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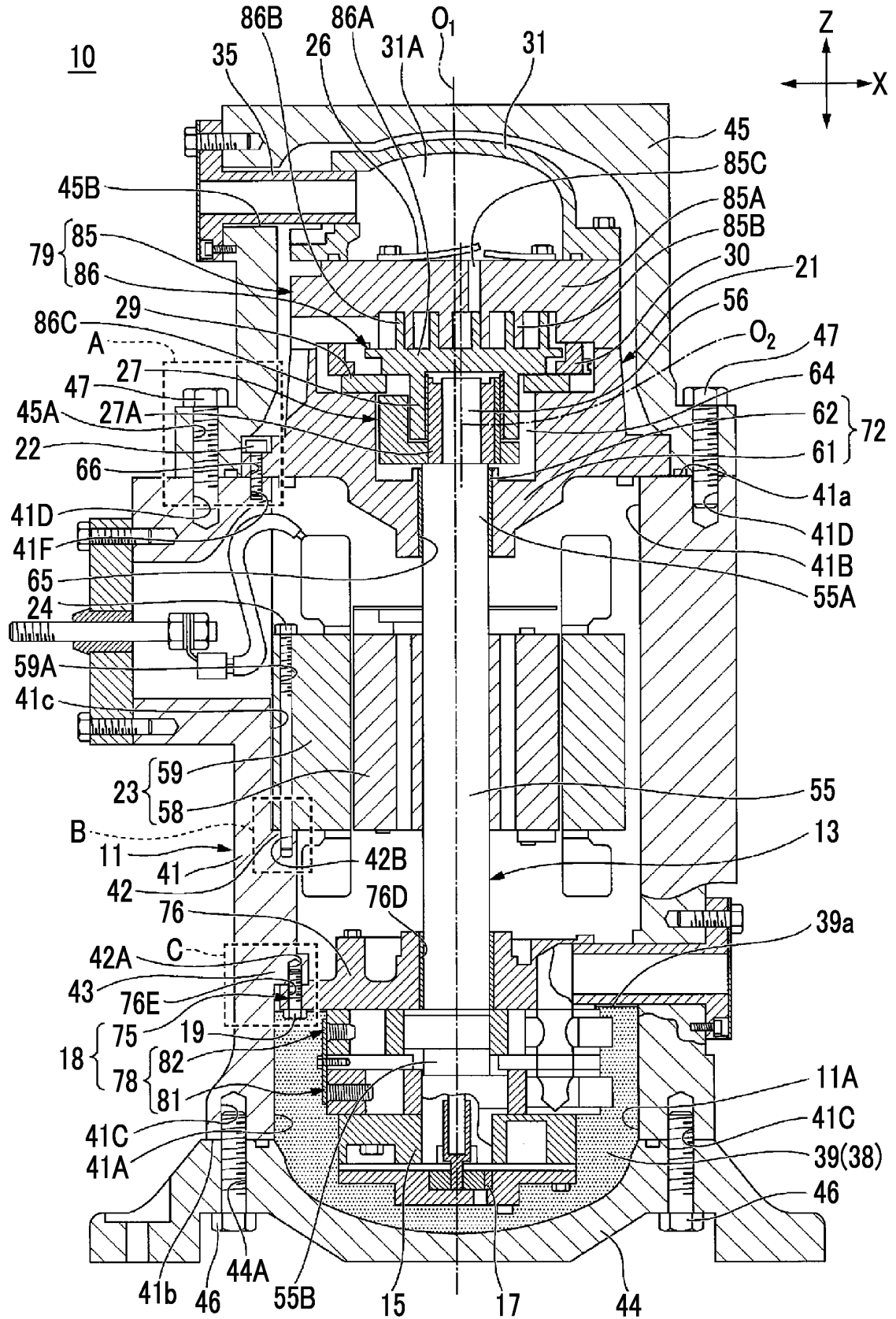
(54) **COMPRESSOR**

(57) A compressor equipped with: a housing (11) that includes a housing main body (41) having a first open end (41A) arranged on one side in the axial direction and a second open end (41B) arranged on the other side in the axial direction, a first cover section (44) secured to the housing main body (41) by first bolts (46) from the one side in the axial direction so as to cover the first open end (41A), and a second cover section (45) secured to

the housing main body (41) by second bolts (47) from the other side in the axial direction so as to cover the second open end (41B); a first compression mechanism (18) secured to the housing main body (11) by a third bolt (19) from the one side in the axial direction; and a second compression mechanism (21) secured to the housing main body (41) by a fourth bolt (22) from the other side in the axial direction.

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FIG. 1



Description

Technical Field

5 **[0001]** The present invention relates to a compressor.

Background Art

10 **[0002]** As a compressor, for example, there is a compressor disclosed in PTL 1.

[0003] The compressor disclosed in PTL 1 includes a housing, a rotary shaft, a scroll compression mechanism, and a motor.

[0004] The housing extends in a vertical direction. The housing has a tubular housing main body, a first lid portion that closes a lower end of the housing main body, and a second lid portion that closes an upper end of the housing main body. The first and second lid portions are respectively fixed to the housing main body by a welding method.

15 **[0005]** The rotary shaft is housed in the housing and extends in the vertical direction.

[0006] The scroll compression mechanism is housed at an upper portion in the housing 11. The scroll compression mechanism has a scroll compression portion and a bearing portion. The scroll compression mechanism is provided at an upper end portion of the rotary shaft.

[0007] The motor is housed in the housing and drives the scroll compression portion by rotating the rotary shaft.

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Citation List

Patent Literature

25 **[0008]** [PTL 1] Japanese Unexamined Patent Application, First Publication No. 2005-180180

Summary of Invention

Technical Problem

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[0009] However, as in PTL 1, when the second lid portion and the first lid portion are fixed to the housing main body by using the welding method, there is a possibility that it is difficult to easily perform the maintenance of the components of the compressor housed in the housing including the scroll compression portion.

