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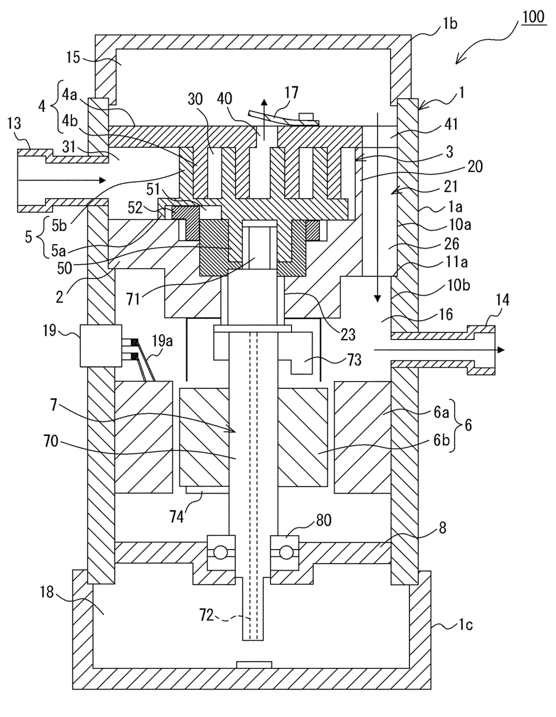
(54) **SCROLL COMPRESSOR**

(57) A scroll compressor includes a shell, a main frame, a fixed scroll, an orbiting scroll, a motor, and a discharge pipe. The shell has therein a refrigerant suction space in which refrigerant suctioned from the outside of the shell is positioned before being suctioned into a compression chamber, a discharge space through which refrigerant compressed in the compression chamber flows out, the discharge space being positioned above the fixed scroll, and a communication passage through which the discharge space and a motor space are in communication with each other. An isolation wall isolating the communication passage from the refrigerant suction space is provided between the main frame and the fixed scroll. A fixed base plate is fixed to an inner wall surface of the shell.

FIG. 1



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Description

Technical Field

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

Background Art

[0002] Scroll compressors have been known as compressors usable for, for example, air-conditioning apparatuses or refrigeration apparatuses. For example, a scroll compressor disclosed in Patent Literature 1 includes a shell, a main frame fixed to an inner wall surface of the shell, a compression mechanism configured to compress refrigerant, and a motor configured to drive the compression mechanism. The compression mechanism includes a fixed scroll that includes a fixed base plate having a first scroll lap, and an orbiting scroll that includes an orbiting base plate having a second scroll lap configured to be engaged with the first scroll lap and that is supported by the main frame such that the orbiting scroll is configured to orbit. A compression chamber in which refrigerant is compressed is formed between the first scroll lap and the second scroll lap in the compression mechanism by engaging the first scroll lap and the second scroll lap with each other. The fixed base plate of the fixed scroll has, along the outer edge thereof, a peripheral wall that projects toward the main frame and that is in contact with an upper surface of the main frame. The peripheral wall of the fixed scroll and the main frame are fixed to each other with a fixing component such as a bolt.

[0003] In the scroll compressor, the inside of the shell is partitioned into a low-pressure chamber and a high-pressure chamber with the compression mechanism interposed therebetween. The motor is disposed in the high-pressure chamber. Refrigerant compressed by the compression mechanism flows out, through a communication passage formed in the peripheral wall of the fixed scroll and the main frame, into the high-pressure chamber in which the motor is disposed. The motor is cooled by the refrigerant that has flowed into the high-pressure chamber.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2003-286949

Summary of Invention

Technical Problem

[0005] In the scroll compressor disclosed in Patent Literature 1, to firmly fix the main frame and the fixed scroll to each other, the peripheral wall along the outer edge of the fixed base plate is provided for all or some parts in a wide phase range, and the fixing component is thus required to have a sufficient fastening force. However, the orbiting scroll has size restrictions to avoid the orbiting scroll and the peripheral wall interfering with each other. Thus, in the scroll compressor, the peripheral wall is an obstacle to expansion of the orbiting scroll, and it is not possible to increase the capacity of the compression chamber.

[0006] The present disclosure has been made to solve such a problem, and an object of the present disclosure is to provide a scroll compressor having a structure in which refrigerant compressed in a compression chamber flows out, through a communication passage, into a high-pressure chamber in which a motor is disposed. In the structure, an orbiting scroll can be expanded up to an inner wall surface of a main shell, and the capacity of the compression chamber can be increased.

Solution to Problem

[0007] A scroll compressor according to an embodiment of the present disclosure includes: a shell defining a sealed space; a main frame fixed to an inner wall surface of the shell; a fixed scroll including a fixed base plate having a first scroll lap; an orbiting scroll including an orbiting base plate having a second scroll lap configured to be engaged with the first scroll lap, the orbiting scroll being supported by the main frame such that the orbiting scroll is configured to orbit, the orbiting scroll defining, between the orbiting scroll and the fixed scroll, a compression chamber in which refrigerant is compressed; a motor disposed below the main frame, the motor being configured to drive the orbiting scroll to revolve relative to the fixed scroll; and a discharge pipe through which an outside of the shell and a motor space in which the motor is provided are in communication with each other and through which refrigerant compressed in the compression chamber is discharged to the outside of the shell. The shell has therein a refrigerant suction space in which refrigerant suctioned from the outside of the shell is positioned before being suctioned into the compression chamber, a discharge space through which refrigerant compressed in the compression chamber flows out, the discharge space being positioned above the fixed scroll, and a communication passage through which the discharge space and the motor space are in communication with each other. An isolation wall isolating the communication passage from the refrigerant suction space is provided between the main frame and the fixed scroll. The fixed base plate is fixed to the inner wall surface of the shell.

