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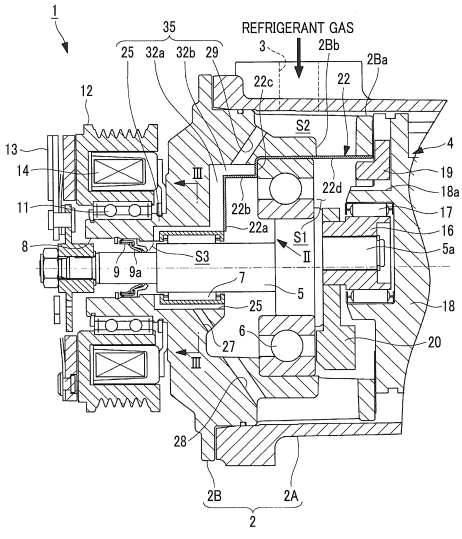
(54) OPEN-TYPE REFRIGERANT COMPRESSOR

(57) An open-type refrigerant compressor (1) equipped with: a housing (2); an intake port (3); a compression mechanism (4) that compresses a refrigerant gas containing lubricating oil in the interior of the housing (2); a drive shaft (5) for driving the compression mechanism; a seal member (9) that is provided in a shaft hole (8) through which the drive shaft (5) protrudes to the outside from the housing (2), and that prevents refrigerant gas from leaking to the outside from the interior of the housing (2); a refrigerant supply passage (35) connecting the interior of the housing (2) and the seal member (9); and a refrigerant gas distribution unit (22) that distributes refrigerant gas, which has been introduced into the interior of the housing (2) from the intake port (3), to the refrigerant supply passage (35) side and the compression mechanism (4) side. The refrigerant gas distribution ratio of the refrigerant gas distributed by the refrigerant gas distribution unit (22) is set such that the amount distributed to the refrigerant supply passage (35) side is greater than the amount distributed to the compression mechanism (4) side.

FIG. 1



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Description

Technical Field

[0001] The present invention relates to an open-type refrigerant compressor which compresses a refrigerant gas, and more specifically, relates to an open-type refrigerant compressor which prevents wear of a seal member provided in a portion where a drive shaft protrudes from a housing.

Background Art

[0002] In a refrigerant compressor (compressor) which compresses refrigerant gas in a car air conditioner or the like, a compression mechanism is accommodated inside a housing formed of an aluminum alloy or the like, a drive shaft driving the compression mechanism protrudes from one side of the housing, and a pulley having an electromagnetic clutch provided on the protrusion portion is driven by an engine or the like via a belt. In the refrigerant compressor, a shaft hole through which the drive shaft protrudes is formed in the housing, and thus, the refrigerant compressor is referred to as an open-type refrigerant compressor. Meanwhile, a refrigerant compressor in which a compression mechanism and a drive motor are housed inside a sealed pressure container is referred to as a closed-type refrigerant compressor.

[0003] In the open-type refrigerant compressor, a lip seal (an oil seal having a lip) is provided in the protrusion portion of the drive shaft, that is, the shaft hole of the housing, and thus, a refrigerant gas inside the housing is prevented from leaking to the outside. The lip seal is lubricated by a lubricant mixed with the refrigerant gas. However, it is considered that oil supplied to the lip seal is insufficient at a low load operation where a circulation amount of the refrigerant gas decreases or the like. In this case, a tip end of the lip wears, and there is a concern that the refrigerant gas and the oil leak.

[0004] In order to solve the concern, for example, PTL 1 discloses an open-type refrigerant compressor in which a guide groove or a communication hole communicating with a lip seal and a bearing member around the lip seal is formed on an inner wall surface of a housing, and a refrigerant gas and a lubricant flowing through an inside of the housing are supplied to the lip seal and the bearing member via the oil passage during an operation.

Citation List

Patent Literature

[0005] [PTL 1] Japanese Unexamined Patent Application Publication No. 2005-23849

Summary of Invention

Technical Problem

[0006] However, in the related art, as described above, it is not known how much the refrigerant gas and lubricant flowing through the inside of the housing are supplied to the lip seal, and for example, there is a possibility that the lip seal wears due to a temporary lack of the lubricant.

[0007] The present invention is made in order to solve the problems, and an object thereof is to provide an open-type refrigerant compressor capable of reliably lubricating the seal member provided in a portion where the drive shaft protrudes from the housing by the lubricant contained in the refrigerant gas and preventing wear of the seal member. Solution to Problem

[0008] According to aspect of the present invention, there is provided an open-type refrigerant compressor including: a housing; a suction port which is formed in the housing; a compression mechanism which is provided inside the housing and compresses a refrigerant gas containing a lubricant; a drive shaft which drives the compression mechanism; a seal member which is provided in a shaft hole through which the drive shaft protrudes from the housing to an outside so as to prevent the refrigerant gas from leaking from an inside of the housing to the outside thereof; a refrigerant supply passage which is continuous from the inside of the housing to the seal member; and a refrigerant gas distribution portion which distributes the refrigerant gas introduced from the suction port to the inside of the housing to the refrigerant supply passage side and the compression mechanism side, in which a distribution ratio of the refrigerant gas distributed by the refrigerant gas distribution portion is set such that an amount distributed to the refrigerant supply passage side is greater than an amount distributed to the compression mechanism side.