[0010] Thus, an object of the present invention is to provide a compressor capable of easily performing the maintenance of components of a compressor housed in a housing including a compression mechanism. Solution to Problem

[0011] In order to solve the above problems, a compressor according to one aspect of the present invention includes a rotary shaft that extends in an axis direction and rotates around an axis; a housing that extends in the axis direction and houses the rotary shaft; a motor having a motor rotor that is provided on an outer peripheral surface of the rotary shaft and a motor stator that is provided in the housing so as to surround the motor rotor; a first compression mechanism that is housed in the housing and is disposed at one end portion of the rotary shaft to compress a refrigerant; and a second compression mechanism that is housed in the housing and is disposed at the other end portion of the rotary shaft to further compress the refrigerant compressed by the first compression mechanism. The housing includes a housing main body formed in a tubular shape and having a first open end disposed on one side in the axis direction and a second open end disposed on the other side in the axis direction, a first lid portion fixed to the housing main body by a first bolt from one side in the axis direction so as to close the first open end, and a second lid portion fixed to the housing main body by a second bolt from the other side in the axis direction so as to close the second open end. The first compression mechanism is fixed to the housing main body by a third bolt from the one side in the axis direction. The second compression mechanism is fixed to the housing main body by a fourth bolt from the other side in the axis direction.

40 **[0012]** According to the present invention, by including the first lid portion fixed to the housing main body by the first bolt from the one side in the axis direction to close the first open end and the first compression mechanism fixed to the housing main body by the third bolt from the one side in the axis direction, it is possible to easily attach and detach the first lid portion and the first compression mechanism with respect to the housing main body.

[0013] Accordingly, the maintenance of the first compression mechanism and the components of the compressor disposed on the first compression mechanism side and housed in the housing can be easily performed.

55 **[0014]** Additionally, by including the second lid portion fixed to the housing main body by the second bolt from the other side in the axis direction to close the second open end and the second compression mechanism fixed to the housing main body by the fourth bolt from the other side in the axis direction, it is possible to easily attach and detach

the second lid portion and the second compression mechanism with respect to the housing main body.

[0015] Accordingly, the maintenance of the second compression mechanism and the components of the compressor disposed on the second compression mechanism side and housed in the housing can be easily performed.

[0016] That is, the maintenance of the components of the compressor housed in the housing including the first and second compression mechanisms can be easily performed.

[0017] Additionally, in the compressor according to the one aspect of the present invention, the first compression mechanism includes a first bearing portion that rotatably supports one end portion of the rotary shaft, and a first compression portion that is fixed to the first bearing portion and compresses the refrigerant, and the first bearing portion is fixed to the housing main body by the third bolt.

[0018] In this way, by configuring the first compression mechanism to have the first bearing portion and the first compression portion and fixing the first bearing portion to the housing main body by the third bolt, the first bearing portion and the first compression portion can be attached and detached as one structure.

[0019] Additionally, in the compressor according to the one aspect of the present invention, the second compression mechanism may include a second bearing portion that rotatably supports the other end portion of the rotary shaft, and a second compression portion that is fixed to the second bearing portion and compresses the refrigerant, and the second bearing portion may be fixed to the housing main body by the fourth bolt.

[0020] In this way, by configuring the second compression mechanism to have the second bearing portion and the second compression portion and fixing the second bearing portion to the housing main body by the fourth bolt, the second bearing portion and the second compression portion can be attached and detached as one structure.

[0021] Additionally, in the compressor according to one aspect of the present invention, the housing may extend in a vertical direction, the first compression portion may be a rotary compression portion that is disposed at a bottom portion in the housing, and the second compression portion may be a scroll compression portion that is disposed at an upper portion in the housing.

[0022] In this way, the invention may be applied to a vertical compressor having the rotary compression portion as the first compression portion, the scroll compression portion as the second compression portion, and the housing extending in the vertical direction.

[0023] Additionally, in the compressor according to the one aspect of the present invention, the housing may have a motor stator support that protrudes radially inward from an inner peripheral surface of the housing main body and supports a lower surface of the motor stator, and the motor stator is fixed to the motor stator support by a fifth bolt from the other side in the axis direction.

[0024] By having the motor stator support and the fifth bolt having such a configuration, the motor stator in the axis direction can be easily positioned when the motor stator is installed in the housing.

[0025] Additionally, in the compressor according to the one aspect of the present invention, the housing main body may have an end surface that is disposed on the other side in the axis direction, the end surface may be a plane orthogonal to the axis direction, the second lid portion may be in contact with an outer region of the end surface disposed outside an inner region of the end surface so as to expose the inner region, a bolt hole for fastening the fourth bolt may be formed in the inner region, and a bolt hole for fastening the second bolt may be formed in the outer region.

[0026] By forming the bolt hole for fastening the fourth bolt and the bolt hole for fastening the second bolt on the same end surface (same plane) in this way, these bolt holes can be easily formed, and the number of flattened parts can be reduced.

[0027] Additionally, in the compressor according to one aspect of the present invention, the motor stator support may be configured integrally with the housing main body, and the housing main body, the motor stator support, the first lid portion, and the second lid portion may be cast products.

[0028] By using the cast products as the housing main body, the motor stator support, the first lid portion, and the second lid portion in this way, the housing main body, the motor stator support, the first lid portion, and the second lid portion having complicated shapes can be easily formed.

Advantageous Effects of Invention

[0029] According to the present invention, the maintenance of the components of the compressor housed in the housing including the first and second compression mechanisms can be easily performed.

Brief Description of Drawings

[0030]

Fig. 1 is a cross-sectional view schematically showing a compressor according to an embodiment of the present invention.

Fig. 2 is an enlarged cross-sectional view of a portion of the compressor shown in Fig. 1 surrounded by a region A.

Fig. 3 is an enlarged cross-sectional view of a portion of the compressor shown in Fig. 1 surrounded by a region B.

Fig. 4 is an enlarged cross-sectional view of a portion of the compressor shown in Fig. 1 surrounded by a region C.

5 Description of Embodiments

[0031] Hereinafter, embodiments to which the present invention is applied will be described in detail with reference to the drawings.

10 [Embodiment]

[0032] A compressor 10 according to an embodiment of the present invention will be described with reference to Figs. 1 to 4.

[0033] In Fig. 1, O_1 represents an axis of a rotary shaft main body 55 (hereinafter, referred to as "axis O_1 "), and O_2 represents indicates an axis of the eccentric shaft portion 56 (hereinafter, referred to as "axis O_2 ").

[0034] Additionally, in Fig. 1, an X direction indicates a radial direction of the compressor 10, a Z direction indicates an axis direction (vertical direction) orthogonal to the X direction, and A to C indicate regions, respectively.