Advantageous Effects of Invention

[0008] An embodiment of the present disclosure provides a structure in which refrigerant compressed in the compression chamber flows out, through the communication passage, from the discharge space into the motor space in which the motor is disposed. In the structure, since the fixed base plate is fixed to the inner wall surface of the shell, a peripheral wall for fixing the main frame and the fixed scroll to each other can be omitted, the orbiting scroll can be expanded up to an inner wall surface of a main shell, and the capacity of the compression chamber can be increased.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a longitudinal sectional view schematically illustrating the internal structure of a scroll compressor according to Embodiment 1.
[Fig. 2] Fig. 2 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 1 when viewed from the top side.
[Fig. 3] Fig. 3 is a transverse sectional view illustrating a compression mechanism of the scroll compressor according to Embodiment 1.
[Fig. 4] Fig. 4 is a plan view illustrating a fixed scroll of the scroll compressor according to Embodiment 1 when viewed from the bottom side.
[Fig. 5] Fig. 5 is a plan view illustrating an orbiting scroll of the scroll compressor according to Embodiment 1 when viewed from the top side.
[Fig. 6] Fig. 6 illustrates the orbiting scroll of the scroll compressor according to Embodiment 1 when viewed from the bottom side and is a diagram illustrating the shape of a recessed portion formed in an orbiting base plate.
[Fig. 7] Fig. 7 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 2.
[Fig. 8] Fig. 8 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 3.
[Fig. 9] Fig. 9 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 4.
[Fig. 10] Fig. 10 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 4 when viewed from the top side.
[Fig. 11] Fig. 11 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 5.
[Fig. 12] Fig. 12 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 5 when viewed from the top side.
[Fig. 13] Fig. 13 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a first modification of the scroll compressor according to Embodiment 5.
[Fig. 14] Fig. 14 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a second modification of the scroll compressor according to Embodiment 5.
[Fig. 15] Fig. 15 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 6.
[Fig. 16] Fig. 16 is an enlarged view of a main part of a first modification of the scroll compressor according to Embodiment 6.
[Fig. 17] Fig. 17 is a plan view illustrating a main frame of the first modification of the scroll compressor according to Embodiment 6 when viewed from the top side.
[Fig. 18] Fig. 18 is an enlarged view of a main part of a second modification of the scroll compressor according to Embodiment 6.

Description of Embodiments

[0010] Embodiments of the present disclosure will be described below with reference to the drawings. In the drawings, the same or corresponding parts have the same reference signs, and the descriptions thereof are omitted or simplified as appropriate. For example, the shapes, sizes, and dispositions of the components described in the drawings can be changed as appropriate within the scope of the present disclosure.

Embodiment 1

[0011] First, a scroll compressor 100 according to Embodiment 1 will be described on the basis of Figs. 1 to 6. Fig. 1 is a longitudinal sectional view schematically illustrating the internal structure of a scroll compressor according to Embodiment 1. Fig. 2 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 1 when viewed from the top side. Fig. 3 is a transverse sectional view illustrating a compression mechanism of the scroll compressor according to Embodiment 1. Fig. 4 is a plan view illustrating a fixed scroll of the scroll compressor according to Embodiment 1 when viewed from the bottom side. Fig. 5 is a plan view illustrating an orbiting scroll of the scroll compressor according to Embodiment 1 when viewed from the top side. Fig. 6 illustrates the orbiting scroll of the scroll compressor according to Embodiment 1 when viewed from the bottom side and is a diagram illustrating the shape of a recessed portion formed in an orbiting base plate. The scroll compressor 100 according to Embodiment 1 is a component of a refrigeration cycle usable for a refrigerator, a freezer, an air-conditioning apparatus, a refrigeration apparatus, a hot-water supply apparatus, or other apparatuses. The scroll compressor 100 suctions refrigerant circulating in the refrigeration cycle, compresses the refrigerant into high-temperature and high-pressure refrigerant, and then discharges the high-temperature and high-pressure refrigerant.

[0012] As illustrated in Fig. 1, the scroll compressor 100 includes a shell 1, which forms the contours thereof, a main frame 2, which is fixed to an inner wall surface of the shell 1, a compression mechanism 3, which is formed by a fixed scroll 4 and an orbiting scroll 5, a motor 6, which is configured to drive the compression mechanism 3, a crankshaft 7, which connects the compression mechanism 3 and the motor 6, and a sub frame 8.

[0013] As illustrated in Fig. 1, the shell 1 is an electrically conductive component made of, for example, a metal, and has a cylindrical shape to define a sealed space. The shell 1 accommodates the main frame 2, the compression mechanism 3, the motor 6, and the crankshaft 7. An oil pan 18, which is configured to store lubricating oil, is provided at the inner bottom of the shell 1.

[0014] The shell 1 is formed by a main shell 1a, which has a cylindrical shape, an upper shell 1b, which has a substantially hemispherical shape and covers an upper opening of the main shell 1a, and a lower shell 1c, which has a substantially hemispherical shape and covers a lower opening of the main shell 1a. The upper shell 1b and the lower shell 1c are joined to the main shell 1a by, for example, welding.

[0015] As illustrated in Fig. 1, an inner wall surface of the main shell 1a has a first inner wall surface 10a, which has a large diameter and is formed as an upper part thereof, and a second inner wall surface 10b, which has a diameter smaller than the inside diameter of the first inner wall surface 10a and is formed below the first inner wall surface 10a. A first step portion 11a, which is formed by a lower end of the first inner wall surface 10a and an upper end of the second inner wall surface 10b, functions as a positioning portion for the main frame 2.

[0016] As illustrated in Fig. 1, the main shell 1a has a suction pipe 13, a discharge pipe 14, and a power supply terminal 19. The suction pipe 13 is provided for suctioning refrigerant into the shell 1 from the outside of the shell 1. For example, the suction pipe 13 illustrated in the figure allows the outside of the shell 1 and a refrigerant suction space 31, which is surrounded by the fixed scroll 4 and the main frame 2, to be in communication with each other, but the configuration is not limited thereto. The suction pipe 13 may have any form as long as refrigerant can be suctioned into the shell 1 from the outside of the shell 1 through the suction pipe 13. The discharge pipe 14 is provided for allowing the outside of the shell 1 and a motor space 16, in which the motor 6 is provided, to be in communication with each other and for discharging, to the outside of the shell 1, refrigerant compressed in a compression chamber 30. The suction pipe 13 and the discharge pipe 14 are joined to the main shell 1a by, for example, welding or soldering with a part of the suction pipe 13 and a part of the discharge pipe 14 inserted into respective holes formed in a side wall of the main shell 1a.

[0017] The refrigerant suction space 31 is a space in which refrigerant suctioned through the suction pipe 13 is positioned before the refrigerant is suctioned into the compression chamber 30. The refrigerant suction space 31 is not limited to the space surrounded by the fixed scroll 4 and the main frame 2 illustrated in the figure. The refrigerant suction space 31 may be provided at a different position as long as the refrigerant suction space 31 is a space in which refrigerant suctioned through the suction pipe 13 is positioned before the refrigerant is suctioned into the compression chamber 30. The refrigerant pressure in the refrigerant suction space 31 is the pressure of refrigerant yet to be compressed and is low. The space provided above the fixed scroll 4 in the shell 1 is a discharge space 15, through which refrigerant compressed in the compression chamber 30 flows out. The motor space 16 is a space that is below the main frame 2 and in which the motor 6 is provided. The shell 1 has therein a communication passage 21, through which the discharge space 15 and the motor space 16 are in communication with each other, as a passage for refrigerant compressed in the compression chamber 30. The refrigerant pressure in the discharge space 15, the motor space 16, or the communication passage 21 is the pressure of refrigerant that has been compressed and is high.

