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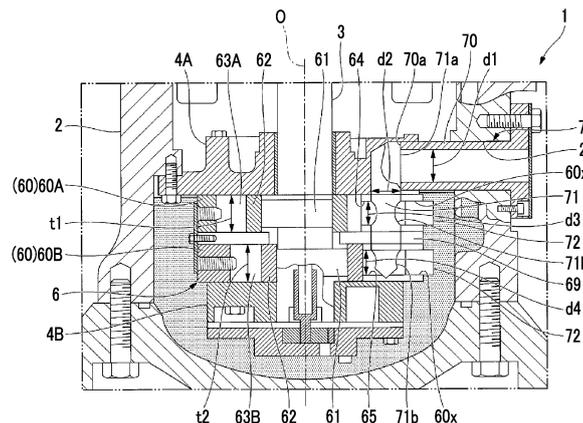
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(54) **ROTARY COMPRESSOR**

(57) According to the present invention, a rotary compression part (6) has a plurality of cylinders (60A, 60B) that form compression chambers (63A, 63B) and are disposed side by side in the vertical direction, and a separator plate (69) disposed between the plurality of cylinders (60A, 60B), wherein the suction pipe (7) has a main pipe (70) that is disposed above or below the cylinders (60A, 60B) and extends penetrating through a housing

(2) in a radial direction of a rotary shaft (3), and a connection pipe (71) that is connected to the main pipe (70), extends in the axial direction (O) of the rotary shaft (3), is disposed between the plurality of cylinders (60A, 60B) on a radial outside of the compression chambers (63A, 63B) in the plurality of cylinders (60A, 60B), and communicates with each of the compression chambers (63A, 63B).

FIG. 2



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Description

Technical Field

[0001] The present invention relates to a rotary compressor.

Background Art

[0002] In the related art, as a rotary compressor, a rotary compressor as shown in PTL 1, which includes a housing, a rotary shaft that extends in a vertical direction in the housing and is rotated by an electric motor, a rotary compression portion including a cylinder supported by the rotary shaft, and an upper bearing and a lower bearing that are rotatably supported by the rotary shaft and fixed above and below the cylinder, is known. A suction pipe through which a refrigerant can be introduced into a compression chamber of the rotary compression portion is connected to the cylinder. PTL 1 also discloses a twin rotary compressor in which cylinders are vertically disposed in two stages. Each cylinder is connected to at least one of suction pipes that separately extend from an accumulator.

Citation List

Patent Literature

[0003] [PTL 1] Japanese Unexamined Patent Application Publication No. 2013-227957

Summary of Invention

Technical Problem

[0004] In the case of the twin rotary compressor in the related art, it is preferable that the thickness of a separator plate interposed between the cylinders is made small for vibration reduction. This is because the two cylinders are separated from each other and the influence of vibration caused by eccentric movement of a piston rotor is large if the separator plate is thick. However, if the thickness of the separator plate is small, it is difficult to perform processing between the suction pipes at a connecting portion between the two suction pipes and a housing. Therefore, to widen a space between the suction pipes to facilitate the processing, it is necessary to make the separator plate thick or make the suction pipes thin. However, if the separator plate is thick, the vibration increases as described above and if the suction pipes are thin, there is an increase in pressure drop and thus the compression efficiency decreases. Therefore, it is conceivable to omit the processing between the suction pipes by combining the suction pipes into one pipe.

[0005] However, in a case where a configuration in which one suction pipe is connected to an inner side of an inner peripheral surface of the cylinder is applied to

twin cylinders as it is as in the case of application to a single cylinder structure in PTL 1 and the one suction pipe is connected to pass through the twin cylinders so that a refrigerant is sucked, a suction chamber of one of the twin cylinders and a compression chamber of the other of the twin cylinders are directly connected to each other and thus there is a problem that the compression efficiency decreases.

[0006] The present invention has been made in view of such circumstances and an object thereof is to provide a rotary compressor with which it is possible to reduce vibration without a decrease in compression efficiency in a rotary compressor including a plurality of cylinders.

Solution to Problem

[0007] The present invention adopts the following aspects in order to solve the above problems and achieve the object.