[0009] According to the open-type refrigerant compressor having the above-described configuration, the refrigerant gas introduced from the suction port to the inside of the housing is distributed to the refrigerant supply passage side and the compression mechanism side by the refrigerant gas distribution portion. The refrigerant gas distributed to the refrigerant supply passage side flows to the seal member, and the seal member is lubricated by the lubricant contained in the refrigerant gas. Meanwhile, the refrigerant gas distributed to the compression mechanism side is compressed by the compression mechanism, becomes a compressed refrigerant gas, and is discharged from the discharge port formed in the housing.

[0010] The distribution ratio of the refrigerant gas by the refrigerant gas distribution portion is set such that the distribution amount to the refrigerant supply passage side is greater than the distribution amount to the compression mechanism side, and thus, a sufficient amount of refrigerant gas can be supplied to the seal member. Accordingly, the seal member is preferentially lubricated by the

lubricant contained in the refrigerant gas, a lubrication state of the seal member is improved, and thus, it is possible to prevent wear of the seal member. Thereafter, the refrigerant gas supplied to the seal member flows to the compression mechanism side, lubricates other mechanisms or the like, and is compressed by the compression mechanism so as to be a compressed refrigerant gas.

[0011] In the open-type refrigerant compressor having the above-described configuration, the distribution ratio of the refrigerant gas distributed by the refrigerant gas distribution portion may be set such that an entire amount of the refrigerant gas introduced from the suction port to the inside of the housing flows to the refrigerant supply passage side. Accordingly, the entire amount of the refrigerant gas sucked from the suction port initially flows to the seal member, and thus, the amount of the lubricant supplied to the seal member becomes the maximum amount. Therefore, a lubrication state of the seal member is maximally improved.

[0012] In the open-type refrigerant compressor having the above-described configuration, the refrigerant gas distribution portion may be attached to the inside of the housing as a separate part. Accordingly, it is possible to freely set the distribution amount of the refrigerant gas by appropriately setting the shape of the refrigerant gas distribution portion.

[0013] In the open-type refrigerant compressor having the above-described configuration, at least a portion of the refrigerant supply passage may be formed by covering a refrigerant supply groove formed on an inner surface of the housing with the refrigerant gas distribution portion. Accordingly, the shape of the refrigerant gas distribution portion may have any shape as long as it has a shape capable of covering the refrigerant supply groove formed on the inner surface of the housing, and thus, it is possible to simplify the shape of the refrigerant gas distribution portion.

[0014] In the open-type refrigerant compressor having the above-described configuration, a terminal portion of the refrigerant supply passage may communicate with a seal space which is formed between the seal member and a bearing member disposed inside the seal member. Accordingly, the refrigerant gas supplied to the seal space passes through a gap with the bearing member and flows to compression mechanism side, and thus, the bearing member can be favorably lubricated, and even when the amount of the refrigerant supplied to the seal member is excessive, it is possible to prevent a pressure of the refrigerant gas applied to the seal member from excessively increasing, and it is possible to prevent the refrigerant from leaking to the outside.

[0015] In the open-type refrigerant compressor having the above-described configuration, a refrigerant discharge passage through which the refrigerant gas is introduced from the seal member to the compression mechanism side may be provided. Accordingly, the refrigerant gas and the lubricant supplied to the seal member are introduced to the compression mechanism side by the refrigerant discharge passage so as to form steady flows of the refrigerant gas and the lubricant, and thus, it is possible to favorably lubricate the respective portions of the open-type refrigerant compressor.

Advantageous Effects of Invention

[0016] As described above, according to the open-type refrigerant compressor of the present invention, a seal member provided in a portion where a drive shaft protrudes from a housing can be reliably lubricated by a lubricant contained in a refrigerant gas, and it is possible to prevent wear of the seal member.

Brief Description of Drawings

[0017]

Fig. 1 is a partially longitudinal sectional view of an open-type compressor showing an embodiment of the present invention.

Fig. 2 is an exploded perspective view showing a refrigerant gas distribution portion when viewed from an arrow II in Fig. 1.

Fig. 3 is a longitudinal sectional view in the vicinity of a sub bearing taken along line III-III in Fig. 1.

Description of Embodiments

[0018] Hereinafter, an embodiment of the present invention will be described with reference to Figs. 1 to 3.

[0019] Fig. 1 is a partially longitudinal sectional view of an open-type scroll compressor (open-type refrigerant compressor) showing an embodiment of the present invention. For example, an open-type scroll compressor 1 according to the present embodiment is used for a car air conditioner which is installed in an engine room of an automobile, is driven by engine power, and is configured to compress a refrigerant gas. However, the present invention is not limited to this, and the present invention may be applied to an open-type compressor used for living space air conditioning, a refrigeration system, a heat pump type hot water supply system, or the like.

[0020] The open-type scroll compressor 1 includes an approximately cylindrical housing 2 formed of an aluminum alloy or the like. The housing 2 includes a housing main body 2A constituting a main body, and a housing cover 2B which is fixed by a bolt or the like so as to airtightly close an opening portion provided on one end of the housing main body 2A. The other end (not shown) of the housing main body 2A is closed.

[0021] A scroll compression mechanism 4 (compression mechanism) and a drive shaft 5 are accommodated in an internal space S1 of the housing 2. A suction port 3 through which a refrigerant gas before being compressed is sucked and a discharge port (not shown) through which the refrigerant gas compressed by the scroll compression mechanism 4 is discharged are pro-

vided on an outer peripheral surface of the housing 2.