[0018] The power supply terminal 19 is provided for supplying electricity to the scroll compressor 100. The power supply terminal 19 is a metal component. As illustrated in Fig. 1, one end of the power supply terminal 19 is disposed outside the shell 1, and the other end of the power supply terminal 19 is disposed inside the shell 1. The other end of the power supply terminal 19 disposed inside the shell 1 is connected to the motor 6 via wiring lines 19a.

[0019] As illustrated in Fig. 1, the main frame 2 is a metal frame that has a cylindrical shape and whose diameter is gradually reduced downward. The main frame 2 supports the orbiting scroll 5 such that the orbiting scroll 5 is configured to orbit. The position of the main frame 2 in an up-down direction is determined by supporting a peripheral surface of an upper part of the main frame 2 with the first step portion 11a of the main shell 1a. The main frame 2 is fixed to the inner wall surface of the main shell 1a by, for example, shrink fitting or welding with the peripheral surface of the upper part supported by the first step portion 11a. The refrigerant suction space 31 and the motor space 16 are isolated from each other by airtightly fixing a contact surface of the main frame 2 and a contact surface of the main shell 1a to each other.

[0020] As illustrated in Figs. 1 and 2, an upper surface of the main frame 2 is a flat surface 24, which has an annular shape. An isolation wall 20, which isolates the communication passage 21 from the refrigerant suction space 31, is provided between the flat surface 24 of the main frame 2 and the fixed scroll 4. The isolation wall 20 is configured such that the isolation wall 20 projects toward the fixed scroll 4 from a part of the flat surface 24 of the main frame 2 and an upper end portion of the isolation wall 20 supports the fixed scroll 4. A sectional shape of the isolation wall 20 is a recessed shape, and the isolation wall 20 is formed along the inner wall surface of the main shell 1a. The space surrounded by the isolation wall 20 and the inner wall surface of the main shell 1a is the communication passage 21 isolated from the refrigerant suction space 31. The isolation wall 20 can be formed by a method such as casting.

[0021] As illustrated in Figs. 2 and 3, due to the isolation wall 20, the communication passage 21 has a circular arc shape in the circumferential direction of the inner wall surface of the main shell 1a. As illustrated in Fig. 3, the isolation wall 20 is disposed at a phase to substantially face the suction pipe 13. This is because refrigerant suctioned through the suction pipe 13 is easily suctioned into the compression chamber 30 without a suction pressure loss due to the refrigerant passing through a narrow passage in the vicinity of the isolation wall 20. The shape of the communication passage 21 is not limited to the circular arc shape illustrated in the figure. It is sufficient that the shape of the communication passage 21 be a long and narrow shape in the circumferential direction of the inner wall surface of the main shell 1a, such as a rectangular shape, an oval shape, or an ellipse shape.

[0022] In the scroll compressor 100, the pressure loss of refrigerant can be reduced by increasing the passage sectional area of the communication passage 21. However, when the passage sectional area of the communication passage 21 is excessively large, the isolation wall 20 and the orbiting scroll 5 interfere with each other, and this is an obstacle to expansion of the compression chamber 30. To address this, it is preferable to set the passage sectional area of the communication passage 21 to be, as an index, one to four times the passage sectional area of the discharge pipe 14.

[0023] A peripheral surface of the main frame 2 has a first through hole 26, through which the motor space 16 and the space surrounded by the isolation wall 20 and the inner wall surface of the main shell 1a are in communication with each other. The first through hole 26 forms a part of the communication passage 21. The first through hole 26 has a notch shape substantially the same as a sectional shape of the isolation wall 20. The shape of the first through hole 26 is not limited to the notch shape illustrated in the figure, and the first through hole 26 may be, for example, a hole whose periphery is surrounded.

[0024] The inside of the cylinder of the main frame 2 is formed such that the inside diameter thereof is gradually reduced downward. An upper part of the inside of the cylinder has an Oldham accommodating portion 25. A pair of first Oldham grooves 22, which are formed to face each other with a shaft hole interposed therebetween, are provided in parts of the Oldham accommodating portion 25 and the flat surface 24. The first Oldham grooves 22 are key grooves. A lower part of the inside of the cylinder is a main bearing 23, which supports the crankshaft 7.

[0025] As illustrated in Figs. 1, 3, and 4, the fixed scroll 4 includes a fixed base plate 4a, which has a disk shape, and a first scroll lap 4b, which is provided on a lower surface of the fixed base plate 4a. As illustrated in Figs. 1, 3, and 5, the orbiting scroll 5 includes an orbiting base plate 5a, which has a disk shape, and a second scroll lap 5b, which is provided on an upper surface of the orbiting base plate 5a and is configured to be engaged with the first scroll lap 4b. The orbiting scroll 5 is disposed eccentrically relative to the fixed scroll 4. The compression chamber 30 of the compression mechanism 3 is formed by engaging the first scroll lap 4b of the fixed scroll 4 and the second scroll lap 5b of the orbiting scroll 5 with each other. The capacity of the compression chamber 30 is reduced from the outside toward the inside in radial directions of the fixed scroll 4 and the orbiting scroll 5. In the compression chamber 30, refrigerant suctioned through an outer end portion 4c of the first scroll lap 4b and an outer end portion 5c of the second scroll lap 5b moves toward the center thereof and is gradually compressed.

[0026] The fixed scroll 4 is made of a metal such as cast iron. A peripheral surface of the fixed base plate 4a of the fixed scroll 4 is fixed to the first inner wall surface 10a of the main shell 1a by, for example, shrink fitting or welding with the fixed base plate 4a supported by the isolation wall 20.

[0027] A discharge port 40, which is in communication with the compression chamber 30 and through which compressed refrigerant having a high temperature and a high pressure is discharged from the compression chamber 30, is formed at the center of the fixed base plate 4a. The discharge port 40 is in communication with the discharge space 15 provided above the fixed scroll 4. A discharge valve 17, which is configured to open and close the discharge port 40 according to the pressure of refrigerant, is provided on and screwed to an upper surface of the fixed scroll 4. The discharge valve 17 opens the discharge port 40 when the refrigerant pressure in the compression chamber 30 reaches a predetermined pressure.