(1) An aspect of the present invention provides a rotary compressor including a rotary shaft that extends along an axis, a bearing that supports the rotary shaft such that the rotary shaft is rotatable around the axis, a motor that rotates the rotary shaft, a rotary compression portion that compresses a refrigerant by means of rotation of the rotary shaft, a housing that accommodates the rotary shaft, the bearing, the motor, and the rotary compression portion, and a suction pipe through which the refrigerant is introduced into compression chambers of the rotary compression portion. The rotary compression portion includes a plurality of cylinders that form the compression chambers and are disposed to be arranged in a vertical direction and a separator plate that is disposed between the plurality of cylinders and the suction pipe includes a main pipe that is disposed above or below the cylinders and extends to penetrate the housing in a radial direction of the rotary shaft and a connection pipe that is connected to the main pipe, extends in an axial direction of the rotary shaft, is disposed over the plurality of cylinders radially outside the compression chambers of the plurality of cylinders, and communicates with each of the compression chambers.

[0008] In the case of the rotary compressor according to the above aspect, the main pipe of the suction pipe is disposed above or below the plurality of cylinders and the refrigerant can be sucked into each of the compression chambers of the plurality of cylinders through the connection pipe extending in the axial direction. Accordingly, the compression chambers of the plurality of the cylinders are connected to each other and thus the refrigerant can be sucked into each of the compression chambers through one suction pipe without a decrease in compression efficiency. In a case where the number of suction pipes can be reduced to one, it is easy to per-

form processing on a portion where the suction pipe is connected to the housing even if the thickness of the separator plate is small.

[0009] In addition, in the case of the rotary compressor according to the above aspect, the main pipe of the suction pipe is disposed above or below the plurality of cylinders and thus the inner diameter of the main pipe is not limited to the thickness of the cylinders and the inner diameter of the main pipe can be made large. In addition, the inner diameter of the connection pipe can be made large. Accordingly, a larger amount of refrigerant can be compressed and the compression efficiency can be improved.

[0010] (2) In the rotary compressor described in (1), an inner diameter of the suction pipe may be larger than a thickness of the cylinder.

[0011] In a case where a suction pipe of which the inner diameter is larger than the thickness of the cylinder is adopted as described above, a large amount of the refrigerant can be supplied to the compression chambers and the compression efficiency can be improved.

[0012] (3) In the rotary compressor described in (1) or (2), each of the plurality of cylinders may be provided with a suction flow path that extends in the radial direction and through which the compression chamber and the connection pipe communicate with each other.

[0013] In this case, supply to each compression chamber can be performed via each suction flow path that extends in the radial direction through the connection pipe that extends in the axial direction from the suction pipe. Accordingly, branched flow to the compression chambers of the plurality of cylinders from one suction pipe can be made efficiently and thus the compression efficiency can be improved.

[0014] (4) In the rotary compressor described in (3), the suction flow path may be open to an outer peripheral surface of the cylinder so that an opening hole is provided in the cylinder and the opening hole may be provided with a sealing plug.

[0015] In this case, it is possible to process a lateral hole in each cylinder and to form the suction flow paths by inserting a processing tool toward the compression chambers radially inward from outer peripheral surfaces of the cylinders. In addition, since the opening holes are in a state of being sealed by the sealing plugs after the lateral holes as the suction flow paths are processed, it is possible to avoid that a refrigerant that flows through the connection pipe flows out of the cylinders through the opening holes while easily processing the suction flow paths.

[0016] (5) In the rotary compressor described in (3) or (4), an inner diameter of the main pipe and an inner diameter of the connection pipe may be the same as each other and the inner diameter of the main pipe and the inner diameter of the connection pipe may be larger than an inner diameter of the suction flow path.

[0017] According to such a configuration, the inner diameter of each of the main pipe and the connection pipe

constituting a flow path for the refrigerant supplied into the suction flow paths of the plurality of cylinders can be made larger than the inner diameter of the suction flow paths of the cylinders. Therefore, a large amount of the refrigerant can be supplied to each compression chamber and the compression efficiency can be improved.

[0018] (6) In the rotary compressor described in any one of (3) to (5), an inner diameter of the suction flow path provided in one of the cylinders that is on an upper side may be equal to or smaller than an inner diameter of the suction flow path provided in the other of the cylinders that is on a lower side.