[0035] Additionally, in Fig. 1, a lower side of a paper surface indicates one side in a direction of the axis O_1 (hereinafter, referred to as "one side in the axis direction"), and an upper side of the paper surface indicates the other side in the direction of the axis O_1 (hereinafter, referred to as "the other side in the axis direction"). In Fig. 1, a two-cylinder rotary compression portion 78 is taken as an example of a first compression portion constituting a first compression mechanism 18.

[0036] In Fig. 2, D represents a region (hereinafter referred to as "inner region D") of an upper end surface 41a where a fourth bolt hole 41F is formed, and E represents a region (hereinafter, referred to as "outer region E") of the upper end surface 41a which is disposed outside the inner region D and where the second bolt hole 41D is formed.

[0037] In Figs. 1 to 4, the same components are designated by the same reference signs.

[0038] The compressor 10 includes a housing 11, a rotary shaft 13, a lower bearing portion 15, an oil supply pump 17, a first compression mechanism 18, a third bolt 19, a second compression mechanism 21, a fourth bolt 22, a motor 23, a fifth bolt 24, an discharge valve 26, a bush assembly 27, a thrust plate 29, an Oldham ring 30, a cover 31, and a discharge pipe 35.

[0039] The housing 11 has a semi-sealed structure. An oil reservoir 39 formed by accumulation of oil 38 is disposed at a bottom portion 11A in the housing 11.

[0040] The housing 11 includes a housing main body 41, a motor stator support 42, a first compression mechanism support 43, a first lid portion 44, a second lid portion 45, a first bolt 46, and a second bolt 47.

[0041] The housing main body 41 is formed in a tubular shape and extends in the Z direction. The housing main body 41 has a first open end 41A disposed on one side in the axis direction, a second open end 41B disposed on the other side in the axis direction, a first bolt hole 41C, a second bolt hole 41D, and a fourth bolt hole 41F.

[0042] The housing main body 41 has an upper end surface 41a (end surface) disposed on the other side in the axis direction and a lower end surface 41b disposed on one side in the axis direction. The upper end surface 41a and the lower end surface 41b are planes orthogonal to the Z direction.

[0043] A plurality of the first bolt holes 41C are formed at a lower end portion of the housing main body 41. Each first bolt hole 41C is formed so as to extend upward (the other side in the axis direction) from the lower end surface 41b. The plurality of first bolt holes 41C are disposed at intervals in a circumferential direction of the housing main body 41.

[0044] A plurality of the second bolt holes 41D are formed at an upper end portion of the housing main body 41. The plurality of second bolt holes 41D are disposed at intervals in the circumferential direction of the housing main body 41. Each second bolt hole 41D is formed so as to extend downward (one side in the axis direction) from the upper end surface 41a.

[0045] A plurality of the fourth bolt holes 41F are formed in an inner region D disposed inside an outer region E where the second bolt holes 41D are formed, in the upper end portion of the housing main body 41.

[0046] The plurality of fourth bolt holes 41F are disposed at intervals in the circumferential direction of the housing main body 41. The fourth bolt hole 41F is formed so as to extend downward (one side in the axis direction) from the upper end surface 41a.

[0047] That is, the plurality of second and fourth bolt holes 41D and 41F are formed on the upper end surface 41a that is the same plane.

[0048] In this way, by forming the plurality of second and fourth bolt holes 41D and 41F on the upper end surface 41a that is the same plane, the plurality of second and fourth bolt holes 41D and 41F can be easily formed, and the number of flattened parts can be reduced.

[0049] The first lid portion 44 is disposed directly below the housing main body 41 so as to come into contact with the

lower end surface 41b. The first lid portion 44 closes the first open end 41A.

[0050] A plurality of bolt holes 44A are formed in the first lid portion 44. Each bolt hole 44A is formed so as to penetrate a portion of the first lid portion 44 facing the first bolt hole 41C in the Z direction.

[0051] The second lid portion 45 is disposed on the housing main body 41. The second lid portion 45 comes into contact with the outer region E of the upper end surface 41a where the plurality of second bolt holes 41D are formed and exposes the inner region D of the upper end surface 41a where the plurality of fourth bolt holes 41F are formed. The second lid portion 45 closes the second open end 41B.

[0052] The second lid portion 45 has a plurality of bolt holes 45A and a discharge pipe mounting portion 45B. Each bolt hole 45A penetrates the portion of the first lid portion 44 facing each first bolt hole 41C in the Z direction.

[0053] The motor stator support 42 is provided on an inner peripheral surface 41c of the housing main body 41. The motor stator support 42 is configured integrally with the housing main body 41. The motor stator support 42 protrudes radially inward from the inner peripheral surface 41c of the housing main body 41.

[0054] The motor stator support 42 is a member that supports a lower surface 59a side of the motor stator 59. The motor stator support 42 has an upper surface 42a and a fifth bolt hole 42B.

[0055] The upper surface 42a is a plane orthogonal to the Z direction. The upper surface 42a is in contact with the lower surface 59a of the motor stator 59. Accordingly, the motor stator support 42 supports the lower surface 59a of the motor stator 59.

[0056] The first compression mechanism support 43 is provided on the inner peripheral surface 41c of the housing main body 41. The first compression mechanism support 43 is configured integrally with the housing main body 41. The first compression mechanism support 43 protrudes radially inward from the inner peripheral surface 41c of the housing main body 41.

[0057] The shape of the first compression mechanism support 43 can be, for example, a C shape when viewed from the Z direction.

[0058] The first compression mechanism support 43 has a lower surface 43b and a third bolt hole 43A. The lower surface 43b is a plane orthogonal to the Z direction. The lower surface 43b is a surface against which a support 76 constituting the first compression mechanism 18 abuts.

[0059] As the housing main body 41, the motor stator support 42, the first compression mechanism support 43, the first lid portion 44, and the second lid portion 45 described above, for example, cast products may be used.

[0060] By using the cast products as the housing main body 41, the motor stator support 42, the first compression mechanism support 43, the first lid portion 44, and the second lid portion 45 in this way, the housing main body 41, the motor stator support 42, the first compression mechanism support 43, the first lid portion 44, and the second lid portion 45 having complicated shapes can be easily formed.

[0061] A plurality of the third bolt holes 43A are formed at a lower end portion of the first compression mechanism support 43. The plurality of third bolt holes 43A are disposed at intervals in the circumferential direction of the first compression mechanism support 43. Each third bolt hole 43A is formed so as to extend upward (the other side in the axis direction) from the lower surface 43b.