[0028] The peripheral surface of the fixed base plate 4a has a second through hole 41, through which the discharge space 15 and the space surrounded by the isolation wall 20 and the inner wall surface of the main shell 1a are in communication with each other. The second through hole 41 forms a part of the communication passage 21. The second through hole 41 has a notch shape substantially the same as a sectional shape of the isolation wall 20. The shape of the second through hole 41 is not limited to the notch shape illustrated in the figure, and the second through hole 41 may be, for example, a hole whose periphery is surrounded.

[0029] The orbiting scroll 5 is made of a metal such as aluminum. As illustrated in Fig. 1, the orbiting scroll 5 does not rotate but revolves relative to the fixed scroll 4 due to an Oldham ring 52 for preventing rotation of the orbiting scroll 5. The surface (lower surface in the example illustrated in the figure) of the orbiting base plate 5a on which the second scroll lap 5b is not formed functions as an orbiting scroll thrust bearing surface. A boss 50, which has a hollow cylindrical shape, is provided at the center of the orbiting scroll thrust bearing surface. The orbiting scroll 5 is revolved by revolving an eccentric shaft portion 71, which is inserted into the boss 50, of the crankshaft 7.

[0030] The orbiting scroll thrust bearing surface has a pair of second Oldham grooves 51, which are formed to face each other with the boss 50 interposed therebetween. The second Oldham grooves 51 are key grooves each having an ellipse shape. The pair of second Oldham grooves 51 are disposed such that a line connecting the pair of second Oldham grooves 51 is orthogonal to a line connecting the pair of first Oldham grooves 22.

[0031] The Oldham ring 52 includes a ring portion, first key portions, and second key portions. The ring portion has an annular shape and is disposed in the Oldham accommodating portion 25 of the main frame 2. The first key portions are provided on a lower surface of the ring portion. The first key portions are a pair and accommodated in the respective first Oldham grooves 22 of the main frame 2. The second key portions are provided on an upper surface of the ring portion. The second key portions are a pair and accommodated in the respective second Oldham grooves 51 of the orbiting scroll 5. The position of the second scroll lap 5b of the orbiting scroll 5 in the rotation direction is determined by engaging the second Oldham grooves 51 of the orbiting scroll 5 with the respective second key portions of the Oldham ring 52. That is, the Oldham ring 52 determines the position of the orbiting scroll 5 relative to the main frame 2 and determines the phase of the second scroll lap 5b relative to the main frame 2. When the orbiting scroll 5 is revolved by rotating the crankshaft 7, the Oldham ring 52 prevents rotation of the orbiting scroll 5 by the first key portions sliding in the respective first Oldham grooves 22 and the second key portions sliding in the respective second Oldham grooves 51.

[0032] The refrigerant is, for example, a halogenated hydrocarbon having a composition containing double-bonded carbon, a halogenated hydrocarbon having a composition containing no double-bonded carbon, a hydrocarbon, or a mixture thereof. Examples of the halogenated hydrocarbon containing double-bonded carbon include an HFC refrigerant having an ozone depletion potential of zero, and tetrafluoropropene such as HFO1234yf, HFO1234ze, and HFO1243zf, each of which is a fluorocarbon-based low GWP refrigerant and represented by a chemical formula $C_3H_2F_4$. Examples of the halogenated hydrocarbon containing no double-bonded carbon include a refrigerant mixed with R32 (difluoromethane) represented as CH_2F_2, R41, or other refrigerants. Examples of the hydrocarbon include a natural refrigerant such as propane or propylene. Examples of the mixture include a mixed refrigerant in which, for example, HFO1234yf, HFO1234ze, or HFO1243zf is mixed with R32, R41, or other refrigerants.

[0033] As illustrated in Fig. 1, the motor 6 is provided below the main frame 2 and is configured to drive the orbiting scroll 5 connected to the motor 6 via the crankshaft 7 to revolve relative to the fixed scroll 4. The motor 6 is formed by a stator 6a, which has an annular shape and is fixed to the inner wall surface of the shell 1 by, for example, shrink fitting, and a rotor 6b, which is rotatably attached to face an inner side of the stator 6a. For example, the stator 6a has a ring shape in plan view and has a structure in which a coil is wound around an iron core, with an insulating layer therebetween, formed by stacking a plurality of electromagnetic steel sheets. The rotor 6b has, at the center thereof, a through hole passing through the rotor 6b in the up-down direction and has a structure in which a permanent magnet is embedded in an iron core formed by stacking a plurality of electromagnetic steel sheets.

[0034] As illustrated in Fig. 1, the crankshaft 7 is a rod-shaped component made of a metal. The crankshaft 7 includes a main shaft portion 70 and the eccentric shaft portion 71. The main shaft portion 70 is a shaft forming a main part of the crankshaft 7 and is disposed such that the central axis thereof coincides with the central axis of the main shell 1a. The main shaft portion 70 is fixed to the through hole at the center of the rotor 6b by, for example, shrink fitting. The main shaft portion 70 is rotatably supported by the main bearing 23, which is provided at the center of the main frame 2, and a sub bearing 80, which is provided at the center of the sub frame 8 joined to a lower part of the shell 1 by, for example, shrink fitting or welding. To eliminate imbalance due to orbiting of the orbiting scroll 5, a first balancer 73 is provided at an upper part of the main shaft portion 70, and a second balancer 74 is provided at a lower part of the main shaft portion 70.

[0035] The eccentric shaft portion 71 is provided at an upper end portion of the main shaft portion 70 such that the central axis thereof is eccentric relative to the central axis of the main shaft portion 70. The eccentric shaft portion 71 is rotatably supported by the boss 50 of the orbiting scroll 5. The crankshaft 7 rotates along with rotation of the rotor 6b and revolves the orbiting scroll 5 with the eccentric shaft portion 71. An oil passage 72 is provided in the main shaft portion 70 and the eccentric shaft portion 71 such that the oil passage 72 passes therethrough in the axial direction, that is, in the up-down direction.

[0036] The sub frame 8 is a metal frame. The sub frame 8 is joined to the inner wall surface of the main shell 1a by, for example, shrink fitting or welding. As illustrated in Fig. 1, the sub frame 8 includes the sub bearing 80 and an oil pump (not illustrated). The sub bearing 80 is a ball bearing provided at the center of the sub frame 8. The oil pump is a pump for sucking up lubricating oil stored in the oil pan 18 of the shell 1 and is provided below the sub bearing 80.