[0019] According to such a configuration, a large amount of the refrigerant flowing through the inside of the suction pipe is not supplied to the compression chamber of the cylinder on the upper side. Therefore, the refrigerant can be sufficiently supplied to the compression chamber of the cylinder on the lower side and thus insufficiency of the amount of the refrigerant supplied can be suppressed and a decrease in compression efficiency can be suppressed.

Advantageous Effects of Invention

[0020] With the rotary compressor according to each aspect of the present invention, it is possible to reduce vibration by reducing the thickness of the separator plate without a decrease in compression efficiency in a rotary compressor including a plurality of cylinders.

Brief Description of Drawings

[0021]

Fig. 1 is a vertical cross-sectional view showing the configuration of a rotary compressor according to a first embodiment of the present invention.

Fig. 2 is a vertical cross-sectional view showing main components in the vicinity of a rotary compression portion of the rotary compressor shown in Fig. 1.

Description of Embodiments

[0022] Hereinafter, a rotary compressor according to an embodiment of the present invention will be described with reference to the drawings. The embodiment shows one aspect of the present invention and is not to limit the present invention and any change can be made within the scope of the technical idea of the present invention.

[0023] As shown in Fig. 1, a rotary compressor according to the present embodiment (hereinafter, simply referred to as compressor 1) is, for example, a vertical hermetic rotary compressor which is used for an air conditioner, a freezer, or the like.

[0024] The compressor 1 includes a housing 2, a rotary shaft 3, an upper bearing 4A, a lower bearing 4B, an electric motor 5, a rotary compression portion 6, a scroll compression portion 10, and a suction pipe 7. The rotary shaft 3 extends along an axis (rotational axis O which

will be described later). The upper bearing 4A and the lower bearing 4B support the rotary shaft 3 such that the rotary shaft 3 is rotatable around the rotational axis O. The electric motor 5 rotates the rotary shaft 3. The rotary compression portion 6 compresses a refrigerant by means of rotation of the rotary shaft 3. Through the suction pipe 7, the refrigerant can be introduced into compression chambers 63A and 63B of the rotary compression portion 6.

[0025] Although the compressor 1 of the present embodiment is a two-stage compressor that further includes the scroll compression portion 10 above the rotary compression portion 6, the scroll compression portion 10 does not need to be provided.

[0026] Here, the central axis of the housing 2 and the rotary shaft 3 are disposed on a common axis extending in the vertical direction (vertical direction) and the common axis will be referred to as the rotational axis O. The rotary shaft 3 is disposed such that a direction in which the rotary shaft 3 extends is parallel to the vertical direction and is accommodated in the housing 2 such that the rotary shaft 3 can rotate around the rotational axis O.

[0027] The housing 2 is a hermetic housing, extends in the vertical direction, and accommodates the rotary shaft 3, the bearings 4A and 4B, the electric motor 5, and the rotary compression portion 6. The housing 2 includes a main body portion 21 that has a cylindrical shape, an upper cover portion 22, and a lower cover portion 23, the upper cover portion 22 and the lower cover portion 23 closing upper and lower openings of the main body portion 21. Regarding the housing 2, an opening 24 is formed above cylinders 60 (60A and 60B) at a lower portion of a side wall. The suction pipe 7 is fixed to the opening 24 in a state of being inserted therein with a pipe axis direction being parallel to a horizontal direction.

[0028] At a bottom portion of the housing 2, oil is accumulated and a pool of oil is formed. The position of the liquid surface of the pool of oil at the time of initial enclosure of oil is above the rotary compression portion 6. As a result, the rotary compression portion 6 is driven in the pool of oil.

[0029] The upper cover portion 22 is provided with a discharge pipe 13 that penetrates a peripheral wall member in a thickness direction and communicates with the inside of the housing 2. Through the discharge pipe 13, a compressed refrigerant is discharged to the outside of the housing 2.

[0030] The electric motor 5 is accommodated in a central portion of the housing 2 in the vertical direction. The electric motor 5 includes a rotor 51 and a stator 52. The rotor 51 is fixed to an outer peripheral surface of the rotary shaft 3 and is disposed above the rotary compression portion 6. The stator 52 is disposed to surround an outer peripheral surface of the rotor 51 and is fixed to an inner surface 21a of the main body portion 21 of the housing 2.