[0022] A drive shaft 5 is rotatably supported by the housing cover 2B via a main bearing 6 and a sub bearing 7 (bearing member). For example, a single row deep groove ball bearing is used as the main bearing 6 and a needle bearing is used as the sub bearing 7. One end of the drive shaft 5 protrudes to the outside through a shaft hole 8 which is formed in the housing cover 2B. The sub bearing 7 is press-fitted to the inside of the shaft hole 8, and a lip seal 9 (seal member) is press-fitted to the outer side of the sub bearing 7. The lip seal 9 is inclined toward the sub bearing 7 and includes a lip 9a lightly pressed against an outer peripheral surface of the drive shaft 5.

[0023] A pulley 12 is rotatably installed on a tip outer peripheral portion of the housing cover 2B via a pulley bearing 11, and a belt (not shown) is wound between the pulley 12 and a drive pulley provided in a driving source such as an engine (not shown). A clutch plate 13 fixed to a tip end portion of the drive shaft 5 faces an outer end surface of the pulley 12 to be close to the outer end surface, and if an electromagnetic clutch 14 fixed to the housing cover 2B so as to be positioned inside the pulley 12 is excited, the clutch plate 13 is pulled toward the pulley 12 side to frictionally engage with the outer end surface of the pulley 12, a rotation of the pulley 12 is transmitted to the drive shaft 5, and the drive shaft 5 rotates.

[0024] A crank pin 5a which is eccentric by a predetermined dimension with respect to a center axis of the drive shaft 5 is integrally formed on a rear end of the drive shaft 5, and the crank pin 5a is fitted to a boss 18a, which is formed on a rear surface of an orbiting scroll 18 of the scroll compression mechanism 4, via a drive bush 16 and a drive bearing 17.

[0025] The scroll compression mechanism 4 has a known configuration in which the orbiting scroll 18 and a fixed scroll (not shown) engage with each other to be shifted by a phase of 180°, and if the drive shaft 5 rotates, the orbiting scroll 18 is driven so as to revolve with respect to the fixed scroll by an operation of a rotation prevention mechanism 19, a pair of compression chambers (not shown) formed between both scrolls is moved from an outer peripheral position to a center position, and thus, a volume gradually decreases.

[0026] Accordingly, the refrigerant gas sucked from the suction port 3 into the internal space S1 of the housing 2 is sucked and compressed by the scroll compression mechanism 4, is discharged from the discharge port, and is supplied to a condenser (not shown) or the like. A member 20 is a balancer weight.

[0027] The refrigerant gas contains a lubricant (refrigerating machine oil) at a predetermined ratio, and respective internal mechanism portions such as the main bearing 6, the sub bearing 7, the lip seal 9, the crank pin 5a, the drive bush 16, the drive bearing 17, the rotation prevention mechanism 19, or the scroll compression mechanism 4 is lubricated by a mist of the lubricant. The lip seal 9 is a seal member which prevents the refrigerant gas and the lubricant from leaking from the inside of the housing 2 to the outside thereof, and the lip 9a is lubricated by oil contained in the refrigerant gas so as to prevent wear of the lip 9a. However, at the time of a low load operation in which a circulation amount of the refrigerant gas decreases or the like, there is a concern that the oil supplied to the lip seal 9 is insufficient and a tip of the lip 9a wears.

[0028] In order to prevent the wear of the lip seal 9, the open-type scroll compressor 1 is configured such that the refrigerant gas sucked from the suction port 3 preferentially flows to the lip seal 9 side rather than to the internal space S1 side of housing 2. This configured is as follows.

[0029] A refrigerant introduction space S2 is defined inside the suction port 3. The refrigerant introduction space S2 is formed as a room having a predetermined volume (approximately several cubic centimeters) by closing a bottom portion of a refrigerant passage hole 2Bb (existing hole in the related art) penetrating an insertion flange 2Ba of the housing cover 2B inserted into the opening portion of the housing main body 2A using a partition plate 22 (refrigerant gas distribution portion) shown in Fig. 2. In addition, for example, the suction port 3 and the refrigerant introduction space S2 are positioned on a top portion of the housing 2. In the related art, the partition plate 22 does not exist, and thus, the suction port 3 communicates with the internal space S1 as it is via the refrigerant passage hole 2Bb.

[0030] As shown in Fig. 2, the partition plate 22 is attached to the inside of the housing 2 (2B) by two bolts 23 as separate parts. For example, the partition plate 22 has a shape formed by bending a sheet metal material in a stepwise manner, and as shown in Figs. 1 and 2, includes, in order from a center side of the housing 2, a first vertical surface 22a, a first horizontal surface 22b, a second vertical surface 22c, and a second horizontal surface 22d. The second horizontal surface 22d is a surface which is a bottom portion of the refrigerant introduction space S2, and bolt holes 22e are drilled on both horizontal end portions of the first vertical surface 22a.

[0031] As shown in Figs. 1 and 3, for example, four refrigerant guide grooves 25 are formed on an inner peripheral surface of the shaft hole 8, to which the sub bearing 7 is press-fitted, at regular intervals in a circumferential direction. For example, the refrigerant guide grooves 25 are respectively disposed at 12 o'clock, 3 o'clock, 6 o'clock, 9 o'clock positions (see Fig. 3) in a dial of a timepiece, tips of the refrigerant guide grooves 25 communicate with a seal space S3 formed between the lip seal 9 and the sub bearing 7, and rear ends thereof communicate with the internal space S1 of the housing 2. As shown in Fig. 3, the sub bearing 7 includes an outer ring member 7a, an inner ring member 7b, a plurality of roller-shaped rolling members 7c disposed between the inner and outer ring members 7a and 7b, and a retainer 7d which holds the plurality of rolling members 7c at regular intervals. In the outer ring member 7a, oil supply holes 7e are formed

at positions aligned with the refrigerant guide grooves 25.

