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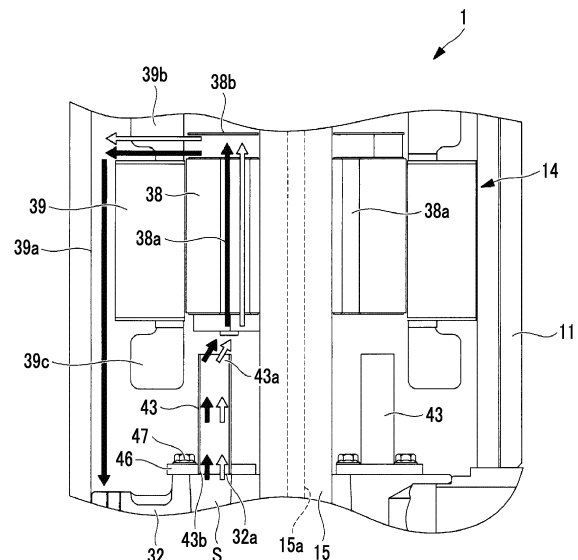
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(54) **COMPRESSOR**

(57) Provided is a compressor capable of reducing initial costs. This compressor comprises: a housing (11); a rotary shaft (15) which is accommodated in the housing (11) and rotates about an axis; a rotary compression mechanism which is connected to the lower end of the rotary shaft (15) and compresses and discharges a refrigerant; an electric motor (14) which has a rotor (38) fixed to the rotary shaft (15) and having a rotor passage (38a) that passes through the rotor in the direction of the axis and guides the refrigerant discharged from the rotary compression mechanism to an upper side, the electric motor being provided at the axial center of the rotary shaft (15) to rotationally drive the rotary shaft (15); a scroll compression mechanism which is connected to the upper end of the rotary shaft (15) and suctions and compresses the refrigerant discharged from the rotor passage (38a); and a tubular guide pipe (43) which is provided above the rotary compression mechanism and guides the refrigerant discharged from the rotary compression mechanism to the rotor passage (38a). The guide tube (43) is disposed to overlap the rotor (38) when viewed in the axial direction.

FIG. 4



Description

Technical Field

[0001] The present disclosure relates to a compressor.

Background Art

[0002] A two-stage compressor including a rotary compression mechanism and a scroll compression mechanism in a housing is known. In a two-stage compressor disclosed in PTL 1, a refrigerant compressed by a rotary compression mechanism on a low-stage side is discharged into a housing, and the discharged refrigerant is further compressed by a scroll compression mechanism on a high-stage side. In addition, a motor that rotationally drives a rotary shaft is provided between the rotary compression mechanism on the low-stage side and the scroll compression mechanism on the high-stage side. For this reason, a through-hole for guiding the refrigerant discharged from the rotary compression mechanism to the scroll compression mechanism is formed in the motor. In order to guide the refrigerant discharged from the rotary compression mechanism on the low-stage side to the through-hole, in a device described in PTL 1, a funnel-shaped cover is provided above a lower bearing 32A provided above the rotary compression mechanism, and the refrigerant discharged from the rotary compression mechanism is caused to flow upward from the vicinity of the rotary shaft.

Citation List

Patent Literature

[0003] [PTL 1] Japanese Unexamined Patent Application Publication No. 2017-190732

Summary of Invention

Technical Problem

[0004] In general, a component such as a cover provided in a compressor has a thin plate thickness and a relatively complicated shape, and thus is manufactured using a mold or the like. Therefore, when starting the production, it is necessary to prepare a large device such as a mold, and thus there is a problem in that initial costs increase. In particular, there is a problem that costs increase in a compressor or the like produced in a small amount.

[0005] In particular, since the cover described in PTL 1 is a component long in a vertical direction, the cover needs to be manufactured by deep drawing, and thus the cost of a mold is further increased. Therefore, an increase in initial cost is remarkable.

[0006] The present disclosure has been made in view of such circumstances, and an object thereof is to provide

a compressor capable of reducing initial costs.

Solution to Problem

[0007] In order to solve the above problems, a compressor of the present disclosure adopts the following means.

[0008] According to an aspect of the present disclosure, there is provided a compressor including a housing; a rotary shaft portion that is accommodated in the housing and that rotates around a longitudinal axis; a low-stage-side compression mechanism that is connected to a lower end of the rotary shaft portion and that compresses and discharges a refrigerant; an electric motor that includes a rotor fixed to the rotary shaft portion and having a through-hole penetrating the rotor in a direction of the longitudinal axis to upwardly guide the refrigerant discharged from the low-stage-side compression mechanism and that is provided at a center of the rotary shaft portion in the direction of the longitudinal axis to rotationally drive the rotary shaft portion; a high-stage-side compression mechanism that is connected to an upper end of the rotary shaft portion and that sucks and compresses the refrigerant discharged from the through-hole; and a tubular guide pipe that is provided above the low-stage-side compression mechanism and that guides the refrigerant discharged from the low-stage-side compression mechanism to the through-hole, in which the guide pipe is disposed to overlap the rotor when viewed in the direction of the longitudinal axis.

Advantageous Effects of Invention

[0009] According to the present disclosure, it is possible to reduce initial costs.

Brief Description of Drawings

[0010]

Fig. 1 is a longitudinal cross-sectional view of a compressor according to an embodiment of the present disclosure.

Fig. 2 is a longitudinal cross-sectional view showing a main part of the compressor of Fig. 1.

Fig. 3 is a cross-sectional view taken along cutting line III-III of Fig. 2.

Fig. 4 is a longitudinal cross-sectional view showing a flow of a refrigerant by a guide pipe.

Fig. 5 is a longitudinal cross-sectional view showing a modification example of Fig. 4.

Fig. 6 is a cross-sectional view taken along cutting line VI-VI of Fig. 5.

Description of Embodiments

[0011] Hereinafter, an embodiment according to the present disclosure will be described with reference to the

drawings.

[0012] As shown in Fig. 1, a compressor 1 is used for an air conditioner and compresses a refrigerant R, which is, for example, a gas such as carbon dioxide, in two stages. The compressor 1 is fixed to an installation surface FL via leg portions 3. The compressor 1 includes a housing 11 and includes a rotary compression mechanism (low-stage-side compression mechanism) 12, a scroll compression mechanism (high-stage-side compression mechanism) 13, an electric motor 14, and a rotary shaft (rotary shaft portion) 15, which are provided inside the housing 11.

[0013] The housing 11 has a main body portion 21 having a cylindrical shape, and an upper cover portion 22 and a lower cover portion 23 that close upper and lower openings of the main body portion 21. The inside of the housing 11 forms a sealed space.