[0031] A power source (not shown) is connected to the electric motor 5 via a terminal 9. The electric motor 5 rotates the rotary shaft 3 by using electric power from the

power source.

[0032] The upper bearing 4A and the lower bearing 4B are disposed such that the rotary compression portion 6 is vertically interposed therebetween. The upper bearing 4A and the lower bearing 4B are formed of, for example, a metallic material and are fixed to the cylinders 60 constituting the rotary compression portion 6 by being bolted thereto, for example.

[0033] In addition, the upper bearing 4A is fixed to the housing 2. The rotary shaft 3 is supported by the upper bearing 4A and the lower bearing 4B in the housing 2 such that the rotary shaft 3 can freely rotate around the rotational axis O.

[0034] As shown in Fig. 2, the rotary compression portion 6 is disposed at a bottom portion in the housing 2 while being disposed below the electric motor 5 and compresses a refrigerant. The rotary compression portion 6 includes a plurality of (two in present embodiment) cylinders 60 (60A and 60B) having a disk shape, eccentric shaft portions 61, and piston rotors 62.

[0035] The two cylinders 60A and 60B are vertically disposed in the housing 2 in a direction along the rotational axis O. Here, the cylinder on an upper side will be referred to as the upper cylinder 60A and the cylinder on a lower side will be referred to as the lower cylinder 60B.

[0036] The compression chambers 63A and 63B are formed inside the cylinders 60A and 60B, respectively. The compression chambers 63A and 63B accommodate the piston rotors 62.

[0037] In addition, a separator plate 69 is disposed between the cylinders 60A and 60B to be vertically interposed between the cylinders 60A and 60B. The separator plate 69 separates the compression chambers 63A and 63B from each other.

[0038] Suction holes 64 and 65 (suction flow paths) are formed in the upper cylinder 60A and the lower cylinder 60B, the suction holes 64 and 65 being at positions facing the opening 24 as seen in a top view and communicating with the compression chambers 63A and 63B in the cylinders 60A and 60B via the suction pipe 7. The suction holes 64 and 65 are open at outer peripheral surfaces of the cylinders 60A and 60B and thus opening holes 60x are formed in the cylinders 60A and 60B.

[0039] The eccentric shaft portions 61 are provided at a lower end portion of the rotary shaft 3 and are provided inside the piston rotors 62 in a state of being offset from the central axis of the rotary shaft 3 in a direction orthogonal to the central axis. Each piston rotor 62 has a cylindrical shape of which the outer diameter is smaller than the inner diameter of the cylinder 60, is disposed inside the cylinder 60, and is fixed to the eccentric shaft portion 61 with the eccentric shaft portion 61 inserted therein. The piston rotors 62 rotate eccentrically with respect to the rotational axis O as the rotary shaft 3 rotates.

[0040] The suction holes 64 and 65 are holes through which a refrigerant can flow into the cylinders 60A and 60B.

[0041] Note that, the rotary compression portion 6 is

provided with a discharge hole (not shown). Through the discharge hole, the refrigerant compressed at the rotary compression portion 6 is discharged to an internal space of the housing 2 with a middle pressure, that is, a space above the cylinders 60A and 60B.

[0042] The suction pipe 7 includes a main pipe 70 that is disposed above the upper cylinder 60A and extends in a radial direction of the rotary shaft 3 to penetrate the housing 2 and a connection pipe 71 that extends downward from an inner end 70a of the main pipe 70 that is in the housing 2. An upper end 71a of the connection pipe 71 is connected to the inner end 70a of the main pipe 70. The connection pipe 71 is disposed over the upper cylinder 60A and the lower cylinder 60B to be parallel with the rotational axis O radially outside the compression chambers 63A and 63B.

[0043] The inner end 70a of the main pipe 70 is inserted into a radial outer end portion of the upper bearing 4A. The connection pipe 71 extends downward from the inner end 70a of the main pipe 70 through the inside of the upper bearing 4A.

[0044] The connection pipe 71 is provided with through-holes 71b that radially penetrate the connection pipe 71 to respectively communicate with the suction holes 64 and 65. The through-holes 71b are disposed on the axes of the suction holes 64 and 65. Sealing plugs 72 that seal the suction holes 64 and 65 are fitted into the opening holes 60x of radial outer end portions of the suction holes 64 and 65. The sealing plugs 72 are, for example, metal screws or the like. Accordingly, the compression chambers 63A and 63B and the connection pipe 71 communicate with each other via the suction holes 64 and 65 and the through-holes 71b.