[0032] In addition, as shown in Figs. 1 and 3, refrigerant discharge passages 27 which extends in a radial direction from an axial line of the drive shaft 5 and communicate with the internal space S1 of the housing 2 are formed from the refrigerant guide grooves 25 positioned at the 3 o'clock, 6 o'clock, and 9 o'clock positions. In addition, three refrigerant discharge passages 28 penetrating the insertion flange 2Ba of the housing cover 2B are formed in accordance with the positions of the three refrigerant discharge passage 27. As described below, the refrigerant discharge passages 27 and 28 are passages through which the refrigerant gas supplied to the lip seal 9 is introduced to the scroll compression mechanism 4 side.

[0033] As shown in Fig. 2, when viewed from the inside of the housing 2 (2B), a cladding portion 31 having a height of several millimeters is formed on an upper inner wall surface of a portion where the shaft hole 8 is open toward the internal space S1 side, a refrigerant supply groove 32a extending in a vertical direction shown in Fig. 1 is formed at a center portion of the cladding portion 31 in a width direction, and bolt holes 33 are formed on both sides of the refrigerant supply groove 32a. It is not essential to form the cladding portion 31, and the cladding portion 31 may be omitted as long as the refrigerant supply groove 32a can be formed. In addition, a refrigerant supply groove 32b which extends horizontally from an upper end portion of the refrigerant supply groove 32a toward the main bearing 6 side is formed (refer to Figs. 1 and 2). One refrigerant guide passage 29 which is formed similarly to the above-described three refrigerant discharge passages 28 communicates with the refrigerant supply groove 32b, and the other end of the refrigerant guide passage 29 communicates with the refrigerant introduction space S2.

[0034] In the partition plate 22, the first vertical surface 22a abuts against the cladding portion 31 and is fastened to the bolt holes 33 by two bolts 23. Accordingly, as described above, the bottom portion of the refrigerant introduction space S2 is closed by the second horizontal surface 22d of the partition plate 22. In addition, the refrigerant supply grooves 32a and 32b are respectively covered with the first vertical surface 22a and the first horizontal surface 22b of the partition plate 22, and the refrigerant supply grooves 32a and 32b are passages which are separated from the internal space S1, respectively. In addition, in Fig. 1, the second horizontal surface 22d of the partition plate 22 is interposed between the outer peripheral surface of the main bearing 6 and the housing cover 2B. However, the partition plate 22 may be divided into two portions with the main bearing 6 as a boundary, and the divided portions may be individually fixed to the inner surface of the housing 2.

[0035] The refrigerant supply passage 35 which is continuous from the refrigerant introduction space S2 to the lip seal 9 is formed by the uppermost refrigerant guide groove 25 (positioned at the 12 o'clock position shown in Fig. 3), the refrigerant supply groove 32a, the refrigerant supply groove 32b, and the refrigerant guide passage 29. A terminal portion of the refrigerant supply passage 35 is the refrigerant guide groove 25 which is formed on the inner peripheral surface of the shaft hole 8, and thus, the terminal portion communicates with the seal space S3 between the lip seal 9 and the sub bearing 7. In addition, the partition plate 22 functions as a refrigerant gas distribution portion which distributes the refrigerant gas introduced from the suction port 3 into the refrigerant introduction space S2 to the refrigerant supply passage 35 side and the scroll compression mechanism 4 side.

[0036] In the present embodiment, a distribution ratio of the refrigerant gas distributed by the partition plate 22 is set such that an amount of the refrigerant gas distributed to the refrigerant supply passage 35 side is significantly greater than an amount of the refrigerant gas distributed to the scroll compression mechanism 4 side. That is, a shape of the partition plate 22 is determined such that a flow resistance of the refrigerant gas from the refrigerant introduction space S2 to the refrigerant supply passage 35 side is significantly smaller than a flow resistance of the refrigerant gas from the refrigerant introduction space S2 to the scroll compression mechanism 4 side.

[0037] For example, in the present embodiment, the bottom portion of the refrigerant introduction space S2 is completely closed by the second horizontal surface 22d of the partition plate 22, and thus, the distribution ratio of the refrigerant gas is set such that substantially the entire amount of the refrigerant gas introduced into the refrigerant introduction space S2 flows to the refrigerant supply passage 35 side. However, in actual, no sealing means is provided between the respective surfaces 22a to 22d of the partition plate 22 and the refrigerant introduction space S2 (housing cover 2B), there is a gap between the two sides 22 and 2B, and thus, a small amount of the refrigerant gas flowing into the refrigerant introduction space S2 leaks from the gap to the scroll compression mechanism 4 side (internal space S1 side).

[0038] In the open-type scroll compressor 1 configured as described above, if the drive shaft 5 rotates, the scroll compression mechanism 4 sucks the refrigerant gas, and thus, a negative pressure is generated in the internal space S1 of the housing 2, and the refrigerant gas is introduced from the suction port 3 to the refrigerant introduction space S2 by the negative pressure. The introduced refrigerant gas is distributed into the refrigerant supply passage 35 side and the scroll compression mechanism 4 side (internal space S1 side) by the partition plate 22. However, the present embodiment is set such that substantially the entire amount of the refrigerant gas introduced into the refrigerant introduction space S2 is distributed to the refrigerant supply passage 35 side.