[0062] A plurality of the fifth bolt holes 42B are formed at an upper end portion of the motor stator support 42. The plurality of fifth bolt holes 42B are disposed at intervals in the circumferential direction of the motor stator support 42. Each fifth bolt hole 42B is formed so as to extend downward (one side in the axis direction) from the upper surface 42a.

[0063] The first bolt 46 is fastened to the bolt hole 44 and the first bolt hole 41C from one side in the axis direction. Accordingly, the first lid portion 44 is fixed to the housing main body 41 in a state of being detachable from the housing main body 41 by a plurality of the first bolts 46.

[0064] By fixing the first lid portion 44 to the housing main body 41 using the first bolts 46 from one side in the axis direction in this way, the first lid portion 44 can be easily attached to and detached from the housing main body 41.

[0065] Accordingly, the maintenance of the lower bearing portion 15 and the oil supply pump 17 (components of the compressor 10 housed in the housing 11) disposed at the bottom portion in the housing 11 can be easily performed.

[0066] The second bolt 47 is fastened to the bolt hole 45A and the second bolt hole 41D from the other side in the axis direction. Accordingly, the second lid portion 45 is fixed to the housing main body 41 in a state of being detachable from the housing main body 41 by a plurality of second bolts 47.

[0067] By fixing the second lid portion 45 to the housing main body 41 using the second bolts 47 from the other side in the axis direction in this way, the second lid portion 45 can be easily attached to and detached from the housing main body 41.

[0068] Accordingly, the maintenance of the components of the compressor 10 disposed at the upper portion in the housing 11 can be easily performed.

[0069] The rotary shaft 13 is housed in the housing 11 in a state of extending in the Z direction. The rotary shaft 13 has a rotary shaft main body 55 and an eccentric shaft portion 56.

[0070] The rotary shaft main body 55 has a columnar shape and rotates around the axis O_1 . The rotary shaft main body 55 has an upper end portion 55A and a lower end portion 55B. The lower end portion 55B penetrates the first

compression mechanism 18 in the Z direction.

[0071] The rotary shaft main body 55 having the above configuration is supported in a state of being rotatable by the lower bearing portion 15, a first bearing portion 75 constituting the first compression mechanism 18, and a second bearing portion 72 constituting the second compression mechanism 21.

[0072] The eccentric shaft portion 56 is provided at an upper end of the rotary shaft main body 55. The eccentric shaft portion 56 has the axis O_2 offset (eccentric) with respect to the axis O_1 as a central axis. The eccentric shaft portion 56 is a columnar shaft smaller than the outer diameter of the rotary shaft main body 55.

[0073] When the rotary shaft main body 55 rotates around the axis O_1 , the eccentric shaft portion 56 having such a configuration revolves around the axis O_1 to orbit an orbiting scroll 86 constituting the second compression mechanism 21.

[0074] The lower bearing portion 15 is fixed to a lower side of the first compression mechanism 18. The lower bearing portion 15 rotatably supports an end portion of the rotary shaft 13 on one side in the axis direction (end portion of the rotary shaft main body 55 on one side in the axis direction).

[0075] The oil supply pump 17 is internally provided in the lower bearing portion 15. The oil supply pump 17 supplies a part of the oil 38 reserved at the bottom portion 11A in the housing 11 to a scroll compression portion 79 via a through-hole (not shown) formed in the rotary shaft 13.

[0076] The first compression mechanism 18 is housed at the bottom portion in the housing 11. The first compression mechanism 18 includes the first bearing portion 75, and the two-cylinder rotary compression portion 78 that is a first compression portion.

[0077] The first bearing portion 75 includes a support 76 and a bearing main body 77. The support 76 is a disk-shaped member.

[0078] The support 76 includes an outer portion 76A that comes into contact with the first compression mechanism support 43, an inner portion 76B that is disposed inside the outer portion 76A, a step portion 76C, an insertion hole 76D, and a bolt hole 76E.

[0079] The outer portion 76A has an upper surface 76Aa that comes into contact with a lower surface 43b of the first compression mechanism support 43. The upper surface 76Aa is a plane orthogonal to the Z direction.

[0080] An upper surface of the inner portion 76B protrudes upward from the upper surface 76Aa of the outer portion 76A. Accordingly, the step portion 76C is formed on an upper surface side of a boundary portion between the outer portion 76A and the inner portion 76B.

[0081] By forming the step portion 76C between the upper surface 76Aa of the outer portion 76A, which comes into contact with the lower surface 43b of the first compression mechanism support 43, and the upper surface of the inner portion 76B in this way, the first bearing portion 75 can be disposed at a desired position in the radial direction by the step portion 76C.

[0082] The insertion hole 76D is formed so as to penetrate the center of the inner portion in the Z direction. The insertion hole 76D is a hole for inserting a lower end portion side of the rotary shaft main body 55.

[0083] The bolt hole 76E is formed so as to penetrate the outer portion 76A facing the third bolt hole 42A in the Z direction.

[0084] The bearing main body 77 is provided on an inner peripheral surface of the support 76 that partitions the insertion hole 76D. The bearing main body 77 is disposed between an outer peripheral surface of the rotary shaft main body 55 and the support 76 in the radial direction. The bearing main body 77 supports one end portion of the rotary shaft main body 55 in a rotatable state.

[0085] The two-cylinder rotary compression portion 78 is disposed at the bottom portion 11A in the housing 11 and is immersed in the oil reservoir 39.

[0086] The two-cylinder rotary compression portion 78 is fixed to a lower side of the first bearing portion 75. Accordingly, the first bearing portion 75 and the two-cylinder rotary compression portion 78 are configured integrally with each other.

[0087] The two-cylinder rotary compression portion 78 includes a first rotary compression portion 81 and a second rotary compression portion 82.

[0088] A gas-phase refrigerant (hereinafter, simply referred to as "refrigerant") is supplied to the first rotary compression portion 81 and the second rotary compression portion 82 from an accumulator (not shown) that separates the refrigerant into gas and liquid. The first rotary compression portion 81 and the second rotary compression portion 82 compress the refrigerant supplied from the accumulator.

[0089] The second rotary compression portion 82 is disposed to be stacked on the first rotary compression portion 81. The refrigerants compressed by the first rotary compression portion 81 and the second rotary compression portion 82, respectively, are supplied to the second compression mechanism 21 disposed above the two-cylinder rotary compression portion 78.

[0090] The third bolt 19 is fastened to the bolt hole 76E and the third bolt hole 42A from one side in the axis direction.