[0045] An inner diameter d1 of the main pipe 70 is set to be larger than thicknesses t1 and t2 as dimensions of the cylinders 60A and 60B in a direction of the rotational axis. In addition, the inner diameter d1 of the main pipe 70 and an inner diameter d2 of the connection pipe 71 are the same as each other and the inner diameter d1 and the inner diameter d2 are larger than inner diameters d3 and d4 of the suction holes 64 and 65.

[0046] Furthermore, the inner diameter d3 of the upper suction hole 64 provided in the upper cylinder 60A may be set to be equal to or smaller than the inner diameter d4 of the lower suction hole 65 provided in the lower cylinder 60B.

[0047] In the compressor 1 configured as described above, a refrigerant is supplied from the main pipe 70 of the suction pipe 7 to the compression chambers 63A and 63B, which are internal spaces of the cylinders 60, via the connection pipe 71 and the suction holes 64 and 65 of the cylinders 60A and 60B.

[0048] Then, due to the eccentric movement of the piston rotors 62, the volumes of the compression chambers 63A and 63B are gradually reduced so that the refrigerant is compressed. Discharge holes (not shown) through which the refrigerant is discharged are formed at predetermined positions in the cylinders 60A and 60B and the

discharge holes are provided with a reed valve (not shown). Accordingly, when the pressure of the compressed refrigerant is increased, the reed valve is pressed and opened so that the refrigerant is discharged to the outside of the cylinders 60A and 60B. The discharged refrigerant is further compressed at the scroll compression portion 10 and then discharged to an external pipe (not shown) from the discharge pipe 13 provided in an upper portion of the housing 2.

[0049] Next, the action and effect of the rotary compressor described above will be described.

[0050] In the compressor 1 according to the present embodiment, as shown in Figs. 1 and 2, the main pipe 70 can be disposed above the cylinders 60A and 60B and connected thereto such that the main pipe 70 communicates with the cylinders 60A and 60B via the connection pipe 71 and the suction holes 64 and 65. That is, a refrigerant can be sucked into each of the compression chambers of the two cylinders 60A and 60B through one suction pipe 7.

[0051] Since the connection pipe 71 is disposed radially outside the compression chambers 63A and 63B, the compression chambers 63A and 63B are not directly connected to each other by the connection pipe 71. Therefore, the refrigerant can be sucked into the compression chambers 63A and 63B through one suction pipe 7 without a decrease in compression efficiency.

[0052] Here, in a case where each of the cylinders 60A and 60B is provided with one suction pipe 7, it is difficult to perform processing when connecting the suction pipes 7 to the housing 2 at positions where the suction pipes 7 penetrate the housing 2. That is, a processing operation between the two suction pipes 7 is difficult. As a result, it is necessary to make the thickness of the separator plate 69 large, dispose the two suction pipes 7 at positions separated from each other in the vertical direction, and increase the distance between the suction pipes 7. Alternatively, it is necessary to make each suction pipe 7 thin in order to provide an interval between the two suction pipes 7.

[0053] However, in the present embodiment, it is possible to reduce the thickness of the separator plate 69 since it is possible to reduce the number of suction pipes 7 to one. As a result, the distance between the two cylinders 60A and 60B can be made small and thus it is possible to reduce vibration caused by the eccentric movement of the piston rotors 62.

[0054] In addition, in the case of the compressor 1 according to the above aspect, the main pipe 70 of the suction pipe 7 is disposed above the plurality of cylinders 60A and 60B and thus the inner diameter d1 of the main pipe 70 is not limited to the thickness of the cylinders 60A and 60B or the separator plate 69. Similarly, the inner diameter d2 of the connection pipe 71 is not also limited to the thickness of the cylinders 60A and 60B or the separator plate 69. As a result, the inner diameters d1 and d2 of the main pipe 70 and the connection pipe 71 can be made large. In addition, in the present embodiment,

the inner diameter d_1 of the main pipe 70 of the suction pipe 7 and the inner diameter d_2 of the connection pipe 71 are the same as each other and are set to be larger than the inner diameter of the suction holes 64 and 65. As a result, a larger amount of refrigerant can be compressed and the compression efficiency can be improved.