[0014] The rotary shaft 15 is provided to extend vertically along an axis X inside the housing 11. An upper end (one end) side of the rotary shaft 15 is rotatably supported by an upper bearing 31. A lower end (other end) side of the rotary shaft 15 is rotatably supported by a lower bearing 32.

[0015] The electric motor 14 is disposed at a center of the rotary shaft 15 in a longitudinal direction and on an outer peripheral side of the rotary shaft 15, and rotates the rotary shaft 15 around the axis X. The electric motor 14 includes a rotor 38 fixed to an outer peripheral surface of the rotary shaft 15, and a stator 39 that faces the rotor 38 in a radial direction with a gap from an outer peripheral surface of the rotor 38 and that is fixed to an inner wall of the main body portion 21 of the housing 11 by shrink fitting or the like.

[0016] The rotor 38 is provided with rotor passages (through-hole) 38a provided at a predetermined interval in a circumferential direction. Each rotor passage 38a penetrates the rotor 38 in a vertical direction (axis X direction). The refrigerant discharged from a rotary compression mechanism 12 flows upward through the rotor passages 38a. An oil separation plate (baffle plate) 38b is fixed to an upper portion of the rotor 38. The oil separation plate 38b has a circular plate shape and is disposed to extend in a horizontal direction. The oil separation plate 38b rotates around the axis X together with the rotor 38.

[0017] A plurality of stator passages 39a are formed in an outer periphery of the stator 39 at a predetermined angular interval in a circumferential direction (specifically, it will be described later with reference to Fig. 3).

[0018] As shown in Fig. 1, an upper coil end 39b in which a winding is folded back is located at an upper portion of the stator 39, and a lower coil end 39c in which a winding is folded back is located at a lower portion of the stator 39. The electric motor 14 is connected to a power source via an inverter (not shown) and rotates the rotary shaft 15 with a variable frequency.

[0019] The rotary compression mechanism 12 is provided on the lower end (other end) side of the rotary shaft 15 inside the housing 11. The rotary compression mechanism

12 is a two-cylinder mechanism in the present embodiment, and includes an eccentric shaft portion 41 provided in the rotary shaft 15, a rotor 42 fixed to the eccentric shaft portion 41 and rotating in a compression chamber C1 eccentrically with respect to the axis X as the rotary shaft 15 rotates, and a cylinder 44 in which the compression chamber C1 is formed.

[0020] The refrigerant R is supplied to the compression chamber C1 formed in the cylinder 44 from a suction pipe 33. The refrigerant compressed in the compression chamber C1 is discharged from a guide pipe 43 to a region below the electric motor 14 in the housing 11 via the lower bearing 32 (specifically, a discharge space S formed inside the lower bearing 32).

[0021] The cylinder 44 is fixed to the lower bearing 32 from below by a bolt 48. An oil pump 49 fixed by the bolt 48 together with the cylinder 44 is provided below the cylinder 44. The oil is sucked from an oil reservoir O1 in a lower portion of the housing 11 by the oil pump 49, and is guided to the upper bearing 31 side through an oil supply hole 15a penetrating the rotary shaft 15 along the axis X.

[0022] A scroll compression mechanism 13 is disposed above the electric motor 14 inside the housing 11. The scroll compression mechanism 13 includes a fixed scroll 51 fixed to the upper bearing 31, and an orbiting scroll 57 disposed below the fixed scroll 51 to face the fixed scroll 51.

[0023] The fixed scroll 51 has an end plate 52 fixed to an upper surface of the upper bearing 31 and a fixed wrap 53 protruding downward from the end plate 52. A discharge hole 52a vertically penetrating the end plate 52 is formed in a central portion (vicinity of the axis X) of the end plate 52.

[0024] The orbiting scroll 57 is disposed to be interposed between the upper bearing 31 and the fixed scroll 51. The orbiting scroll 57 has an end plate 58 connected to an upper end side of the rotary shaft 15 and an orbiting wrap 59 protruding upward from the end plate 58.

[0025] The end plate 58 is fixed to the eccentric shaft portion 56 provided at the upper end of the rotary shaft 15 via a bush 55, and rotates eccentrically with respect to the axis X as the rotary shaft 15 rotates.

[0026] The orbiting wrap 59 forms a compression chamber C2 for compressing the refrigerant R between the orbiting wrap 59 and the fixed wrap 53 by meshing with the fixed wrap 53.

[0027] A balance weight chamber 63 is formed between a recessed portion on a central side of the upper bearing 31 and a lower side of the orbiting scroll 57. In the balance weight chamber 63, a balance weight 54 rotates together with the rotary shaft 15.

[0028] The refrigerant R compressed by the rotary compression mechanism 12 and discharged into the housing 11 is sucked into the compression chamber C2 from an outer peripheral side of the scroll compression mechanism 13 and is compressed toward a center side. The compressed refrigerant R is discharged from a dis-

charge pipe 34 to the outside of the housing 11 via the discharge hole 52a of the fixed scroll 51.

[0029] A cover 45 is provided below the upper bearing 31 so as to cover the upper bearing 31. The cover 45 is formed by sheet metal processing, and has a substantially conical shape that is expanded in diameter from the lower side to the upper side. An upper end of the cover 45 on an outer peripheral side is fixed to the upper bearing 31 by a bolt 45b (refer to Fig. 2).

[0030] A suction opening 45a is provided at a lower end of the cover 45. That is, the suction opening 45a faces downward and is an annular region formed between the cover 45 and the rotary shaft 15. A space below the housing 11 and a space on the upper bearing 31 side are partitioned by the cover 45, and only the refrigerant sucked from the suction opening 45a is guided to the scroll compression mechanism 13.

[0031] An oil level tank 60 is provided outside and below the housing 11. The oil level tank 60 is a hollow container and communicates with the inside of the housing 11 via a lower pipe 61 and an upper pressure equalization pipe 62. The oil level tank 60 measures an oil level of the oil reservoir O1 by guiding the oil from the oil reservoir O1 in the housing 11 via the lower pipe 61.

[0032] A downstream end of an oil separator oil return pipe 65 is connected to a lower side portion of the housing 11. An upstream end of the oil separator oil return pipe 65 is connected to an oil separator (not shown). The oil separated by the oil separator from the refrigerant discharged from the compressor 1 is returned to the oil reservoir O1 in the housing 11 via the oil separator oil return pipe 65. A height position where the downstream end of the oil separator oil return pipe 65 is connected to the housing 11 is below the lower bearing 32.