[0091] By fixing the first compression mechanism 18 to the housing main body 41 with the third bolt 19 from one side in the axis direction in this way, it is possible to remove the first lid portion 44 from the housing main body 41 and then remove the first compression mechanism 18 from the housing main body 41.

[0092] Accordingly, the maintenance of the first compression mechanism 18 and the components of the compressor

10 disposed on the first compression mechanism 18 side and housed in the housing 11 can be easily performed.

[0093] The second compression mechanism 21 is housed in an upper portion of the housing 11. The second compression mechanism 21 has the second bearing portion 72, and the scroll compression portion 79 that is a second compression portion.

[0094] The second bearing portion 72 has a support 61 and a bearing main body 62.

[0095] The support 61 is a member that supports the bearing main body 62, and is housed in the housing 11. The support 61 is fixed to the housing main body 41 in a state of coming into contact with the inner portion of the upper end surface 41a of the housing main body 41.

[0096] The support 61 is formed with a recessed portion 64, a through-hole 65, and a bolt hole 66.

[0097] The recessed portion 64 is formed at a central portion on an upper side of the support 61 facing the second lid portion 45. The recessed portion 64 is recessed in a direction from the second lid portion 45 toward the first lid portion 44. The recessed portion 64 is a columnar space.

[0098] The through-hole 65 is formed at a central portion on a lower side of the support 61 facing the first lid portion 44. An upper end side of the through-hole 65 communicates with the recessed portion 64. The through-hole 65 is a hole having a columnar shape. The opening diameter of the through-hole 65 is smaller than the opening diameter of the recessed portion 64. The upper end portion 55A of the rotary shaft main body 55 is disposed in the through-hole 65.

[0099] The bolt hole 66 is formed so as to penetrate the support 61 facing the fourth bolt hole 41F in the Z direction.

[0100] The bearing main body 62 is provided on a surface of the support 61 that partitions the through-hole 65. The bearing main body 62 faces an outer peripheral surface of the upper end portion 55A of the rotary shaft main body 55. The bearing main body 62 supports the radial direction of the rotary shaft main body 55 in a rotatable state.

[0101] The scroll compression portion 79 is provided at the upper portion in the housing 11 and is disposed between the cover 31 and the motor 23.

[0102] The scroll compression portion 79 has a fixed scroll 85 and an orbiting scroll 86.

[0103] The fixed scroll 85 is disposed between the cover 31 and the orbiting scroll 86. The fixed scroll 85 has an end plate 85A and a fixed wrap 85B.

[0104] The end plate 85A has a disk shape. The end plate 85A is fixed on the second bearing portion 72 constituting the second compression mechanism 21.

[0105] The end plate 85A has an upper surface, a lower surface, and a discharge port 85C. The discharge port 85C is formed so as to extend in the Z direction so as to penetrate the center of the end plate 85A.

[0106] The discharge port 85C is a through-hole for discharging the refrigerant compressed by the scroll compression portion 79 to the outside of the scroll compression portion 79.

[0107] The fixed wrap 85B protrudes downward from a lower surface of the end plate 85A. The fixed wrap 85B is a wall body formed in a scroll shape when viewed from the direction of the axis O_1 .

[0108] The orbiting scroll 86 is disposed between the fixed scroll 85 and the second bearing portion 72. The orbiting scroll 86 has an end plate 86A, an orbiting wrap 86B, and a boss part 86C.

[0109] The end plate 86A has a disk shape. The end plate 86A is disposed on the support 61 via the thrust plate 29. The end plate 86A is disposed to face the end plate 85A in the Z direction. The end plate 86A has an upper surface, and a lower surface facing the upper surface of the end plate 85A.

[0110] The orbiting wrap 86B is provided on the upper surface of the end plate 86A and protrudes upward. The orbiting wrap 86B is a wall body formed in a scroll shape when viewed from the direction of the axis O_1 .

[0111] The orbiting wrap 86B having the above configuration is disposed so as to mesh with the fixed wrap 85B. Accordingly, a compression chamber for compressing the refrigerant is formed between the orbiting wrap 86B and the fixed wrap 85B. Then, as the orbiting wrap 86B orbits with respect to the fixed scroll 85, the volume of the compression chamber changes, and the refrigerant in the compression chamber is compressed.

[0112] The boss part 86C is provided on the lower surface of the end plate 86A and protrudes downward. The boss part 86C is a member having a cylindrical shape, and a lower side thereof is disposed in the recessed portion 64.

[0113] The scroll compression portion 79 having the above configuration further compresses the refrigerant compressed by the two-cylinder rotary compression portion 78.

[0114] The fourth bolt 22 is fastened to the bolt hole 66 and the fourth bolt hole 41F from the other side in the axis direction.

[0115] The fourth bolt 22 is a bolt for fixing the second compression mechanism 21 to the motor stator support 42 in a state where the second compression mechanism 21 is detachable from the motor stator support 42 (housing 11).

[0116] By fixing the second compression mechanism 21 to the housing main body 41 with the fourth bolt 22 from the other side in the axis direction in this way, it is possible to remove the second lid portion 45 from the housing main body 41 and then remove the second compression mechanism 21 from the housing main body 41.

[0117] Accordingly, the maintenance of the second compression mechanism 21 and the components of the compressor 10 disposed on the second compression mechanism 21 side and housed in the housing 11 can be easily performed.

[0118] The motor 23 is housed in the housing 11 and has a motor rotor 58 and a motor stator 59.

[0119] The motor rotor 58 is fixed to an outer peripheral surface located at an intermediate region of the rotary shaft main body 55 in the Z direction. The motor rotor 58 rotates together with the rotary shaft 13.

[0120] The motor stator 59 is disposed on the motor stator support 42 such that an outer portion of the lower surface 59a of the motor stator 59 comes into contact with the upper surface 42a of the motor stator support 42. The motor stator 59 is disposed outside the motor rotor 58 so as to face an outer peripheral surface of the motor rotor 58.

[0121] A plurality of bolt holes 59A are formed in the motor stator 59. Each bolt hole 59A is formed in the motor stator 59 facing each fifth bolt hole 42B in the Z direction. The bolt hole 59A penetrates the motor stator 59 in the Z direction.

[0122] The fifth bolt 24 is fastened to the bolt hole 59A and the fifth bolt hole 42B from the other side in the axis direction. The fifth bolt 24 is a bolt for fixing the motor stator 59 to the motor stator support 42.