[0055] Furthermore, in the present embodiment, the suction holes 64 and 65 communicating with the connection pipe 71 are provided in the cylinders 60A and 60B and thus the compression efficiency is improved since a refrigerant efficiently branches and flows into the compression chambers 63A and 63B of a pair of the cylinders 60A and 60B from one suction pipe 7.

[0056] In addition, in the present embodiment, it is possible to process lateral holes in the cylinders 60A and 60B and to form the suction holes 64 and 65 by inserting a processing tool such as a drill into outer peripheral surfaces of the cylinders 60A and 60B from a radial outer side. In addition, since the opening holes 60x are in a state of being sealed by the sealing plugs 72 after the lateral holes are processed, it is possible to avoid that a refrigerant that is supplied from the main pipe 70 and flows through the connection pipe 71 flows out of the cylinders 60A and 60B without being directed to the compression chambers 63A and 63B.

[0057] In addition, in a case where the inner diameter d_3 of the upper suction hole 64 provided in the upper cylinder 60A is equal to or smaller than the inner diameter d_4 of the lower suction hole 65 provided in the lower cylinder 60B, a large part of a refrigerant that flows through the inside of the suction pipe 7 is not supplied to the compression chamber 63A of the upper cylinder 60A. Therefore, the refrigerant can be sufficiently supplied to the compression chamber 63B of the lower cylinder 60B as well, insufficiency of the amount of the refrigerant supplied to the lower cylinder 60B can be prevented, and a decrease in compression efficiency can be avoided.

[0058] Hereinabove, the embodiment of the rotary compressor according to the present invention has been described. However, the present invention is not limited to the above-described embodiment and appropriate modification can be made without departing from the spirit of the present invention.

[0059] For example, in the present embodiment, the twin rotary type compressor 1 including the two cylinders 60A and 60B has been described as a subject. However, the compressor 1 is not limited to a twin rotary type compressor and may include a larger number of cylinders.

[0060] In addition, in the present embodiment, a configuration in which the main pipe 70 of the suction pipe 7 is disposed above the cylinders 60A and 60B, extends in the radial direction of the rotary shaft 3, and communicates with the compression chambers 63A and 63B has been described. However, the main pipe 70 may be disposed below the cylinders 60A and 60B.

[0061] In addition, in the above-described embodiment, the inner diameter d_1 of the main pipe 70, the inner

diameter d_2 of the connection pipe 71, the inner diameters d_3 and d_4 of the suction holes 64 and 65 of the cylinders 60A and 60B, and the thicknesses t_1 and t_2 of the cylinders 60A and 60B are set with respect to each part. However, the present invention is not limited thereto.

[0062] That is, the inner diameter d_1 of the main pipe 70 may not be larger than the thickness of the cylinders 60A and 60B. In addition, the inner diameter d_1 of the main pipe 70 and an inner diameter d_2 of the connection pipe 71 may not be the same as each other and the inner diameters d_1 and d_2 may not be larger than the inner diameter of the suction holes 64 and 65. Furthermore, the inner diameter d_3 of the suction hole 64 provided in the upper cylinder 60A may be set to be equal to or smaller than the inner diameter d_4 of the suction hole 65 provided in the lower cylinder 60B.

[0063] In addition, in the present embodiment, a configuration in which the suction holes 64 and 65 are provided and the sealing plugs 72 are provided in the opening holes 60x of the suction holes 64 and 65 has been described. However, a cooling channel that connects the connection pipe 71 and the compression chambers 63A and 63B may be formed in the cylinders 60A and 60B without providing the opening holes 60x and the sealing plugs 72.

[0064] Furthermore, the shapes, the sizes, and the like of the housing 2, the rotary shaft 3, the upper bearing 4A, the lower bearing 4B, the electric motor 5, the rotary compression portion 6 (cylinders 60, eccentric shaft portions 61, and piston rotors 62), the scroll compression portion 10, and the suction pipe 7 can be set appropriately.

[0065] In addition, without departing from the spirit of the present invention, the components in the above embodiments can be appropriately replaced with known components and the above-described embodiments may be appropriately combined with each other.