[0033] An oil return pipe 67 that is in contact with an inner wall of the housing 11 and extends in a vertical direction is provided in the housing 11. As shown in Fig. 2, an upper end (one end) of the oil return pipe 67 is fixed to the upper bearing 31 via a boss 68, and a lower end (other end) is provided to be located in the oil reservoir O1 in the lower portion of the housing 11. The lower end of the oil return pipe 67 is fixed to the inner wall of the housing 11 via a rod-shaped member 70.

[0034] The oil return pipe 67 is provided to penetrate a space formed between the stator 39 and the housing 11. Specifically, as shown in Fig. 3, cutouts are provided in the outer periphery of the stator 39 in a circumferential direction at a predetermined angular interval so that the plurality of stator passages 39a are formed with the inner wall of the housing 11. The refrigerant or the oil flows through the stator passages 39a. Two oil return pipes 67 are inserted through one or a plurality of the stator passages 39a.

[0035] As can be seen from Fig. 3, the rotor passages 38a are provided at a predetermined interval in the circumferential direction. The refrigerant discharged from a rotary compression mechanism 12 flows upward through the rotor passages 38a.

[0036] In addition, as shown in Fig. 2, a stabilizing plate 75 is fixed to a lower surface of the lower bearing 32 (refer to Fig. 1). The stabilizing plate 75 is fixed to the lower bearing 32 (specifically, a leg portion protruding in a radial direction of the lower bearing 32) by a bolt. The stabilizing plate 75 is a circular plate in which an opening is formed at the center. The stabilizing plate 75 covers an upper side of an oil surface of the oil reservoir O1 to stabilize the oil surface.

[0037] As shown in Fig. 4, an annular flat plate 46 is fixed to an upper surface of the lower bearing 32 by bolts 47. A plurality of flat plate openings penetrating the flat plate 46 in a vertical direction are formed in the flat plate 46. Each flat plate opening communicates with a bearing opening 32a formed in the lower bearing 32. In addition, a plurality of (in the present embodiment, four (refer to Fig. 6) as an example) guide pipes 43 are provided on an upper surface of the flat plate 46. A diameter of each flat plate opening is formed to be slightly larger than an outer diameter of the guide pipe 43. A lower end portion of the guide pipe 43 is fitted to the flat plate opening. That is, a refrigerant inlet 43b provided at a lower end (upstream end) of the guide pipe 43 communicates with the bearing opening 32a formed in the lower bearing 32. Fig. 6 is a view showing a modification example of the present embodiment, but the number and the disposition of the guide pipes 43 are the same as those in the present embodiment.

[0038] The plurality of guide pipes 43 are disposed side by side in a circumferential direction (refer to Fig. 6). The plurality of guide pipes 43 are not disposed to be aligned at equal intervals in the circumferential direction. The plurality of guide pipes 43 are disposed so as not to be disposed directly above a discharge valve (not shown) provided in the rotary compression mechanism 12. In addition, the plurality of guide pipes 43 are disposed to be shifted to one side. For example, the plurality of guide pipes 43 are disposed such that, in a plan view, central axes of the guide pipes 43 fall within a range of 180 degrees about a central axis of the rotary compression mechanism 12. The disposition of the plurality of guide pipes 43 is an example and is not limited thereto. In addition, the discharge valve is a valve provided at a discharge port (not shown) for discharging the refrigerant compressed by the rotary compression mechanism 12 to the discharge space S. In this way, since the guide pipe 43 is not disposed directly above the discharge valve, a muffler effect is achieved, and thus noise can be reduced.

[0039] The guide pipe 43 is provided above the rotary compression mechanism 12 and guides the refrigerant discharged from the rotary compression mechanism 12 to the rotor passage 38a. As shown in Fig. 4, the guide pipe 43 is a cylindrical member formed in a linear shape. The guide pipe 43 extends linearly along a vertical direction (axis X direction). The guide pipe 43 extends to the vicinity of a lower end of the rotor 38. An upper end of the guide pipe 43 is located above a lower end of the

lower coil end 39c.

[0040] In addition, the guide pipe 43 is disposed to overlap the rotor 38 when viewed in the axis X direction. Specifically, the guide pipe 43 is disposed to overlap the rotor passage 38a formed in the rotor 38 when viewed in the axis X direction. More specifically, the guide pipe 43 is disposed to overlap an opening in which a refrigerant outlet 43a is formed at a lower end of the rotor passage 38a.

[0041] The compressor 1 having the above-described configuration operates as follows.

[0042] The refrigerant evaporated in an evaporator (not shown) is sucked into the compressor 1 from the suction pipe 33 and is compressed by the rotary compression mechanism 12. The refrigerant compressed by the rotary compression mechanism 12 is discharged from the guide pipe 43 into the housing 11.

[0043] The refrigerant discharged into the housing 11 is sucked from the suction opening 45a of the cover 45, and is guided to the scroll compression mechanism 13 through a flow path in the cover 45 to be compressed. The refrigerant compressed by the scroll compression mechanism 13 is discharged from the discharge pipe 34 to an external gas cooler or condenser through the discharge hole 52a of the fixed scroll 51.

[0044] The oil is separated from the refrigerant discharged from the discharge pipe 34 by an oil separator (not shown). The separated oil is returned to the housing 11 through the oil separator oil return pipe 65, and is stored in the oil reservoir O1.

[0045] The oil stored in the oil reservoir O1 is sucked up by the oil pump 49, and is guided to the scroll compression mechanism 13 side through the oil supply hole 15a formed in the rotary shaft 15. The oil guided to the scroll compression mechanism 13 side is returned to the oil reservoir O1 on the lower side after lubricating a sliding portion such as a bearing portion of the upper bearing 31 and the bush 55. The oil after lubrication, which is guided to the balance weight chamber 63, is guided to the oil return pipe 67 through the oil return hole 31a and the vertical hole 31b (refer to Fig. 2) formed in the upper bearing 31.

[0046] The oil guided to the oil return pipe 67 is discharged from the lower end through a flow path inside the oil return pipe 67, and is returned to the oil reservoir O1.

[0047] Fig. 5 schematically shows the flow of the refrigerant and the oil formed by the cover 45. In the drawing, the flow of the refrigerant is indicated by a white arrow, and the flow of the oil is indicated by a black arrow.

[0048] The refrigerant compressed by the rotary compression mechanism 12 is discharged to the discharge space S formed in the lower bearing 32. The refrigerant discharged into the discharge space S passes through the bearing opening 32a formed in an upper end of the lower bearing 32 and flows into the guide pipe 43. The refrigerant flowing into the guide pipe 43 flows upward in the guide pipe 43 and is discharged from the refrigerant

outlet 43a formed in an upper end (downstream end) of the guide pipe 43. The refrigerant discharged from the guide pipe 43 flows into the rotor passage 38a formed in the rotor 38. In this way, the refrigerant discharged from the rotary compression mechanism 12 is guided from a lower side to an upper side of the rotor 38 through the rotor passage 38a. At this time, the oil is carried with the refrigerant.