[0037] As illustrated in Fig. 1, lubricating oil is stored in the oil pan 18. The lubricating oil is sucked up by the oil pump and passes through the oil passage 72 of the crankshaft 7. Then, the lubricating oil reduces abrasion of parts mechanically in contact with each other, such as the compression mechanism 3, adjusts the temperatures of sliding portions, and improves sealing properties. Preferably, the lubricating oil is an oil, such as a refrigerating machine oil containing, for example, an ester-based synthetic oil, excellent in, for example, lubricating characteristics, electrical insulating properties, stability, dissolubility in refrigerant, and fluidity at low temperature and having an appropriate viscosity.

[0038] Next, refrigerant flow and the function of the communication passage 21 will be described. As illustrated in Fig. 1, refrigerant yet to be compressed flows into the refrigerant suction space 31 through the suction pipe 13 and is suctioned into the compression chamber 30 formed by engaging the fixed scroll 4 and the orbiting scroll 5 with each other. The refrigerant compressed in the compression chamber 30 is discharged into the discharge space 15 through the discharge port 40. The refrigerant filled in the discharge space 15 is compressed refrigerant having a high pressure. Then, the high-pressure refrigerant moves into the motor space 16 through the discharge space 15 and the communication passage 21 and is discharged to the outside of the shell 1 through the discharge pipe 14.

[0039] In the scroll compressor 100 in Embodiment 1, the communication passage 21 and the refrigerant suction space 31 have airtightness by being isolated from each other with the isolation wall 20. The high-pressure refrigerant filled in the communication passage 21 does not leak into the refrigerant suction space 31. Thus, it is possible to reduce a loss of power input and to improve the performance.

[0040] In addition, in the scroll compressor 100 in Embodiment 1, the fixed base plate 4a of the fixed scroll 4 is supported by the isolation wall 20 of the main frame 2 and is fixed to the inner wall surface of the shell 1 by, for example, shrink fitting or welding with the position thereof in the up-down direction determined. That is, in the scroll compressor 100 in Embodiment 1, the main frame 2 or the fixed scroll 4 has no peripheral wall for fixing the main frame 2 and the fixed scroll 4 to each other. Thus, it is possible to expand the orbiting scroll 5 up to the inner wall surface of the main shell 1a and to increase the capacity of the compression chamber 30. In addition, the refrigerant suction space 31 can be expanded by increasing the capacity of the compression chamber 30. Thus, it is possible to increase the area of the passage for refrigerant in the compression chamber 30. Accordingly, the scroll compressor 100 is capable of increasing cooling capacity and heating capacity due to a pressure loss generated while refrigerant that has flowed in through the suction pipe 13 is suctioned into the compression chamber 30 being small. In addition, the structure of the scroll compressor 100 can be simplified by omitting a peripheral wall for fixing the main frame 2 and the fixed scroll 4 to each other. Thus, it is possible to improve the formability of the main frame 2 and to reduce the weight of the scroll compressor 100.

[0041] Furthermore, in the scroll compressor 100 in Embodiment 1, the discharge space 15 and the motor space 16 are in communication with each other through the communication passage 21 to discharge compressed refrigerant having a high pressure to the outside of the shell 1. The communication passage 21 has a circular arc shape along the inner wall surface of the main shell 1a due to the isolation wall 20, which projects toward the fixed scroll 4 from a part of the flat surface 24 of the main frame 2 and is formed along the inner wall surface of the main shell 1a. That is, in the scroll compressor 100 in Embodiment 1, the position and the shape of the communication passage 21 do not prevent the operations of the fixed scroll 4 and the orbiting scroll 5. Thus, it is possible to increase the capacity of the compression chamber 30 without an effect on size restrictions of the fixed scroll 4 and the orbiting scroll 5 due to the provision of the communication passage 21.

[0042] As illustrated in Figs. 3 and 5, the scroll compressor 100 may have a configuration in which a peripheral surface of the orbiting base plate 5a of the orbiting scroll 5 has a recessed portion 53, which has a circular arc shape, for avoiding interference between the orbiting base plate 5a and the isolation wall 20. The recessed portion 53 is formed by recessing, toward the center of the orbiting base plate 5a, a part, close to the isolation wall 20, of the peripheral surface of the orbiting base plate 5a. The scroll compressor 100 is capable of preventing the orbiting base plate 5a and the isolation wall 20 from being in contact with each other due to the provision of the recessed portion 53 and is thus capable of improving the performance.

[0043] The specific shape of the recessed portion 53 will be described with reference to Fig. 6. For convenience of description, Fig. 6 illustrates, with dashed lines, the second scroll lap 5b, which is behind the orbiting base plate 5a in the figure and is thus invisible. The origin O illustrated in Fig. 6 represents the center of the boss 50. The angle, in the circumferential direction, relative to a straight line connecting the origin O and the second scroll lap 5b is an angle θ. The angle formed by a straight line connecting the origin O and the outer end portion 5c of the second scroll lap 5b is an angle θ of 0 degrees. The counterclockwise direction is the + direction. The counterclockwise direction is a direction in which the involute angle of the second scroll lap 5b increases and a direction in which the scroll is unwound. Rmax is the maximum distance between the origin O and the periphery of the orbiting base plate 5a. Rmin is a distance between the origin O and a part, having the recessed portion 53, of the periphery of the orbiting base plate 5a.

[0044] As illustrated in Fig. 6, the recessed portion 53 and the communication passage 21 are configured such that the centroid of a transverse section of each of the recessed portion 53 and the communication passage 21 is disposed within the range in which the angle θ is 30 degrees or more and 150 degrees or less in the + direction. This is because, due to the structure of the compression mechanism 3, the scroll compressor 100 is capable of preventing interference between the second scroll lap 5b and the isolation wall 20 when the centroid of a transverse section of each of the recessed portion 53 and the communication passage 21 is disposed within the above range. That is, in the scroll compressor according to Embodiment 1, the disposition of the centroid of a transverse section of each of the recessed portion 53 and the communication passage 21 within the above range enables the communication passage 21 to have a sufficient passage area and enables the compression chamber 30 to have a sufficient capacity.