[0039] That is, the refrigerant gas distributed from the refrigerant introduction space S2 to the refrigerant supply passage 35 side flows from the refrigerant guide passage 29 which is a starting point of the refrigerant supply pas-

sage 35, flows to the seal space S3 via the refrigerant supply grooves 32 and 32b and the upper refrigerant guide groove 25 (the refrigerant guide groove 25 positioned at the 12 o'clock position shown in Fig. 3) which is the terminal portion of the refrigerant supply passage 35, and lubricates the lip seal 9 and the sub bearing 7 by a misty lubricant contained in the refrigerant gas. When the refrigerant gas passes through the upper refrigerant guide groove 25, the refrigerant gas flows to the inside of the sub bearing 7 from the oil supply holes 7e formed on the outer ring member 7a of the sub bearing 7 to lubricate the sub bearing 7.

[0040] The refrigerant gas (lubricant) which has lubricated the sub bearing 7 is discharged to the internal space S1 side through the refrigerant guide grooves 25 positioned at the 3 o'clock, 6 o'clock, 9 o'clock positions shown in Fig. 3, the three refrigerant discharge passage 27 extending from the three refrigerant guide grooves 25, and the refrigerant discharge passages 28 aligned therewith, and joins with the refrigerant gas which has passed through the gap between the refrigerant introduction space S2 and the partition plate 22. After the refrigerant gas passes through the main bearing 6 and lubricates the main bearing, the refrigerant gas is supplied to the crank pin 5a, the drive bush 16, the drive bearing 17, the rotation prevention mechanism 19, the scroll compression mechanism 4, or the like so as to lubricate these. Thereafter, the refrigerant gas is sucked into the scroll compression mechanism 4 so as to be compressed, becomes a compressed refrigerant gas, and is discharged from the discharge port formed in the housing 2 so as to be supplied to a demand unit such as a condenser.

[0041] In this case, the distribution amount of the refrigerant gas flowing from the refrigerant introduction space S2 to the refrigerant supply passage 35 side is set to be greater than the distribution amount of the refrigerant gas flowing from the refrigerant introduction space S2 to the scroll compression mechanism 4 side (internal space S1) by the partition plate 22, and thus, a sufficient amount of refrigerant gas can be supplied to the lip seal 9. Accordingly, even at the time of the low load operation in which the circulation amount of the refrigerant gas decreases, the lip seal 9 is preferentially lubricated by the lubricant contained in the refrigerant gas, a lubrication state of the lip seal 9 is improved, and thus, it is possible to prevent wear of the lip 9a.

[0042] In the present embodiment, the distribution ratio of the refrigerant gas by the partition plate 22 is set such that substantially the entire amount of the refrigerant gas introduced into the refrigerant introduction space S2 flows to the refrigerant supply passage 35 side, substantially the entire amount of the refrigerant gas sucked from the suction port 3 initially flows to the lip seal 9. Accordingly, the amount of the lubricant supplied to the lip seal 9 becomes the maximum amount, the lubrication state of the lip seal 9 is maximally improved, and it is possible to prevent the wear of the lip 9a.

[0043] The partition plate 22 is attached to the inside of the housing 2 as a separate part, and thus, it is possible to freely set the distribution amount of the refrigerant gas by appropriately setting the shape of the partition plate. For example, it is possible to easily change the refrigerant gas distribution ratio by drilling a hole in the second horizontal surface 22d or the like of the partition plate 22 or bending (deforming) the partition plate 22 (22a to 22d) so as to widen a gap between the partition plate 22 and the refrigerant introduction space S2 or the housing cover 2B (cladding portion 31).

[0044] A portion of the refrigerant supply passage 35 is formed by covering the refrigerant supply grooves 32a and 32b formed on the inner surface of the housing 2 with the first vertical surface 22a and the first horizontal surface 22b of the partition plate 22. According to this configuration, the shape of the partition plate 22 may have any shape as long as it has a flat shape capable of covering the refrigerant supply grooves 32a and 32b, and thus, it is possible to simplify the shape of the partition plate 22. In addition, in the present embodiment, the partition plate 22 is formed of a sheet metal material, respective surfaces 22a to 22d have flat shapes so as to be simplified, and the partition plate 22 is easily manufactured.

[0045] The refrigerant guide groove 25 which is the terminal portion of the refrigerant supply passage 35 communicates with the seal space S3 which is formed between the lip seal 9 and the sub bearing 7, and thus, the refrigerant gas supplied to the lip seal 9 passes through the gap with the sub bearing 7 and flows to the scroll compression mechanism 4 side. Accordingly, the sub bearing 7 is favorably lubricated, and even when the amount of the refrigerant supplied to the lip seal 9 is excessive, it is possible to prevent a pressure of the refrigerant gas applied to the lip seal 9 from excessively increasing, and it is possible to prevent the refrigerant from leaking to the outside.

[0046] In addition, the refrigerant discharge passages 27 and 28 through which the refrigerant gas is introduced from the lip seal 9 to the scroll compression mechanism 4 side are provided. Accordingly, the refrigerant gas and the lubricant supplied to the lip seal 9 are introduced to the scroll compression mechanism 4 side by the refrigerant discharge passages 27 and 28 so as to form steady flows of the refrigerant gas and the lubricant, and thus, it is possible to favorably lubricate the respective portions of the open-type scroll compressor 1.