40 Industrial Applicability

[0066] According to the rotary compressor including a plurality of cylinders of the present invention, vibration can be reduced without a decrease in compression efficiency.

Reference Signs List

50 [0067]

- | | |
|-----|--|
| 1: | compressor (rotary compressor) |
| 2: | housing |
| 3: | rotary shaft |
| 4A: | upper bearing |
| 4B: | lower bearing |
| 5: | electric motor |
| 6: | rotary compression portion (compression portion) |

- 7: suction pipe
- 9: terminal
- 10: scroll compression portion
- 21: main body portion
- 60: cylinder
- 60x: opening hole
- 60A: upper cylinder
- 60B: lower cylinder
- 61: eccentric shaft portion
- 62: piston rotor
- 63A, 63B: compression chamber
- 64, 65: suction holes
- 69: separator plate
- 70: main pipe
- 71: connection pipe
- 71a: upper end
- 71b: through-hole
- 72: sealing plug
- O: rotational axis (axis)

Claims

1. A rotary compressor comprising:

a rotary shaft that extends along an axis;
 a bearing that supports the rotary shaft such that the rotary shaft is rotatable around the axis;
 a motor that rotates the rotary shaft;
 a rotary compression portion that compresses a refrigerant by means of rotation of the rotary shaft;
 a housing that accommodates the rotary shaft, the bearing, the motor, and the rotary compression portion; and
 a suction pipe through which the refrigerant is introduced into compression chambers of the rotary compression portion,
 wherein the rotary compression portion includes

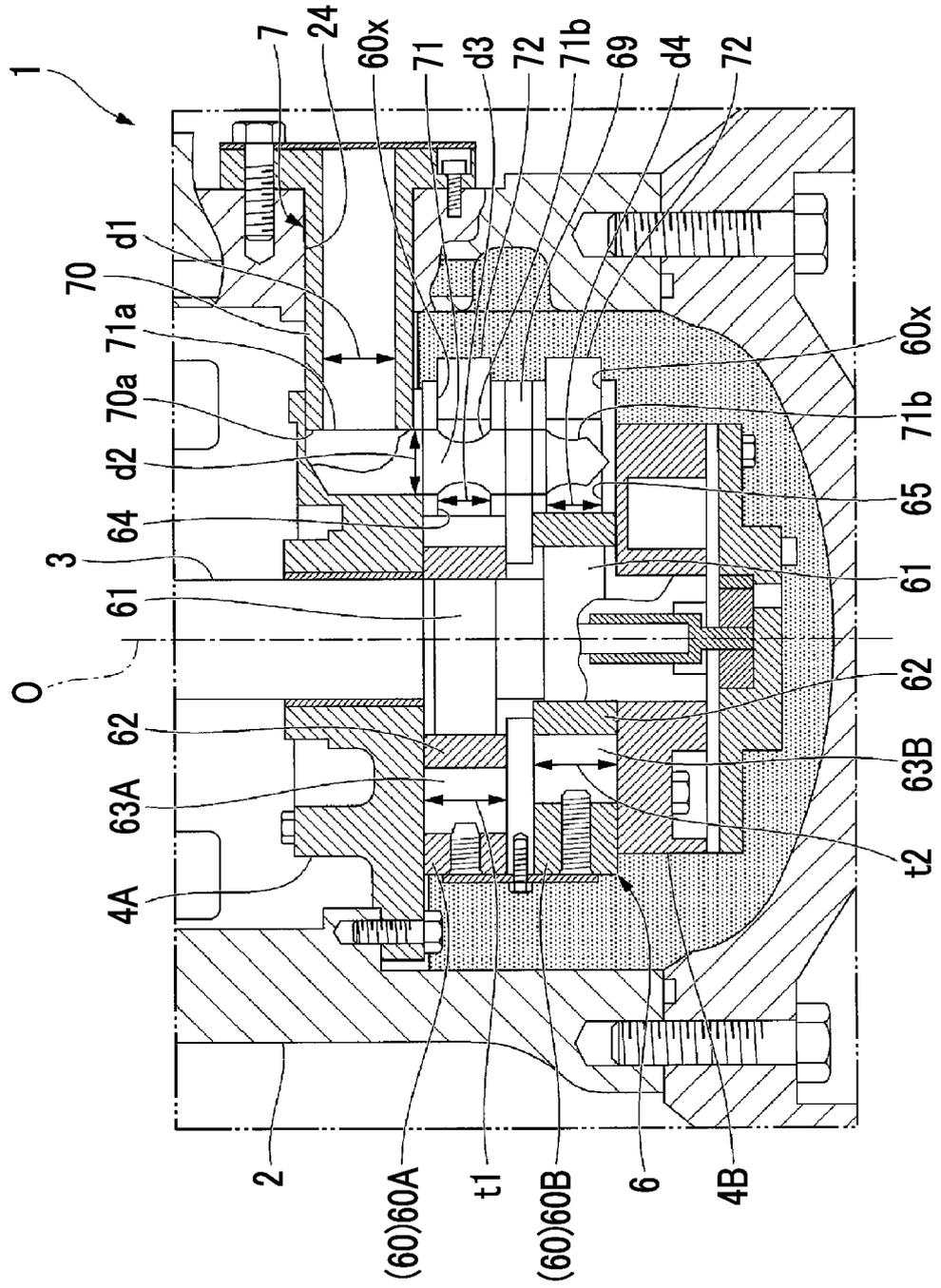
a plurality of cylinders that form the compression chambers and are disposed to be arranged in a vertical direction, and
 a separator plate that is disposed between the plurality of cylinders, and