[0045] In addition, in the scroll compressor 100, the disposition of the centroid of a transverse section of the communication passage 21 within the above range enables the isolation wall 20 to be provided at a position apart from the outer end portion 4c of the first scroll lap 4b and the outer end portion 5c of the second scroll lap 5b, which are suction ports for refrigerant to be suctioned into the compression chamber 30. Thus, the isolation wall 20 does not close parts of the passage in the vicinities of the suction ports. Accordingly, a pressure loss is unlikely to be generated when refrigerant is suctioned into the compression chamber 30. As a result, the scroll compressor 100 is capable of obtaining high refrigeration capacity and high heating capacity.

[0046] Next, the size of the recessed portion 53 will be described. As illustrated in Fig. 6, preferably, the recessed portion 53 is formed such that Rmin is 80 percent or more and 95 percent or less of Rmax. Due to the structure of the compression mechanism 3, this range is an effective range in which interference between the second scroll lap 5b and the isolation wall 20 and interference between the compression chamber 30 and the isolation wall 20 can be prevented with the communication passage 21 having a wide area. The communication passage 21 having a wide area enables the pressure loss of refrigerant to be prevented and the loss of power input to be reduced. Thus, the scroll compressor 100 is capable of improving the performance.

[0047] As described above, the scroll compressor 100 according to Embodiment 1 includes the shell 1, the main frame 2, the fixed scroll 4, the orbiting scroll 5, the motor 6, the suction pipe 13, and the discharge pipe 14. The shell 1 has therein the discharge space 15, which is provided above the fixed scroll 4 and through which refrigerant compressed in the compression chamber 30 flows out, and the communication passage 21, through which the discharge space 15 and the motor space 16 are in communication with each other. The isolation wall 20, which isolates the communication passage 21 from the refrigerant suction space 31, is provided between the main frame 2 and the fixed scroll 4. The fixed base plate 4a is fixed to the inner wall surface of the shell 1.

[0048] That is, the scroll compressor 100 according to Embodiment 1 has a structure in which refrigerant compressed in the compression chamber 30 flows out, through the communication passage 21, from the discharge space 15 into the motor space 16, in which the motor 6 is disposed. In the structure, since the fixed base plate 4a is fixed to the inner wall surface of the shell 1, a peripheral wall for fixing the main frame 2 and the fixed scroll 4 to each other can be omitted, the orbiting scroll 5 can be expanded up to the inner wall surface of the main shell 1a, and the capacity of the compression chamber 30 can be increased.

[0049] In addition, the fixed base plate 4a is fixed to the inner wall surface of the shell 1 while being supported by the isolation wall 20. That is, in the scroll compressor 100 according to Embodiment 1, the fixed base plate 4a of the fixed scroll 4 is supported by the isolation wall 20 of the main frame 2 and can be fixed to the inner wall surface of the shell 1 by, for example, shrink fitting or welding with the position thereof in the up-down direction determined. Thus, in a scroll compressor 100 according to Embodiment 1, the isolation wall 20 is capable of keeping the fixed base plate 4a and the main frame 2 parallel to each other. Accordingly, it is possible to increase the accuracy of determination of the position at which the fixed scroll 4 is fixed and to improve the performance. In addition, this facilitates the operation of fixing the fixed base plate 4a to the inner wall surface of the main shell 1a by, for example, shrink fitting or welding.

[0050] Furthermore, the peripheral surface of the orbiting base plate 5a has the recessed portion 53 for avoiding interference between the orbiting base plate 5a and the isolation wall 20. That is, the scroll compressor 100 according to Embodiment 1 is capable of preventing the orbiting base plate 5a and the isolation wall 20 from being in contact with each other due to the provision of the recessed portion 53 and is thus capable of realizing a structure having high reliability.

[0051] The recessed portion 53 and the communication passage 21 are configured such that the centroid of a transverse section of each of the recessed portion 53 and the communication passage 21 is disposed within the range in which the angle θ is 30 degrees or more and 150 degrees or less in a direction in which the involute angle increases, the angle θ being an angle, in the circumferential direction, relative to a straight line connecting the center of the boss 50 and the outer end portion 5c of the second scroll lap 5b. That is, the scroll compressor 100 according to Embodiment 1 is capable of preventing interference between the second scroll lap 5b and the isolation wall 20. In addition, this configuration enables the communication passage 21 to have a sufficient passage area and enables the compression chamber 30 to have a sufficient capacity.

[0052] The recessed portion 53 is formed such that the distance from the center of the boss 50 to a part, having the recessed portion 53, of the peripheral surface is 80 percent or more and 95 percent or less of the maximum distance from the center of the boss 50 to the peripheral surface of the orbiting base plate 5a. That is, the scroll compressor 100 according to Embodiment 1 is capable of preventing interference between the second scroll lap 5b and the isolation wall 20 and interference between the compression chamber 30 and the isolation wall 20 with the communication passage 21 having a wide area. The communication passage 21 having a wide area enables the pressure loss of refrigerant to be prevented and the loss of power input to be reduced. Thus, the scroll compressor 100 is capable of improving the performance.

Embodiment 2

[0053] Next, a scroll compressor 101 according to Embodiment 2 will be described on the basis of Fig. 7. Fig. 7 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 2. The same components as those of the scroll compressor 100 described in Embodiment 1 have the same reference signs, and the descriptions thereof are omitted as appropriate.

[0054] The scroll compressor 101 according to Embodiment 2 differs from the scroll compressor 100 in Embodiment 1 in the shape of the isolation wall 20. As illustrated in Fig. 7, the isolation wall 20 of the scroll compressor 101 according to Embodiment 2 is configured such that the isolation wall 20 projects toward the flat surface 24 of the main frame 2 from a part of the fixed base plate 4a of the fixed scroll 4 and such that a lower end face of the isolation wall 20 is supported by the flat surface 24 of the main frame 2. A sectional shape of the isolation wall 20 is a recessed shape, and the isolation wall 20 is formed along the inner wall surface of the main shell 1a. The space surrounded by the isolation wall 20 and the inner wall surface of the main shell 1a is the communication passage 21.

[0055] Also in the scroll compressor 101 in Embodiment 2, the communication passage 21 and the refrigerant suction space 31 have airtightness by being isolated from each other with the isolation wall 20. The high-pressure refrigerant filled in the communication passage 21 does not leak into the refrigerant suction space 31. Thus, it is possible to reduce a loss of power input and to improve the performance.