[0049] The refrigerant and the oil that have come out of the rotor passage 38a collide with the oil separation plate 38b and are guided in a radial direction about the axis X by a centrifugal force. Then, the oil having a larger specific gravity larger than the refrigerant collides with the inner wall of the housing 11 and flows downward by gravity. A part of the oil flows upward together with the refrigerant in a space between the inner wall of the housing 11 and the upper coil end 39b. The part of the oil that has ascended together with the refrigerant collides with an upper end of an outer periphery of the cover 45 (refer to Figs. 1 and 2), and then falls downward by gravity.

[0050] According to the present embodiment, the following operations and effects are achieved.

[0051] In the present embodiment, the refrigerant discharged from the rotary compression mechanism 12 is guided to the rotor passage 38a by the guide pipe 43 that is a straight pipe. Since the guide pipe 43 has a relatively simple shape, the guide pipe 43 can be manufactured without using a large device (for example, a mold or the like). Accordingly, compared to a case where the refrigerant is guided to the rotor passage 38a by a component having a complicated shape (a deep-drawn sheet metal component such as a muffler cover) that needs to be manufactured by a mold or the like, it is not necessary to prepare a large device, and thus initial costs can be reduced. Therefore, the costs can be reduced, particularly in a compressor or the like produced in small quantities.

[0052] In addition, in the present embodiment, the guide pipe 43 is disposed to overlap the rotor passage 38a formed in the rotor 38. As a result, a position of the guide pipe 43 becomes close to a position of the rotor passage 38a. Therefore, the refrigerant can be easily guided from the guide pipe 43 to the rotor passage 38a.

[0053] In the above-described embodiment, an example in which the guide pipe 43 is a straight pipe has been described. However, the present disclosure is not limited thereto. For example, as shown in Figs. 5 and 6, a guide pipe 43' of which an upper end portion is curved to a radial inner side (the rotor passage 38a side) may be used. The guide pipe 43' is curved such that the refrigerant outlet 43a is closer to the rotor passage 38a than the refrigerant inlet 43b when viewed in the axis X direction.

[0054] With such a configuration, a position of the refrigerant outlet 43a becomes close to a position of the rotor passage 38a. Therefore, the refrigerant can be more easily guided from the guide pipe 43' to the rotor passage 38a.

[0055] The guide pipe may be inclined such that the upper end of the guide pipe is close to the rotor passage 38a.

[0056] The compressor described in the embodiment described above is understood as follows, for example.

[0057] A compressor according to an aspect of the present disclosure includes a housing (11); a rotary shaft portion (15) that is accommodated in the housing and that rotates around a longitudinal axis; a low-stage-side compression mechanism (12) that is connected to a lower end of the rotary shaft portion and that compresses and discharges a refrigerant; an electric motor (14) that includes a rotor (38) fixed to the rotary shaft portion and having a through-hole (38a) penetrating the rotor in a direction of the longitudinal axis (axis X) to upwardly guide the refrigerant discharged from the low-stage-side compression mechanism and that is provided at a center of the rotary shaft portion in the direction of the longitudinal axis to rotationally drive the rotary shaft portion; a high-stage-side compression mechanism (13) that is connected to an upper end of the rotary shaft portion and that sucks and compresses the refrigerant discharged from the through-hole; and a tubular guide pipe (43) that is provided above the low-stage-side compression mechanism and that guides the refrigerant discharged from the low-stage-side compression mechanism to the through-hole, in which the guide pipe is disposed to overlap the rotor when viewed in the direction of the longitudinal axis.

[0058] In the above configuration, the refrigerant discharged from the low-stage-side compression mechanism is guided to the through-hole by the tubular guide pipe. Since the guide pipe has a relatively simple shape, the guide pipe can be manufactured without using a large device (for example, a mold or the like). Accordingly, compared to a case where the refrigerant is guided to the through-hole by a component having a complicated shape (a deep-drawn sheet metal component such as a muffler cover) that needs to be manufactured by a mold or the like, it is not necessary to prepare a large device, and thus initial costs can be reduced. Therefore, the costs can be reduced, particularly in a compressor or the like produced in small quantities.

[0059] In addition, in the above configuration, the guide pipe is disposed to overlap the rotor. As a result, the position of the guide pipe becomes close to the position of the through-hole. Therefore, the refrigerant can be easily guided from the guide pipe to the through-hole.

[0060] In addition, in the compressor according to the aspect of the present disclosure, the guide pipe is disposed to overlap the through-hole when viewed in a direction of the longitudinal axis.

[0061] The compressor according to claim 1, in which the guide pipe is disposed to overlap the through-hole when viewed in a direction of the longitudinal axis.

[0062] In addition, in the compressor according to the aspect of the present disclosure, the guide pipe is curved such that an upper end thereof provided with a refrigerant

outlet (43a) through which the refrigerant is discharged is close to the through-hole when viewed in the direction of the longitudinal axis.

[0063] In the above configuration, the position of the refrigerant outlet through which the refrigerant is discharged is close to the position of the through-hole. Therefore, the refrigerant can be more easily guided from the guide pipe to the through-hole.

10 Reference Signs List

[0064]

- 1: compressor
- 3: leg portion
- 11: housing
- 12: rotary compression mechanism (low-stage-side compression mechanism)
- 13: scroll compression mechanism (high-stage-side compression mechanism)
- 14: electric motor
- 15: rotary shaft (rotary shaft portion)
- 15a: oil supply hole
- 21: main body portion
- 22: upper cover portion
- 23: lower cover portion
- 31: upper bearing
- 31a: oil return hole
- 31b: vertical hole
- 32: lower bearing
- 32a: bearing opening
- 33: suction pipe
- 34: discharge pipe
- 38: rotor
- 38a: rotor passage (through-hole)
- 38b: oil separation plate
- 39: stator
- 39a: stator passage
- 39b: upper coil end
- 39c: lower coil end
- 41: eccentric shaft portion
- 42: rotor
- 43: guide pipe
- 43a: refrigerant outlet
- 43b: refrigerant inlet
- 44: cylinder
- 45: cover
- 45a: suction opening
- 46: flat plate
- 47: bolt
- 48: bolt
- 49: oil pump
- 51: fixed scroll
- 52: end plate
- 52a: discharge hole
- 53: fixed wrap
- 54: balance weight
- 55: bush