[0123] By having the bolt hole 59A formed in the motor stator 59 described above, the motor stator support 42 in which the fifth bolt hole 42B is formed, and the fifth bolt 24, the motor stator 59 can be easily positioned in the Z direction when the motor stator 59 is installed in the housing 11.

[0124] The bush assembly 27 is provided between the orbiting scroll 86 and the rotary shaft 13. The bush assembly 27 connects the orbiting scroll 86 and the rotary shaft 13 to each other. The bush assembly 27 has a bush 27A provided between the eccentric shaft portion 56 and the boss part 86C.

[0125] The thrust plate 29 is provided between the end plate 86A and the second bearing portion 72. The thrust plate 29 is a member for holding a thrust load generated in the orbiting scroll 86.

[0126] The Oldham ring 30 is provided between the end plate 86A and the end plate 85A. The Oldham ring 30 has a protrusion fitted into grooves (not shown) formed in the end plate 86A and the end plate 85A. The Oldham ring 30 is a member for suppressing the rotation of the orbiting scroll 86 (rotation around the axis O_2) and converting the rotary motion of the rotary shaft main body 55 into an orbiting motion.

[0127] The cover 31 is housed in the housing 11 and is provided on the upper surface of the end plate 85A. The cover 31 forms a discharge chamber 31A between an inner surface of the cover 31 and the upper surface of the end plate 85A.

[0128] When the discharge port 85C is opened by the discharge valve 26, the refrigerant compressed by the scroll compression portion 79 is discharged into the discharge chamber 31A.

[0129] The discharge pipe 35 is provided in the housing 11 in a state of communicating with the discharge chamber 31A. The discharge pipe 35 discharges the refrigerant compressed by the compressor 10 to the outside of the compressor 10.

[0130] According to the compressor 10 of the present embodiment, by fixing the first lid portion 44 to the housing main body 41 in a detachable state with the first bolts 46 from one side in the axis direction and by fixing the first compression mechanism 18 to the housing main body 41 with the third bolt 19 from one side in the axis direction, it is possible to remove the first lid portion 44 from the housing main body 41 and then remove the first compression mechanism 18 from the housing main body 41.

[0131] Accordingly, the maintenance of the first compression mechanism 18 and the components of the compressor 10 disposed on the first compression mechanism 18 side and housed in the housing 11 can be easily performed.

[0132] Additionally, by fixing the second lid portion 45 to the housing main body 41 in a detachable state with the second bolts 47 from the other side in the axis direction and by fixing the second compression mechanism 21 to the housing main body 41 with the fourth bolt 22 from the other side in the axis direction, it is possible to remove the second lid portion 45 from the housing main body 41 and then remove the second compression mechanism 21 from the housing main body 41.

[0133] Accordingly, the maintenance of the second compression mechanism 21 and the components of the compressor 10 disposed on the second compression mechanism 21 side and housed in the housing 11 can be easily performed.

[0134] That is, the maintenance of the components of the compressor 10 housed in the housing 11 including the first and second compression mechanisms 18 and 21 can be easily performed.

[0135] Although the preferred embodiments of the present invention have been described in detail above, the present invention is not limited to such specific embodiments, and various modifications and changes can be made within the spirit of the present invention described within the claims.

[0136] In addition, in the present embodiment, as an example of the compressor 10, a vertical compressor in which the housing 11 and the rotary shaft 13 extend in the vertical direction has been described as an example. However, for example, the present invention is also applicable to a horizontal compressor in which the housing 11 and the rotary shaft 13 extends in a horizontal direction orthogonal to the vertical direction.

[0137] Additionally, in the present embodiment, a case where the two-cylinder rotary compression portion 78 is used as an example of the rotary compression portion has been described as an example. However, instead of this, a single-cylinder rotary compression portion may be used.

Industrial Applicability

[0138] The present invention is applicable to compressors. Reference Signs List

[0139]

	10:	Compressor
	11:	Housing
5	11A:	Bottom portion
	13:	Rotary shaft
	15:	Lower bearing portion
	17:	Oil supply pump
	18:	First compression mechanism
10	19:	Third bolt
	21:	Second compression mechanism
	22:	Fourth bolt
	23:	Motor
	24:	Fifth bolt
15	26:	Discharge valve
	27:	Bush assembly
	27A:	Bush
	29:	Thrust plate
	30:	Oldham ring
20	31:	Cover
	31A:	Discharge chamber
	35:	Discharge pipe
	38:	Oil
	39:	Oil reservoir
25	41:	Housing main body
	41a:	Upper end surface
	41A:	First open end
	41b:	Lower end surface
	41B:	Second open end
30	41C:	Inner peripheral surface
	41C:	First bolt hole
	41D:	Second bolt hole
	41F:	Fourth bolt hole
	42:	Motor stator support
35	42a, 76Aa:	Upper surface
	42B:	Fifth bolt hole
	43:	First compression mechanism support
	43A:	Third bolt hole
	43b, 59a:	Lower surface
40	44:	First lid portion
	44A, 45A, 59A, 66:	Bolt hole
	45:	Second lid portion
	45B:	Discharge pipe mounting portion
	46:	First bolt
45	47:	Second bolt
	55:	Rotary shaft main body
	55A:	Upper end portion
	55B:	Lower end portion
	56:	Eccentric shaft portion
50	58:	Motor rotor
	59:	Motor stator
	61, 76:	Support
	62, 77:	Bearing main body
	64:	Recessed portion
55	65:	Through-hole
	72:	Second bearing portion
	75:	First bearing portion
	76A:	Outer portion

	76B:	Inner portion
	76C:	Step portion
	76D:	Insertion hole
	76E:	Bolt hole
5	78:	Two-stage rotary compression portion
	79:	Scroll compression portion
	81:	First rotary compression portion
	82:	Second rotary compression portion
	85:	Fixed scroll
10	85A, 86A:	End plate
	85B:	Fixed wrap
	85c:	Discharge port
	86:	Orbiting scroll
	86B:	Orbiting wrap
15	86C:	Boss part
	A to C:	Region
	D:	Inner region
	E:	Outer region
20	O ₁ , O ₂ :	Axis

Claims

1. A compressor comprising:

a rotary shaft that extends in an axis direction and rotates around an axis;
 a housing that extends in the axis direction and houses the rotary shaft;
 a motor having a motor rotor that is provided on an outer peripheral surface of the rotary shaft and a motor stator that is provided in the housing so as to surround the motor rotor;
 a first compression mechanism that is housed in the housing and is disposed at one end portion of the rotary shaft to compress a refrigerant; and
 a second compression mechanism that is housed in the housing and is disposed at the other end portion of the rotary shaft to further compress the refrigerant compressed by the first compression mechanism,
 wherein the housing has a housing main body formed in a tubular shape and having a first open end disposed on one side in the axis direction and a second open end disposed on the other side in the axis direction, a first lid portion fixed to the housing main body by a first bolt from one side in the axis direction so as to close the first open end, and a second lid portion fixed to the housing main body by a second bolt from the other side in the axis direction so as to close the second open end,
 the first compression mechanism is fixed to the housing main body by a third bolt from the one side in the axis direction, and
 the second compression mechanism is fixed to the housing main body by a fourth bolt from the other side in the axis direction.