[0056] In addition, in the scroll compressor 101 in Embodiment 2, the isolation wall 20 on the fixed base plate 4a of the fixed scroll 4 is supported by the main frame 2, and the fixed base plate 4a is fixed to the inner wall surface of the shell 1 by, for example, shrink fitting or welding with the position thereof in the up-down direction determined. That is, in the scroll compressor 101 in Embodiment 2, the main frame 2 or the fixed scroll 4 has no peripheral wall for fixing the main frame 2 and the fixed scroll 4 to each other. Thus, it is possible to expand the orbiting scroll 5 up to the inner wall surface of the main shell 1a and to increase the capacity of the compression chamber 30. In addition, the refrigerant suction space 31 can be expanded by increasing the capacity of the compression chamber 30. Thus, it is possible to increase the area of the passage for refrigerant in the compression chamber 30. Accordingly, the scroll compressor 101 is capable of increasing cooling capacity and heating capacity due to a pressure loss generated while refrigerant that has flowed in through the suction pipe 13 is suctioned into the compression chamber 30 being small. In addition, the structure of the scroll compressor 101 can be simplified by omitting a peripheral wall for fixing the main frame 2 and the fixed scroll 4 to each other. Thus, it is possible to reduce the weight of the scroll compressor 101. Furthermore, in the scroll compressor 101, the upper surface of the main frame 2 is formed by only the flat surface 24. Thus, the main frame 2 can be formed by lathe processing, resulting in an improvement in the formability of the main frame 2.

[0057] Furthermore, in the scroll compressor 101 in Embodiment 2, the discharge space 15 and the motor space 16 are in communication with each other through the communication passage 21 to discharge compressed refrigerant having a high pressure to the outside of the shell 1. The communication passage 21 has a circular arc shape along the inner wall surface of the main shell 1a due to the isolation wall 20, which projects toward the upper surface of the main frame 2 from a part of the fixed base plate 4a of the fixed scroll 4 and is formed along the inner wall surface of the main shell 1a. That is, in the scroll compressor 101 in Embodiment 2, the position and the shape of the communication passage 21 do not prevent the operations of the fixed scroll 4 and the orbiting scroll 5. Thus, it is possible to increase the capacity of the compression chamber 30 without an effect on size restrictions of the fixed scroll 4 and the orbiting scroll 5 due to the provision of the communication passage 21.

Embodiment 3

[0058] Next, a scroll compressor 102 according to Embodiment 3 will be described on the basis of Fig. 8. Fig. 8 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 3. The same components as those of the scroll compressor 100 described in Embodiment 1 have the same reference signs, and the descriptions thereof are omitted as appropriate.

[0059] As illustrated in Fig. 8, the scroll compressor 102 according to Embodiment 3 differs from the scroll compressor 100 in Embodiment 1 and the scroll compressor 101 in Embodiment 2 in the shape of the isolation wall 20. The isolation wall 20 of the scroll compressor 102 according to Embodiment 3 includes a first wall 20a, which projects toward the fixed scroll 4 from a part of the flat surface 24 of the main frame 2, and a second wall 20b, which projects toward the flat surface 24 of the main frame 2 from the fixed base plate 4a of the fixed scroll 4, and the isolation wall 20 is configured such that an upper end face of the first wall 20a and a lower end face of the second wall 20b butt against each other. A sectional shape of the isolation wall 20 is a recessed shape, and the isolation wall 20 is formed along the inner wall surface of the main shell 1a. The space surrounded by the isolation wall 20 and the inner wall surface of the main shell 1a is the communication passage 21.

[0060] The scroll compressor 102 according to Embodiment 3 achieves advantageous effects similar to those of the scroll compressor 100 in Embodiment 1 and the scroll compressor 101 in Embodiment 2. In addition, in the scroll compressor 102 according to Embodiment 3, the first wall 20a and the second wall 20b each have a short length. Thus, when outer diameters of the first wall 20a and the second wall 20b are processed, the amount of deflection due to cutting resistance is small, and high processing accuracy can be achieved. Accordingly, the scroll compressor 102 according to Embodiment 3 is capable of improving the airtightness of the communication passage 21 and the refrigerant suction space 31 and is thus capable of improving the performance.

Embodiment 4

[0061] Next, a scroll compressor 103 according to Embodiment 4 will be described on the basis of Figs. 9 and 10. Fig. 9 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 4. Fig. 10 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 4 when viewed from the top side. The same components as those of the scroll compressors 100 to 102 described in Embodiments 1 to 3 have the same reference signs, and the descriptions thereof are omitted as appropriate.

[0062] As illustrated in Figs. 9 and 10, the isolation wall 20 of the scroll compressor 103 according to Embodiment 4 is formed by a structure having a hollow, and the inside of the hollow of the isolation wall 20 is the communication passage 21. The isolation wall 20 is configured such that the isolation wall 20 projects toward the fixed scroll 4 from the flat surface 24 of the main frame 2 and an upper end face of the isolation wall 20 supports the fixed scroll 4. The side closer to the outer diameter of the isolation wall 20 is in contact with the inner wall surface of the main shell 1a. The first through hole 26 formed in the main frame 2 is a hole whose periphery is surrounded. That is, in the scroll compressor 103 according to Embodiment 4, the side, closer to the outer diameter of the main shell 1a, of the isolation wall 20 and a peripheral surface of an upper part of the main frame 2 can be formed as the same flat surface continuous in the up-down direction. That is, the main frame 2 can be formed by continuous cutting in lathe processing. Thus, it is possible to reduce wear in processing tools.

[0063] As described in Embodiment 2 above, the isolation wall 20 may be configured such that the isolation wall 20 projects toward the flat surface 24 of the main frame 2 from the fixed base plate 4a of the fixed scroll 4 and such that the lower end face of the isolation wall 20 is supported by the main frame 2. In addition, as described in Embodiment 3 above, the isolation wall 20 may include the first wall 20a, which projects toward the fixed scroll 4 from the upper surface of the main frame 2, and the second wall 20b, which projects toward the upper surface of the main frame 2 from the fixed base plate 4a of the fixed scroll 4, and the isolation wall 20 may be configured such that the upper end face of the first wall 20a and the lower end face of the second wall 20b butt against each other.

Embodiment 5

[0064] Next, a scroll compressor 104 according to Embodiment 5 will be described on the basis of Figs. 11 to 14. Fig. 11 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 5. Fig. 12 is a sectional view illustrating a main frame of the scroll compressor according to Embodiment 5 when viewed from the top side. The same components as those of the scroll compressors 100 to 103 described in Embodiments 1 to 4 have the same reference signs, and the descriptions thereof are omitted as appropriate.