[0047] As described above, according to the open-type scroll compressor 1 of the present embodiment, the lip seal 9 provided in the portion (shaft hole 8) where the drive shaft 5 protrudes from the housing 2 can be reliably lubricated by the lubricant contained in the refrigerant gas, and it is possible to prevent the wear of the lip seal 9 (lip 9a).

[0048] In addition, the present invention is not limited to only the configuration the above-described embodiment, appropriate modifications or improvements can be applied to the present invention, and embodiments to

which the modifications and the improvement are applied are included in the scope of the present invention.

[0049] For example, a basic internal structure of the open-type scroll compressor 1 and positional relationships of components do not necessarily need to be the same as those shown in the present embodiment.

[0050] Particularly, in the embodiment, the refrigerant introduction space S2 formed inside the suction port 3 is configured by closing the bottom portion of the refrigerant passage hole 2Bb drilled in the insertion flange 2Ba of the housing cover 2B by the second horizontal surface 22d of the partition plate 22. However, the refrigerant introduction space S2 may be formed by only the shape of the partition plate 22.

[0051] In addition, instead of the scroll type refrigerant compression mechanism, another type refrigerant compression mechanism such as a rotary type compression mechanism, a vane type compression mechanism, or a swash plate type compression mechanism may be adopted.

Reference Signs List

[0052]

1: open-type refrigerant compressor
2: housing
3: suction port
4: scroll compression mechanism (compression mechanism)
5: drive shaft
7: sub bearing (bearing member)
8: shaft hole
9: lip seal (seal member)
22: partition plate (refrigerant gas distribution portion)
27, 28: refrigerant discharge passage
32a, 32b: refrigerant supply groove
35: refrigerant supply passage
S1: internal space
S2: refrigerant introduction space
S3: seal space

Claims

1. An open-type refrigerant compressor comprising:

a housing;
a suction port which is formed in the housing;
a compression mechanism which is provided inside the housing and compresses a refrigerant gas containing a lubricant;
a drive shaft which drives the compression mechanism;
a seal member which is provided in a shaft hole through which the drive shaft protrudes from the housing to an outside so as to prevent the refrigerant gas from leaking from an inside of the housing to the outside thereof;
a refrigerant supply passage which is continuous from the inside of the housing to the seal member; and
a refrigerant gas distribution portion which distributes the refrigerant gas introduced from the suction port to the inside of the housing to the refrigerant supply passage side and the compression mechanism side,
wherein a distribution ratio of the refrigerant gas distributed by the refrigerant gas distribution portion is set such that an amount distributed to the refrigerant supply passage side is greater than an amount distributed to the compression mechanism side.

2. The open-type refrigerant compressor according to claim 1,
wherein the distribution ratio of the refrigerant gas distributed by the refrigerant gas distribution portion is set such that an entire amount of the refrigerant gas introduced from the suction port to the inside of the housing flows to the refrigerant supply passage side.

3. The open-type refrigerant compressor according to claim 1 or 2,
wherein the refrigerant gas distribution portion is attached to the inside of the housing as a separate part.

4. The open-type refrigerant compressor according to claim 3,
wherein at least a portion of the refrigerant supply passage is formed by covering a refrigerant supply groove formed on an inner surface of the housing with the refrigerant gas distribution portion.

5. The open-type refrigerant compressor according to any one of claims 1 to 4,
wherein a terminal portion of the refrigerant supply passage communicates with a seal space which is formed between the seal member and a bearing member disposed inside the seal member.

6. The open-type refrigerant compressor according to any one of claims 1 to 5,
wherein a refrigerant discharge passage through which the refrigerant gas is introduced from the seal member to the compression mechanism side is provided.