2. The compressor according to claim 1,

wherein the first compression mechanism includes a first bearing portion that rotatably supports one end portion of the rotary shaft, and a first compression portion that is fixed to the first bearing portion and compresses the refrigerant, and
 wherein the first bearing portion is fixed to the housing main body by the third bolt.

3. The compressor according to claim 2,

wherein the second compression mechanism includes a second bearing portion that rotatably supports the other end portion of the rotary shaft, and a second compression portion that is fixed to the second bearing portion and compresses the refrigerant, and
 the second bearing portion is fixed to the housing main body by the fourth bolt.

4. The compressor according to claim 3,

wherein the housing extends in a vertical direction,
the first compression portion is a rotary compression portion that is disposed at a bottom portion in the housing,
and
the second compression portion is a scroll compression portion that is disposed at an upper portion in the housing.

5 5. The compressor according to any one of claims 1 to 4,

wherein the housing has a motor stator support that protrudes radially inward from an inner peripheral surface
of the housing main body and supports a lower surface of the motor stator, and
10 the motor stator is fixed to the motor stator support by a fifth bolt from the other side in the axis direction.

6. The compressor according to any one of claims 1 to 5,

wherein the housing main body has an end surface that is disposed on the other side in the axis direction,
15 the end surface is a plane orthogonal to the axis direction,
the second lid portion is in contact with an outer region of the end surface disposed outside an inner region of
the end surface so as to expose the inner region,
a bolt hole for fastening the fourth bolt is formed in the inner region, and
a bolt hole for fastening the second bolt is formed in the outer region.

20 7. The compressor according to claim 5,

wherein the motor stator support is configured integrally with the housing main body, and
the housing main body, the motor stator support, the first lid portion, and the second lid portion are cast products.