the suction pipe includes

a main pipe that is disposed above or below the cylinders and extends to penetrate the housing in a radial direction of the rotary shaft, and
 a connection pipe that is connected to the main pipe, extends in an axial direction of the rotary shaft, is disposed over the plurality of cylinders radially outside the compression chambers of the plurality of cylinders, and communicates with each of the com-

- pression chambers.
- 2. The rotary compressor according to claim 1, wherein an inner diameter of the suction pipe is larger than a thickness of the cylinder.
 - 3. The rotary compressor according to claim 1 or 2, wherein each of the plurality of cylinders is provided with a suction flow path that extends in the radial direction and through which the compression chamber and the connection pipe communicate with each other.
 - 4. The rotary compressor according to claim 3, wherein the suction flow path is open to an outer peripheral surface of the cylinder so that an opening hole is provided in the cylinder, and the opening hole is provided with a sealing plug.
 - 5. The rotary compressor according to claim 3 or 4, wherein an inner diameter of the main pipe and an inner diameter of the connection pipe are the same as each other and the inner diameter of the main pipe and the inner diameter of the connection pipe are larger than an inner diameter of the suction flow path.
 - 6. The rotary compressor according to any one of claims 3 to 5, wherein an inner diameter of the suction flow path provided in one of the cylinders that is on an upper side is equal to or smaller than an inner diameter of the suction flow path provided in the other of the cylinders that is on a lower side.

FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/017646

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F04C18/356(2006.01)i, F04C29/00(2006.01)i, F04C29/12(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)

Int.Cl. F04C18/356, F04C29/00, 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 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

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	JP 2010-150949 A (DAIKIN INDUSTRIES, LTD.) 08 July 2010, paragraphs [0002], [0003], [0022]-[0058], [0062], fig. 1-7 (Family: none)	1-3
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 134213/1982 (Laid-open No. 39794/1984) (MITSUBISHI HEAVY INDUSTRIES, LTD.) 14 March 1984, specification, page 1, lines 13-15, page 6, lines 5-17, fig. 3, 4 (Family: none)	1-6

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

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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3-4-3, Kasumigaseki, Chiyoda-ku,
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 92135/1984 (Laid-open No. 9584/1986) (SANYO ELECTRIC CO., LTD.) 21 January 1986, specification, page 3, liens 4-11, fig. 4 (Family: none)	4, 6
Y	JP 8-270580 A (SANYO ELECTRIC CO., LTD.) 15 October 1996, paragraph [0004] (Family: none)	6
Y	JP 2003-120529 A (TOYOTA INDUSTRIES CORPORATION) 23 April 2003, paragraph [0038] (Family: none)	6
A	CN 102644597 A (GUANGDONG MIDEA TOSHIBA COMPRESSOR CORPORATION) 22 August 2012, paragraphs [0029]-[0032], fig. 3, 4 (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013227957 A [0003]