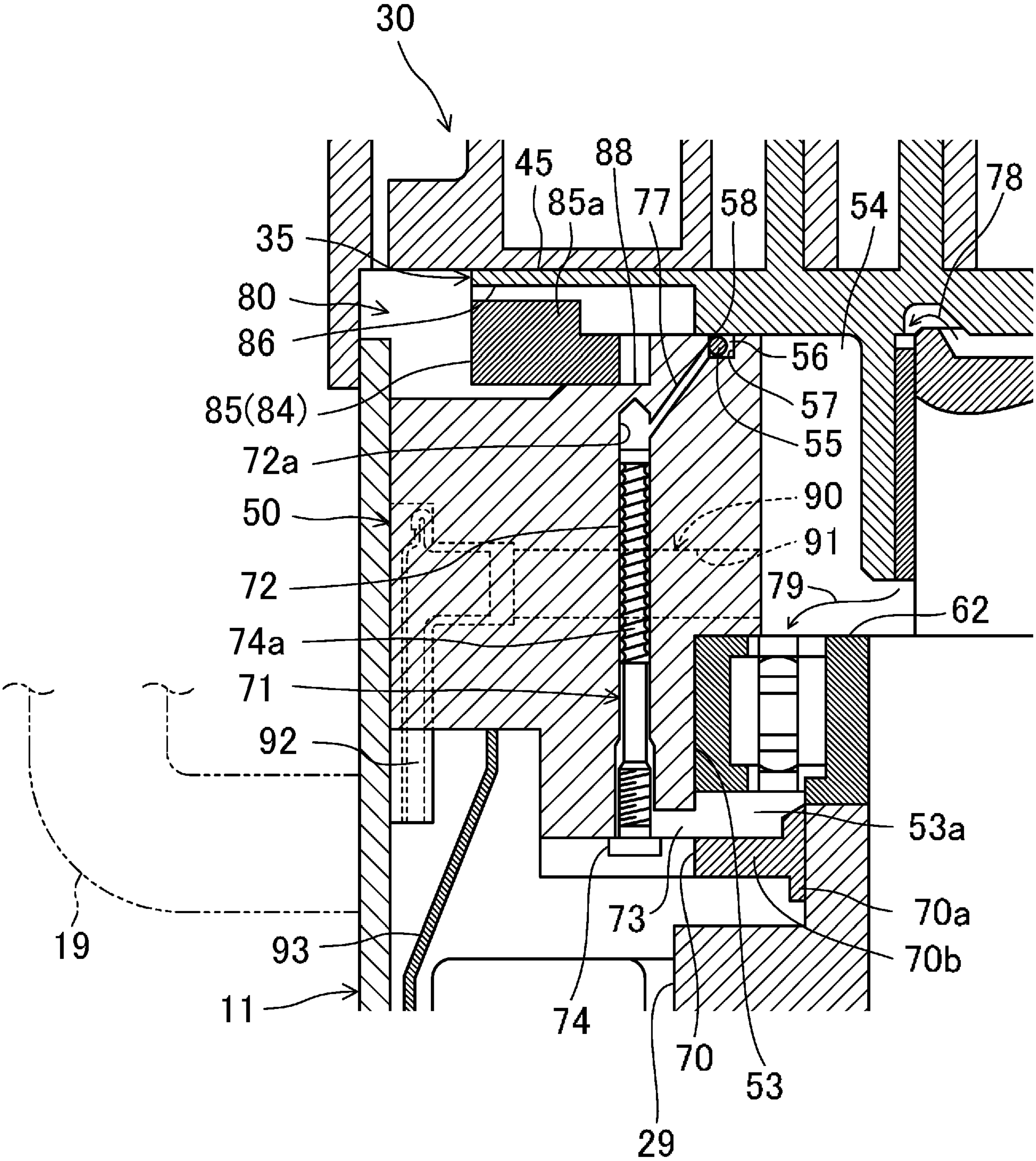
FIG.7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REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

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- JP 2017223150 A **[0004]**