FIG. 1

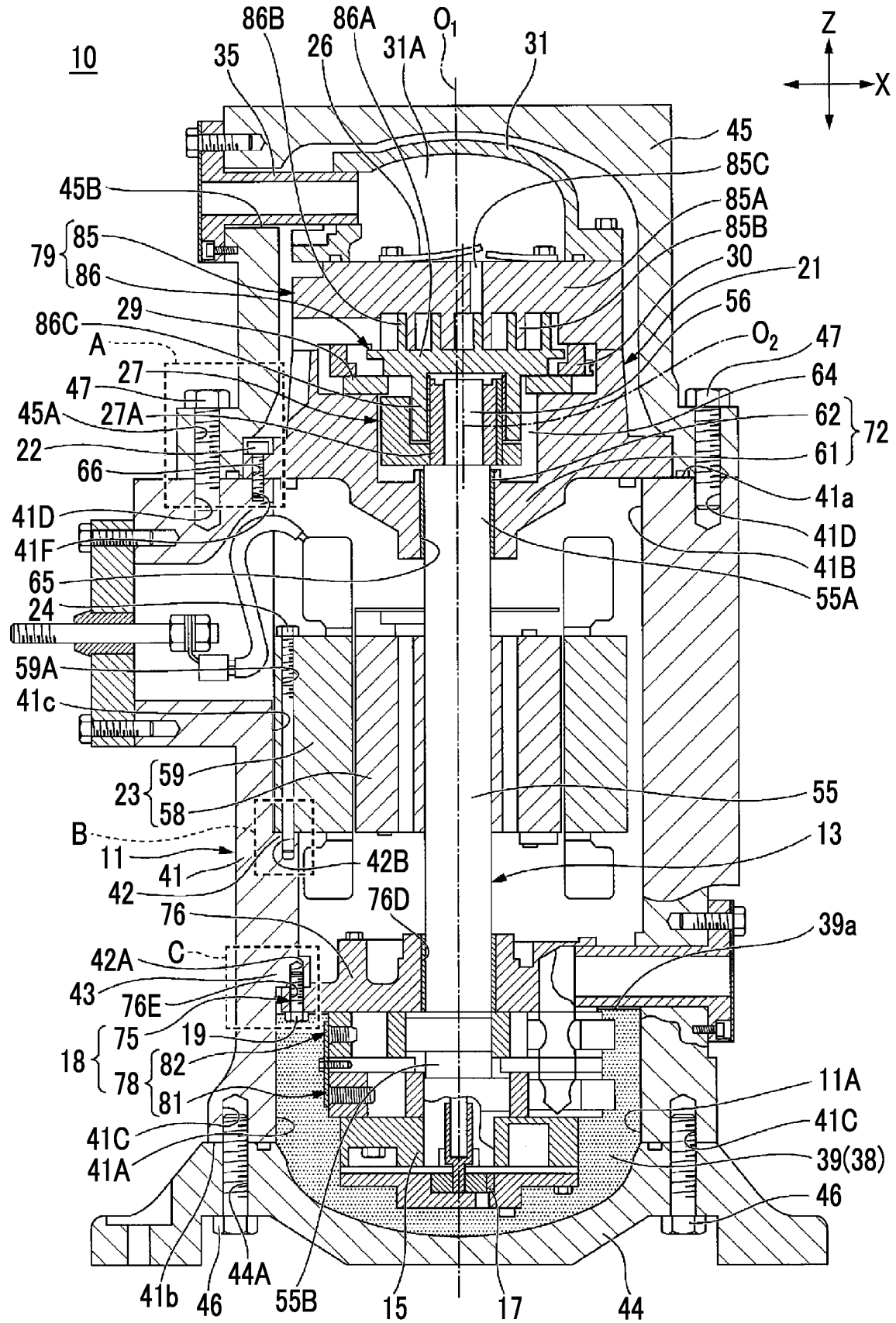


FIG. 2

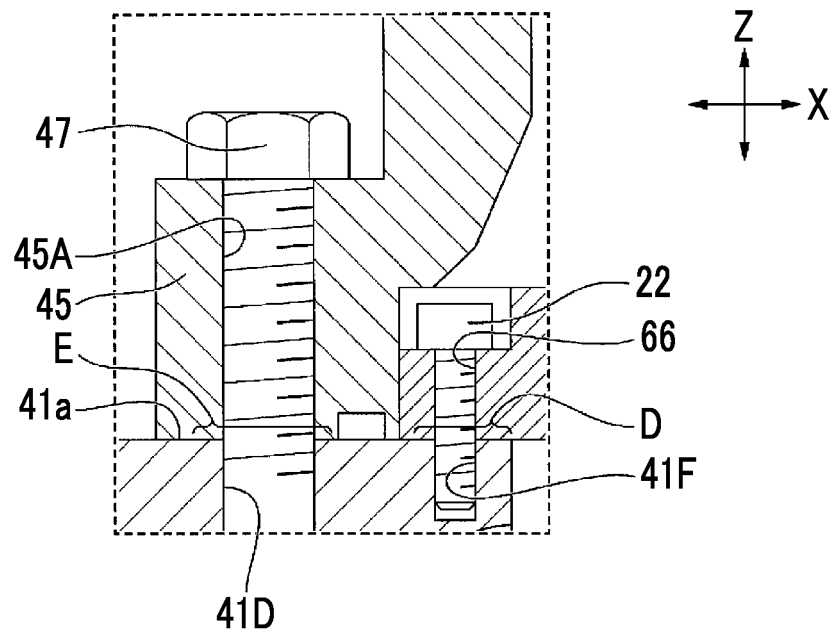


FIG. 3

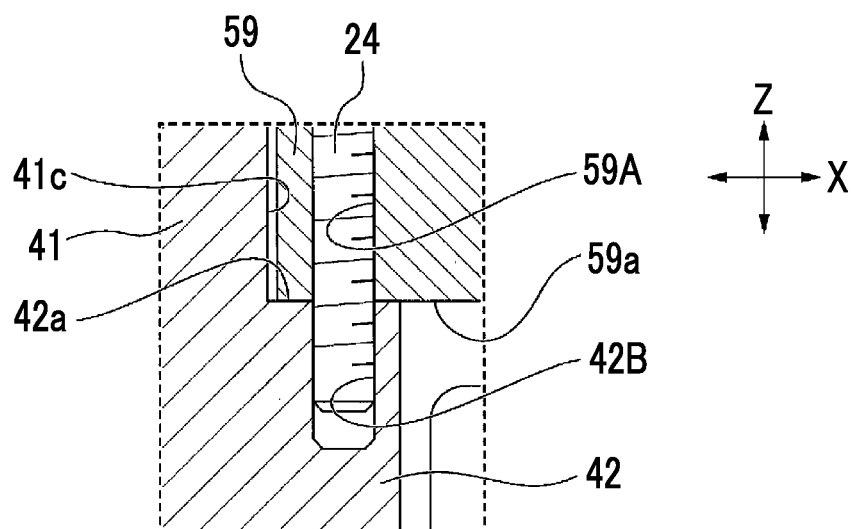
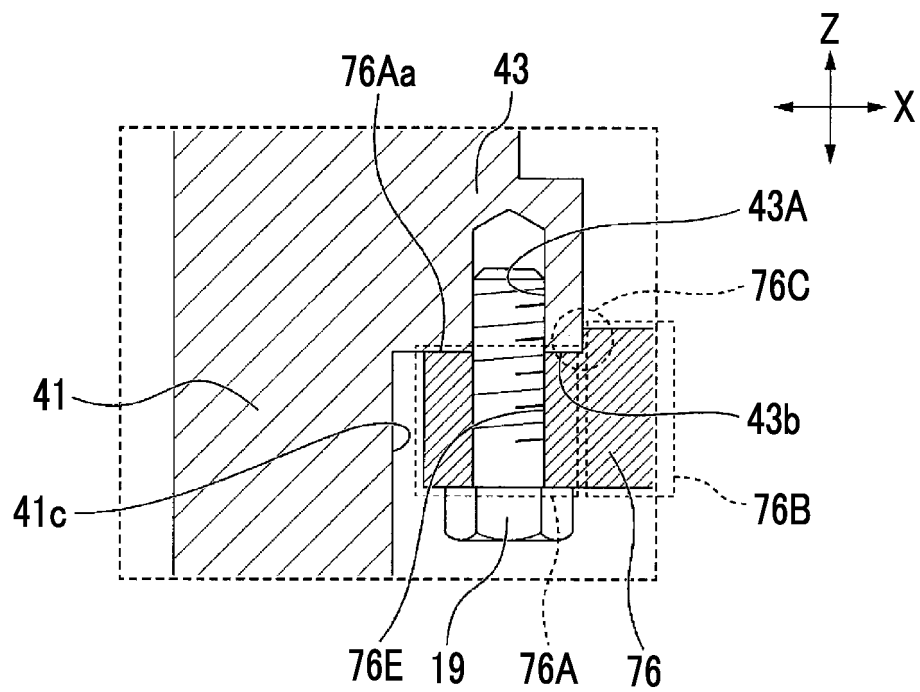


FIG. 4



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/014599

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. F04B39/14 (2006.01) i, F04C29/00 (2006.01) i

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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. F04B39/14, F04C29/00

15

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

20

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-069084 A (SANDEN CORP.) 17 March 2005, paragraphs [0019]-[0021], fig. 1 (Family: none)	1-7
A	JP 07-279865 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 27 October 1995, paragraph [0017], fig. 4 (Family: none)	1-7
A	JP 2018-123691 A (DAIKIN INDUSTRIES, LTD.) 09 August 2018, paragraph [0032] & WO 2018/139354 A1	1-7
A	JP 2009-115017 A (SANYO ELECTRIC CO., LTD.) 28 May 2009, paragraph [0019], fig. 1 (Family: none)	1-7

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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

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Date of the actual completion of the international search
24.06.2019Date of mailing of the international search report
02.07.2019

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/014599

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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.
A	JP 2006-022651 A (CALSONIC COMPRESSOR INC.) 26 January 2006, paragraphs [0061], [0062], fig. 1 (Family: none)	1-7

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2005180180 A [0008]