56: eccentric shaft portion	
57: orbiting scroll	
58: end plate	
59: orbiting wrap	
60: oil level tank	5
61: lower pipe	
62: pressure equalization pipe	
63: balance weight chamber	
65: oil separator oil return pipe	
67: oil return pipe	10
68: boss	
70: rod-shaped member	
75: stabilizing plate	
C1: compression chamber	
C2: compression chamber	15
FL: installation surface	
O1: oil reservoir	
X: axis	
S: discharge space	20

Claims

1. A compressor comprising:
 - a housing;
 - a rotary shaft portion that is accommodated in the housing and that rotates around a longitudinal axis;
 - a low-stage-side compression mechanism that is connected to a lower end of the rotary shaft portion and that compresses and discharges a refrigerant;
 - an electric motor that includes a rotor fixed to the rotary shaft portion and having a through-hole penetrating the rotor in a direction of the longitudinal axis to upwardly guide the refrigerant discharged from the low-stage-side compression mechanism and that is provided at a center of the rotary shaft portion in the direction of the longitudinal axis to rotationally drive the rotary shaft portion;
 - a high-stage-side compression mechanism that is connected to an upper end of the rotary shaft portion and that sucks and compresses the refrigerant discharged from the through-hole; and
 - a tubular guide pipe that is provided above the low-stage-side compression mechanism and that guides the refrigerant discharged from the low-stage-side compression mechanism to the through-hole,
 - wherein the guide pipe is disposed to overlap the rotor when viewed in the direction of the longitudinal axis.
2. The compressor according to claim 1, wherein the guide pipe is disposed to overlap the through-hole when viewed in the direction of the longitudinal axis.
3. The compressor according to Claim 1 or 2, wherein the guide pipe is curved such that an upper end thereof provided with a refrigerant outlet through which the refrigerant is discharged is close to the through-hole when viewed in the direction of the longitudinal axis.