FIG. 1

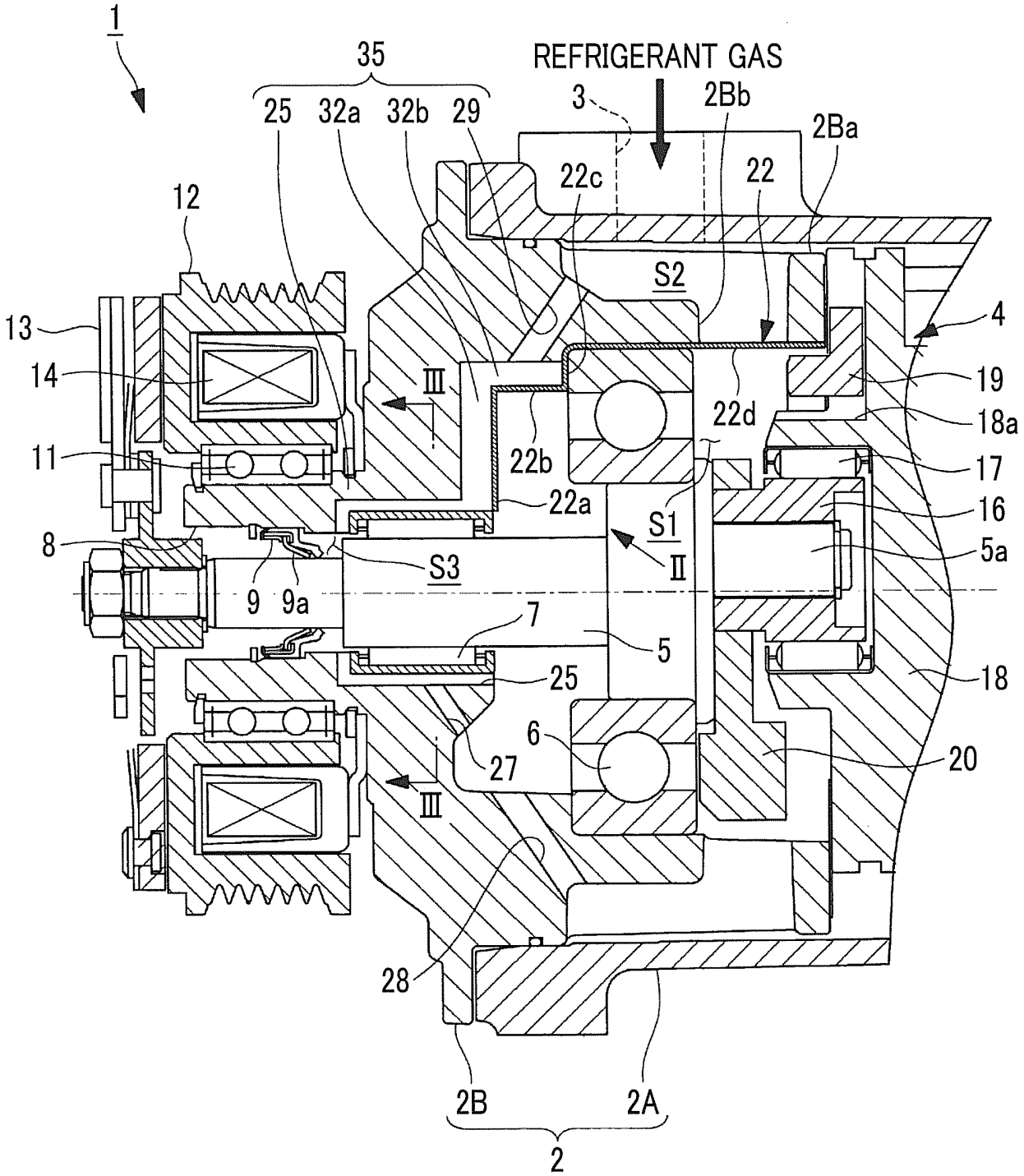

1
35
25
32a
32b
29
REFRIGERANT GAS
3
2Bb
2Ba
22c
22
12
S2
4
13
14
III
19
22d
18a
11
22b
17
22a
16
S1
8
S3
II
5a
9
9a
7
5
18
25
6
20
27
III
28
2B
2A
2

FIG. 2

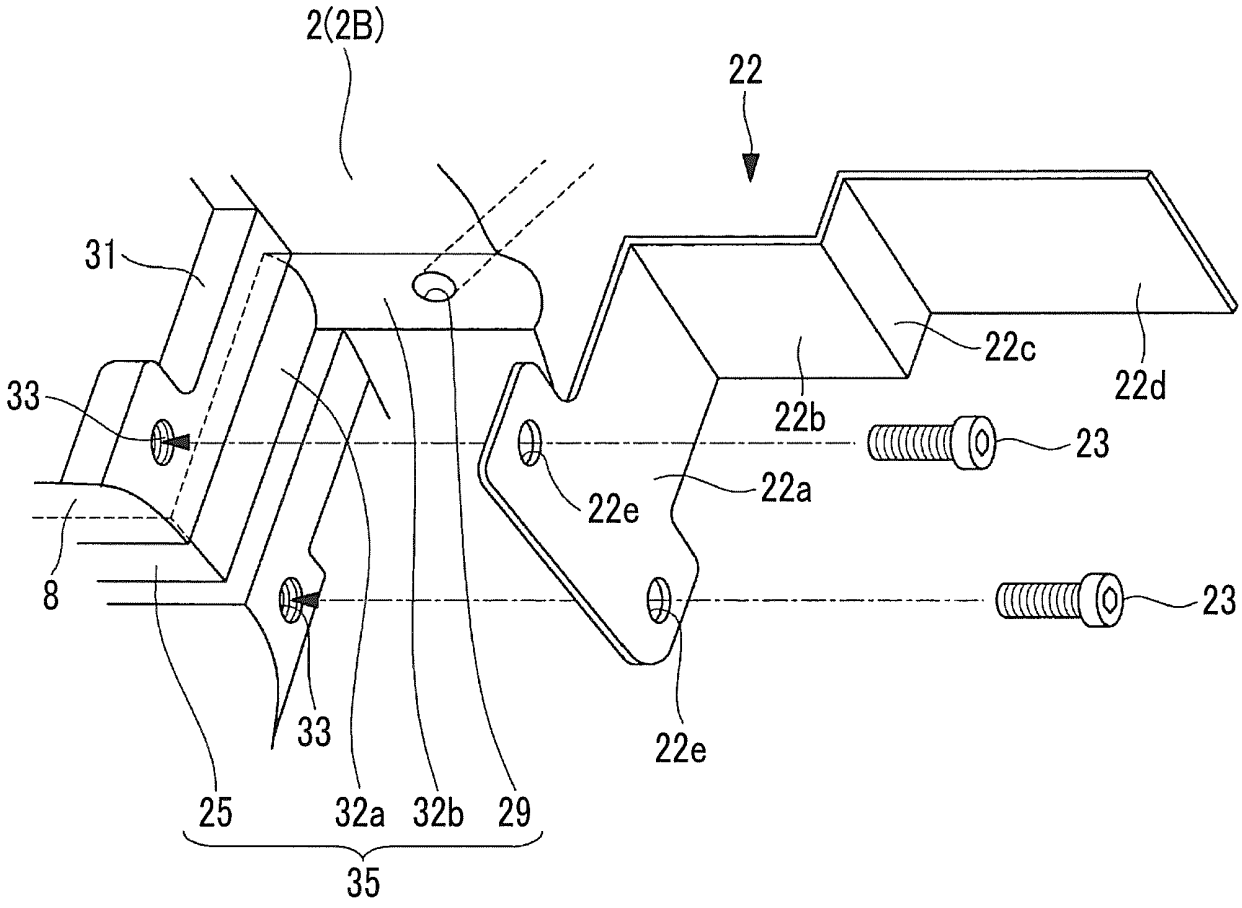
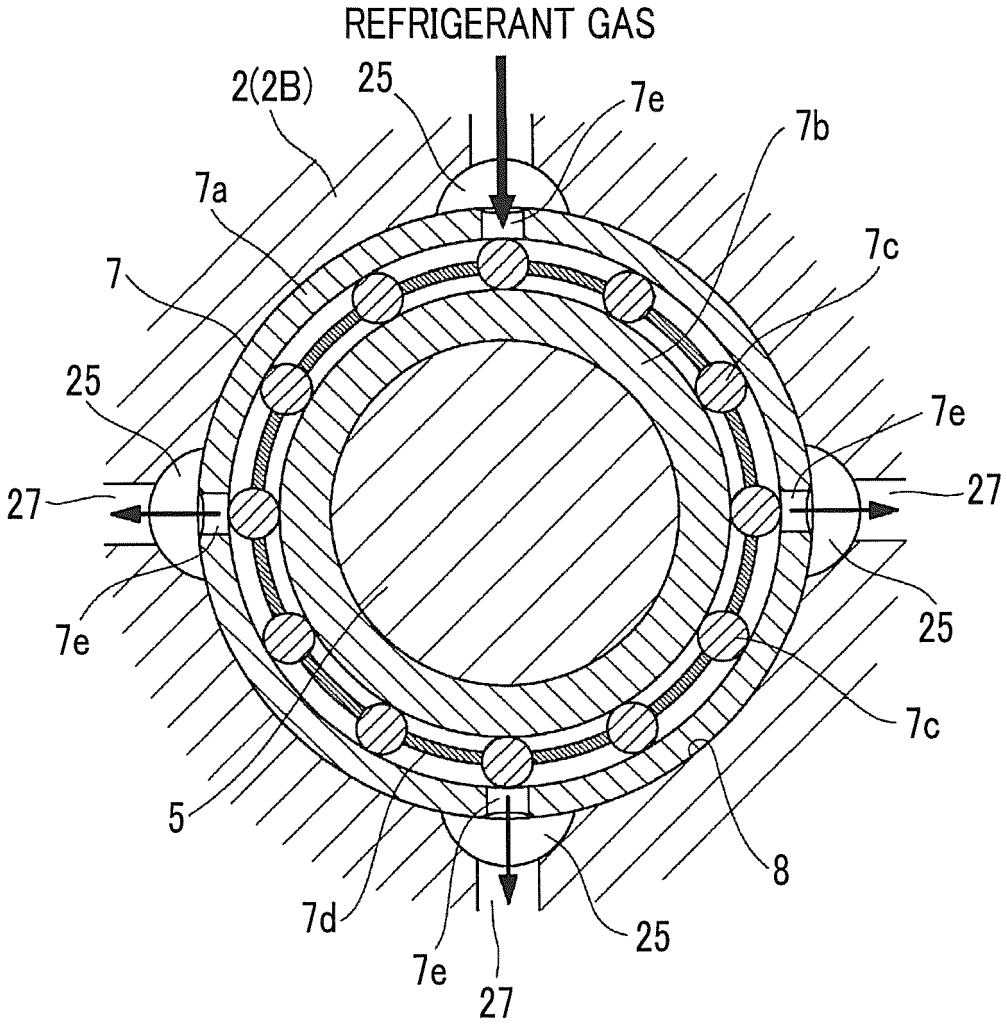


FIG. 3


REFRIGERANT GAS
2(2B)
25
7e
7b
7a
7c
7
25
7e
27
27
7e
25
7c
5
8
7d
25
7e
27

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/024878

A. CLASSIFICATION OF SUBJECT MATTER
F04B39/02(2006.01)i, *F04B39/12*(2006.01)i, *F04C29/02*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04B39/02, F04B39/12, F04C29/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017
Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	JP 2014-227956 A (Calsonic Kansei Corp.), 08 December 2014 (08.12.2014), paragraphs [0009] to [0018]; fig. 1 (Family: none)	1-3,5-6 4
X A	JP 2004-176543 A (Sanden Corp.), 24 June 2004 (24.06.2004), paragraphs [0027] to [0042], [0066] to [0069]; fig. 1 (Family: none)	1-3,5-6 4
A	US 2015/0337964 A1 (THERMO KING CORP.), 26 November 2015 (26.11.2015), entire text; all drawings & CN 105026761 A	1-6

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
05 September 2017 (05.09.17)	12 September 2017 (12.09.17)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

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Patent documents cited in the description

- JP 2005023849 A **[0005]**