FIG. 1

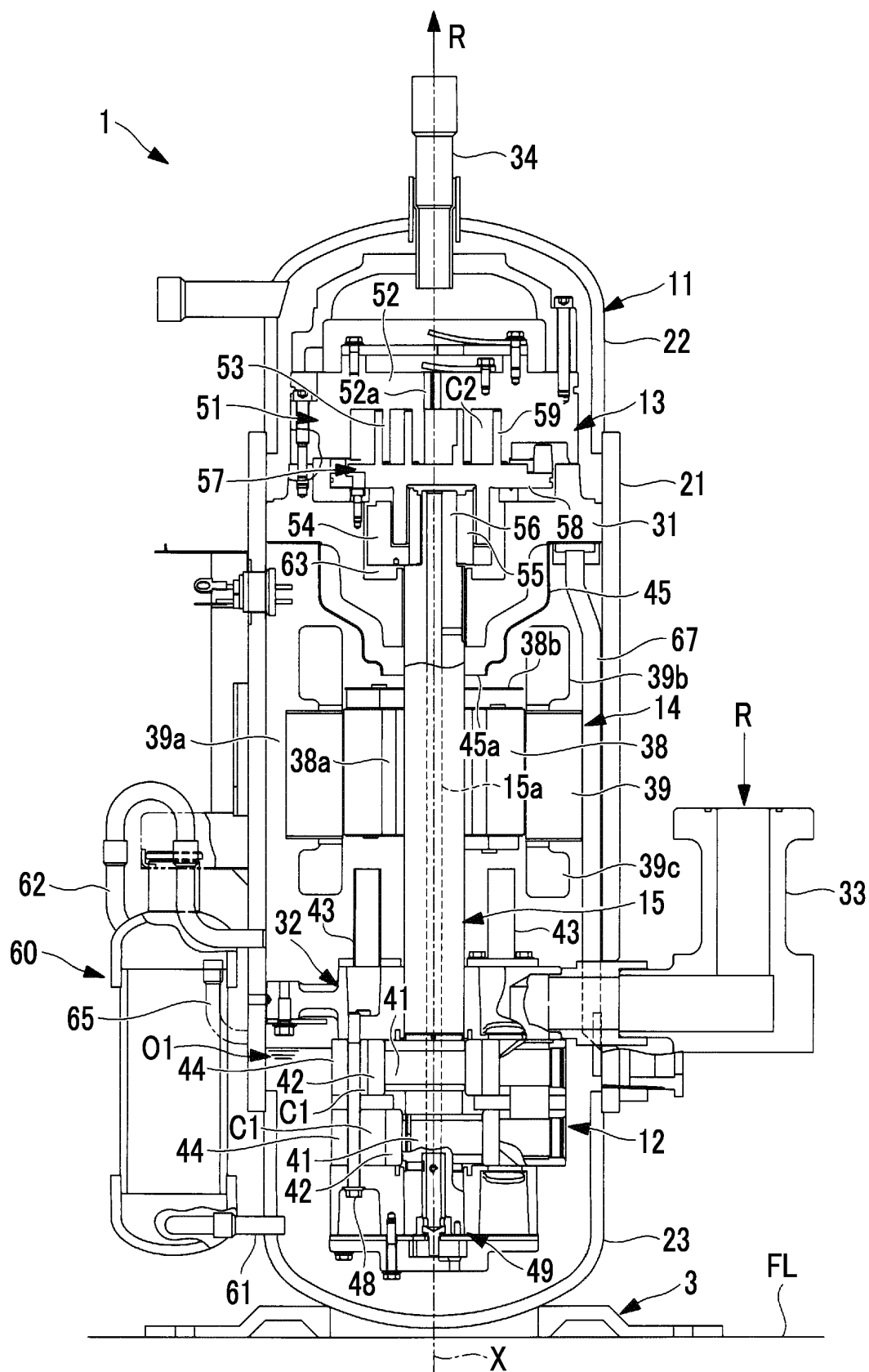


FIG. 2

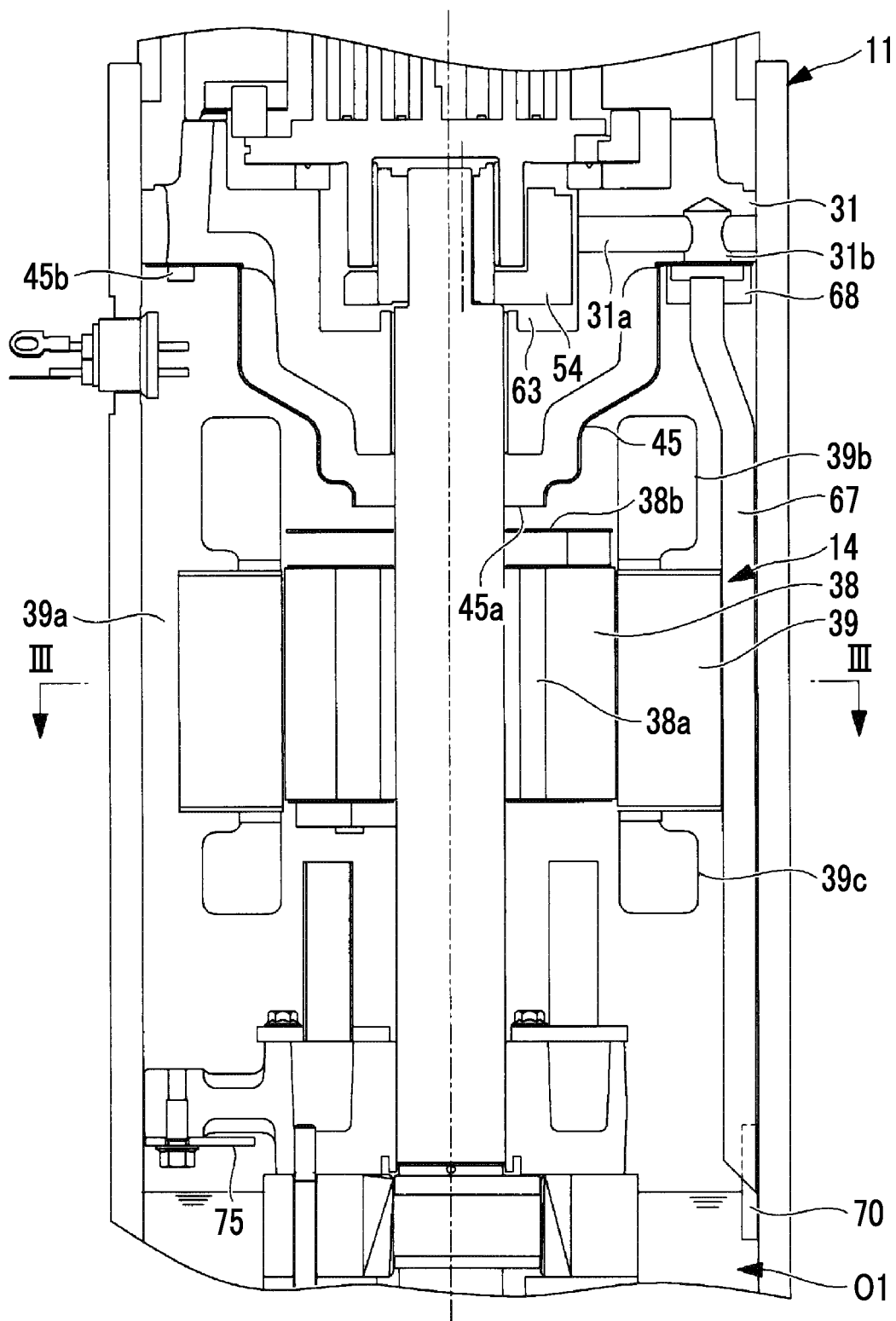


FIG. 3

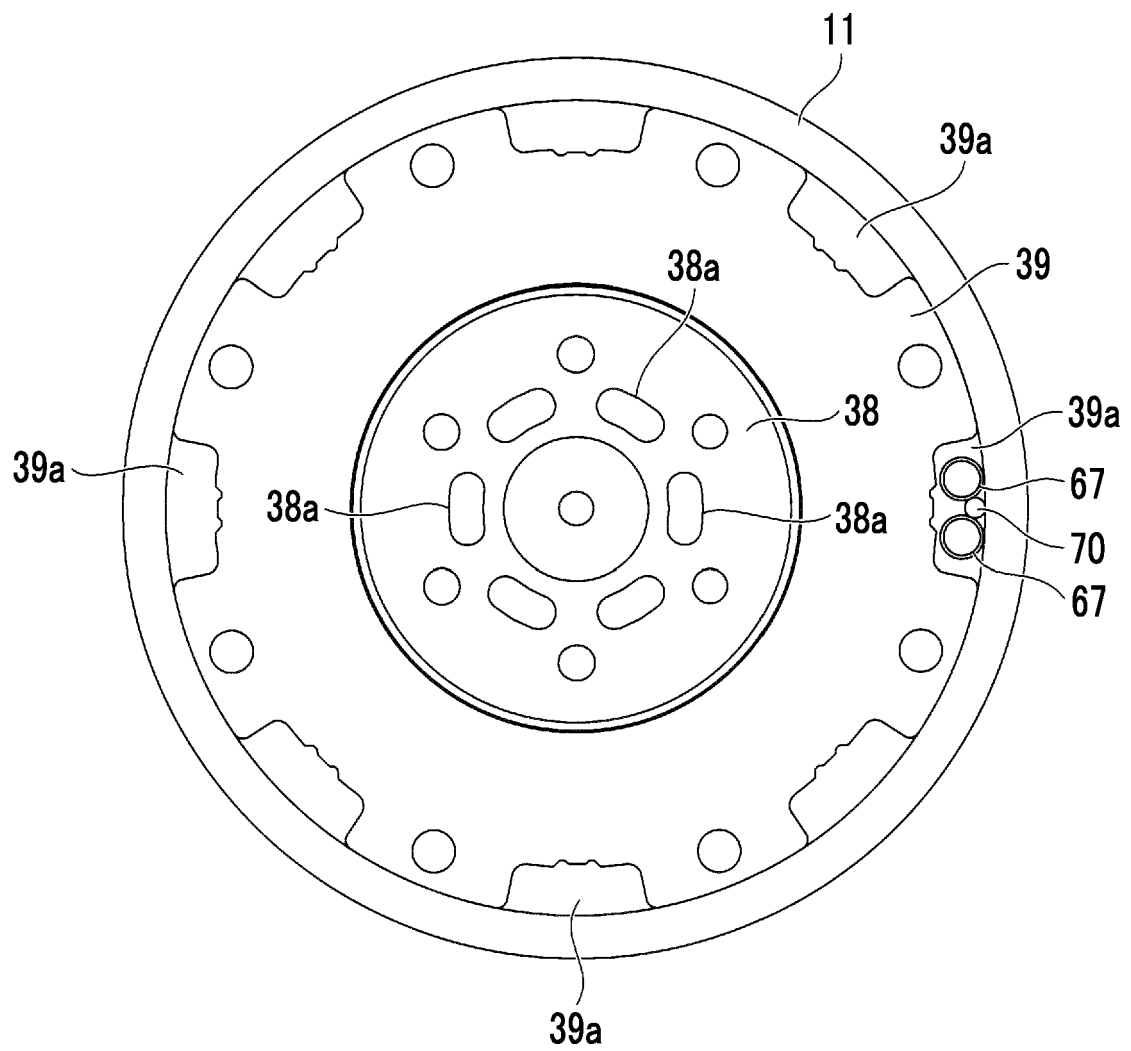


FIG. 4

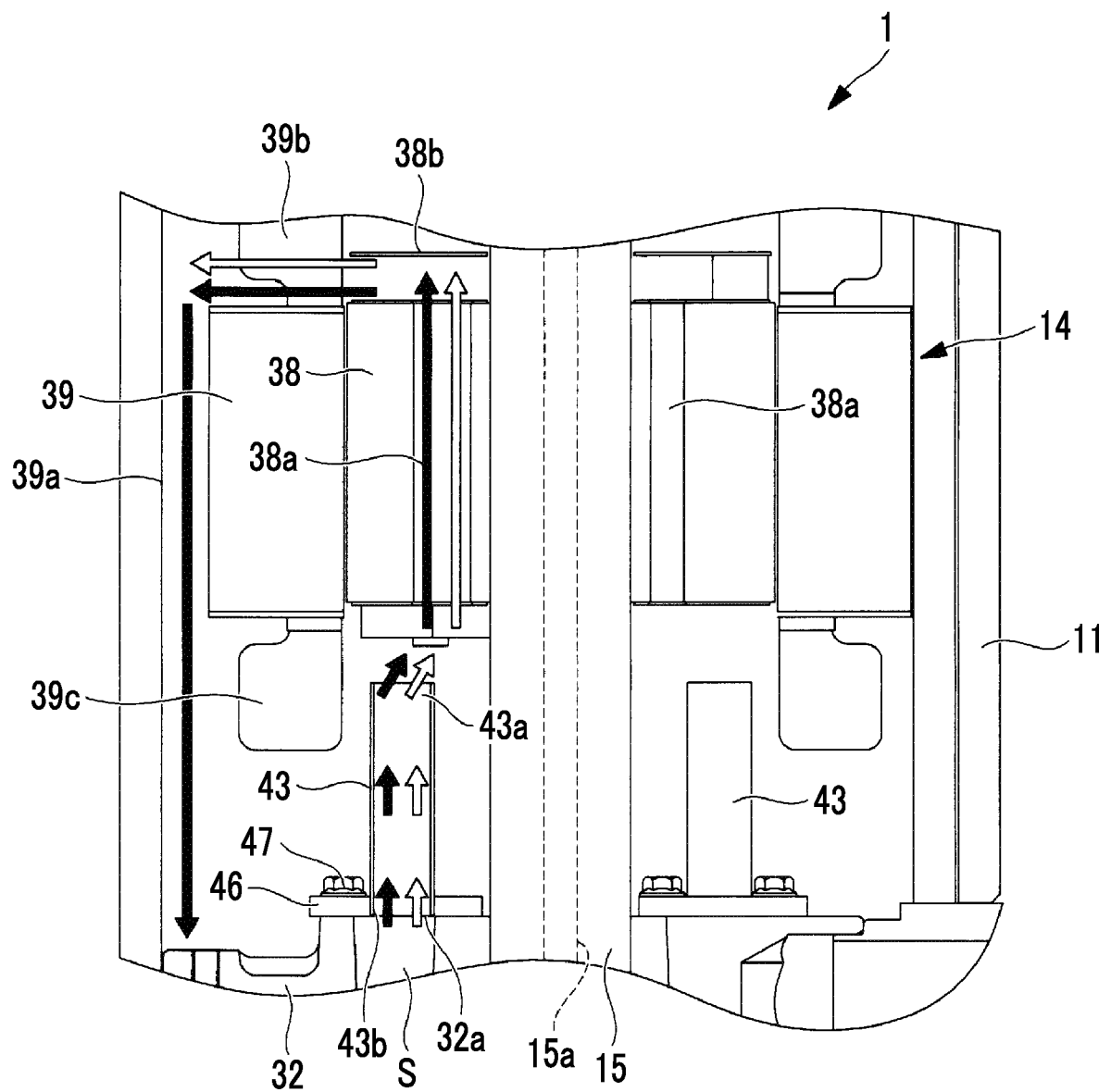


FIG. 5

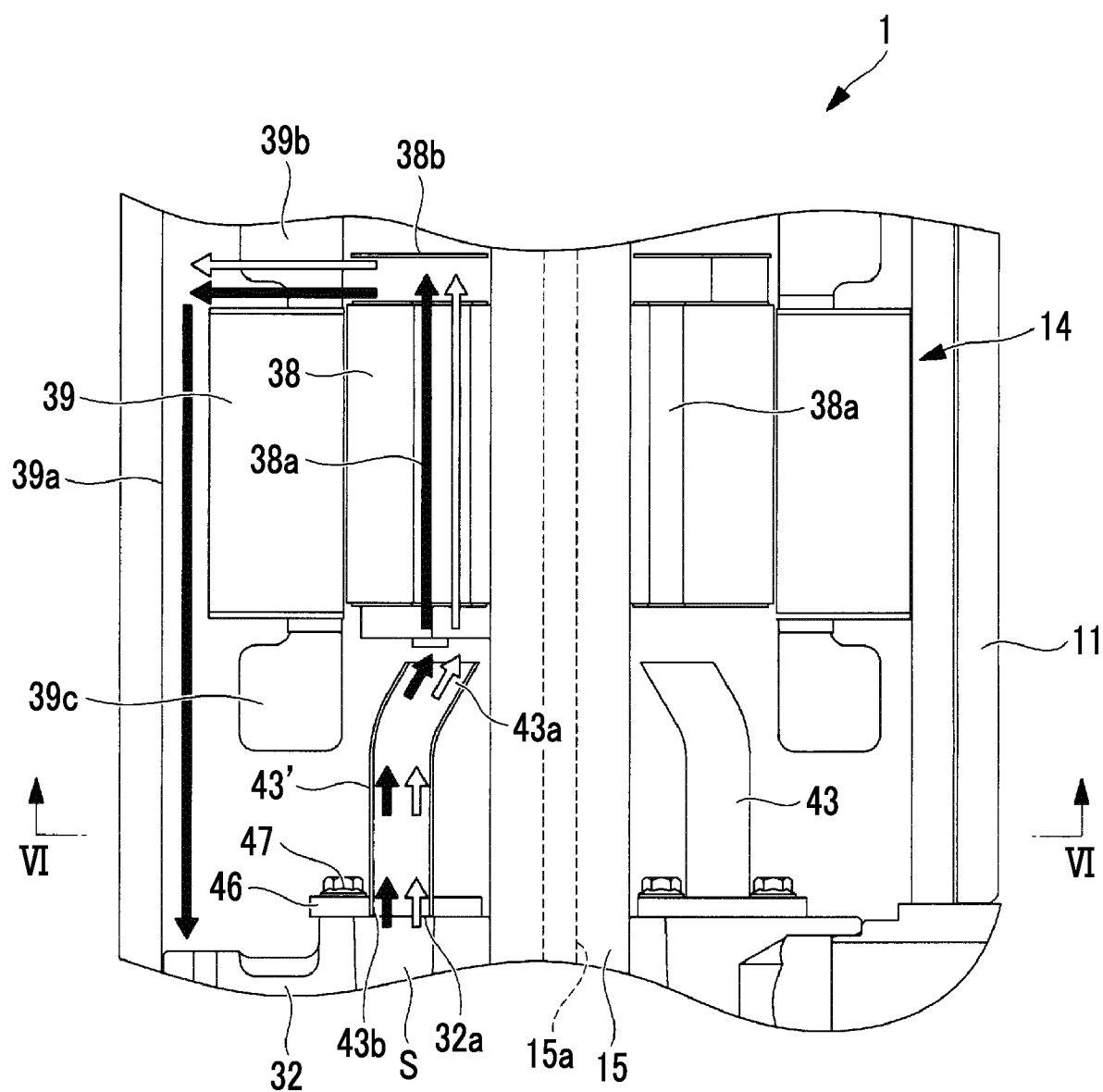
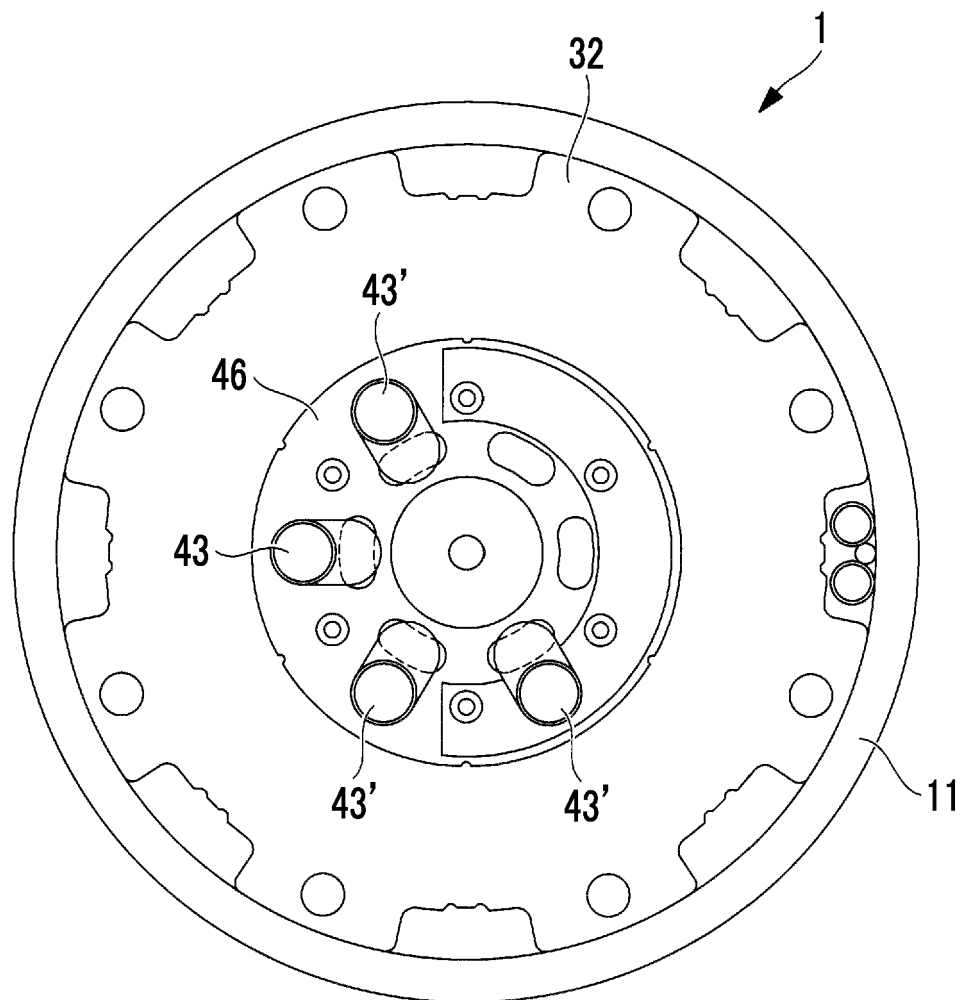


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2022/040221

A. CLASSIFICATION OF SUBJECT MATTER F04C 23/00 (2006.01)i; F04C 29/12 (2006.01)i; F04B 39/12 (2006.01)i FI: F04C29/12 D; F04B39/12 101D; F04C23/00 F 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) F04B39/12; F04C23/00; F04C29/12 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2022 Registered utility model specifications of Japan 1996-2022 Published registered utility model applications of Japan 1994-2022 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)												
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>JP 2012-149544 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 09 August 2012 (2012-08-09) paragraphs [0014]-[0036], fig. 1-3</td> <td>1-2</td> </tr> <tr> <td>Y</td> <td></td> <td>3</td> </tr> <tr> <td>Y</td> <td>JP 2010-53778 A (TOSHIBA CARRIER CORP.) 11 March 2010 (2010-03-11) paragraphs [0015], [0016], [0025]-[0027], [0031]-[0034], fig. 1</td> <td>3</td> </tr> </tbody> </table> ☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex. * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	JP 2012-149544 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 09 August 2012 (2012-08-09) paragraphs [0014]-[0036], fig. 1-3	1-2	Y		3	Y	JP 2010-53778 A (TOSHIBA CARRIER CORP.) 11 March 2010 (2010-03-11) paragraphs [0015], [0016], [0025]-[0027], [0031]-[0034], fig. 1	3
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Date of the actual completion of the international search 05 December 2022	Date of mailing of the international search report 20 December 2022											
Name and mailing address of the ISA/JP Japan Patent Office (ISA/JP) 3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915 Japan	Authorized officer Telephone No.											

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/040221

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP	2012-149544	A	09 August 2012	(Family: none)	
JP	2010-53778	A	11 March 2010	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2017190732 A [0003]