[0065] As illustrated in Figs. 11 and 12, the scroll compressor 104 according to Embodiment 5 includes support walls 27, which project toward the fixed scroll 4 from the flat surface 24 of the main frame 2 and whose upper end faces support the fixed base plate 4a. As illustrated in Fig. 12, two support walls 27 are provided at intervals along the outer edge of the upper surface of the main frame 2 such that the support walls 27 and the second scroll lap 5b of the orbiting scroll 5 do not interfere with each other. The number of the support walls 27 to be provided is not limited to two illustrated in the figure and may be one or three or more.

[0066] The support walls 27 each have a curved shape along the inner wall surface of the main shell 1a. Each upper end face of the support walls 27 is positioned at a height substantially equal to the height at which the upper end face of the isolation wall 20 is positioned. The expression "each upper end face of the support walls 27 is positioned at a height substantially equal to the height at which the upper end face of the isolation wall 20 is positioned" means that, for example, the difference in height between the support wall 27 and the isolation wall 20 is 0.5 percent or less of the height of the isolation wall 20.

[0067] In the scroll compressor 104 according to Embodiment 5, the fixed base plate 4a of the fixed scroll 4 can be fixed to the inner wall surface of the main shell 1a by, for example, shrink fitting after the position of the fixed base plate 4a in the up-down direction is determined by supporting the fixed base plate 4a with the upper end face of the isolation wall 20 and the upper end faces of the support walls 27. That is, in the scroll compressor 104 according to Embodiment 5, the fixed base plate 4a is supported by the support walls 27 and the isolation wall 20 at a plurality of points. Accordingly, it is possible to keep the fixed base plate 4a and the main frame 2 parallel to each other and to thus increase the accuracy of determination of the position at which the fixed scroll 4 is fixed. In addition, this facilitates the operation of fixing the fixed base plate 4a to the inner wall surface of the main shell 1a by, for example, shrink fitting or welding. The support walls 27 do not affect an increase in the capacity of the compression chamber 30 because the support walls 27 are provided along the inner wall surface of the main shell 1a such that the support walls 27 and the second scroll lap 5b of the orbiting scroll 5 do not interfere with each other.

[0068] Fig. 13 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a first modification of the scroll compressor according to Embodiment 5. As illustrated in Fig. 13, the support wall 27 may be configured such that the support wall 27 projects toward the upper surface of the main frame 2 from the fixed base plate 4a of the fixed scroll 4 and a lower end face of the support wall 27 is supported by the flat surface 24 of the main frame 2. This support wall 27 also has a curved shape along the inner wall surface of the main shell 1a.

[0069] Fig. 14 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a second modification of the scroll compressor according to Embodiment 5. As illustrated in Fig. 14, the support wall 27 may be configured as follows: the support wall 27 includes a first support wall 27a, which projects toward the fixed base plate 4a of the fixed scroll 4 from the upper surface of the main frame 2, and a second support wall 27b, which projects toward the upper surface of the main frame 2 from the fixed base plate 4a, and the support wall 27 supports the fixed base plate 4a such that an upper end face of the first support wall 27a and a lower end face of the second support wall 27b butt against each other. In the scroll compressor 104 of the second modification, the first support wall 27a and the second support wall 27b each have a short length. Thus, when the outer diameter of the first support wall 27a and the second support wall 27b are processed, the amount of deflection due to cutting resistance is small, and high processing accuracy can be achieved.

[0070] Also in the first modification and the second modification of the scroll compressor 104 according to Embodiment 5 described above, the fixed base plate 4a is supported by the support wall 27 and the isolation wall 20 at a plurality of points. Accordingly, it is possible to keep the fixed base plate 4a and the main frame 2 parallel to each other and to thus increase the accuracy of determination of the position at which the fixed scroll 4 is fixed. In addition, this facilitates the operation of fixing the fixed base plate 4a to the inner wall surface of the main shell 1a by, for example, shrink fitting or welding.

[0071] Each isolation wall 20 illustrated in Figs. 11 to 14 is configured such that the isolation wall 20 projects toward the fixed scroll 4 from the upper surface of the main frame 2 and the upper end face of the isolation wall 20 supports the fixed scroll 4 but may be configured as described in Embodiment 2 or Embodiment 3 above.

Embodiment 6

[0072] Next, a scroll compressor 105 according to Embodiment 6 will be described on the basis of Figs. 15 to 18. Fig. 15 is a longitudinal sectional view schematically illustrating an upper part of the internal structure of a scroll compressor according to Embodiment 6. The same components as those of the scroll compressor 100 described in Embodiment 1 have the same reference signs, and the descriptions thereof are omitted as appropriate.

[0073] As illustrated in Fig. 15, in the scroll compressor 105 according to Embodiment 6, the inner wall surface of the shell 1 has a second step portion 11b, which supports the peripheral surface of the fixed base plate 4a. The inner wall surface of the main shell 1a has a third inner wall surface 10c, which has a diameter larger than the inside diameter of the first inner wall surface 10a and is provided above the first inner wall surface 10a. The second step portion 11b is a step formed by a lower end of the third inner wall surface 10c and an upper end of the first inner wall surface 10a. The second step portion 11b is formed in the circumferential direction of an inner wall surface of the main frame 2 and functions as a positioning portion for the fixed scroll 4. That is, the fixed scroll 4 is fixed to the third inner wall surface 10c of the main shell 1a by, for example, shrink fitting or welding with the position thereof in the up-down direction determined by supporting the peripheral surface of the fixed base plate 4a with the second step portion 11b.

[0074] There is no problem even when a space S, which is very small and has a size of, for example, about 10 to 100 μm, exists between the upper end face of the isolation wall 20 and the lower surface of the fixed base plate 4a. This is because there is almost no refrigerant leakage between the communication passage 21 and the refrigerant suction space 31 due to the space S being very small.

[0075] In the scroll compressor 105 according to Embodiment 6, the second step portion 11b formed in the circumferential direction of the inner wall surface of the main frame 2 is capable of increasing the accuracy of determination of the position at which the fixed scroll 4 is fixed. Thus, it is possible to increase the accuracy of parallelism between the fixed base plate 4a and the main frame 2. Here, the position of the orbiting scroll 5 is determined by the orbiting scroll 5 coming into contact with the fixed base plate 4a or the main frame 2. That is, since it is possible to increase the accuracy of parallelism between the fixed base plate 4a and the main frame 2, the scroll compressor 105 according to Embodiment 6 enables a space S between an upper end face of the second scroll lap 5b and the lower surface of the fixed base plate 4a to be very small and enables the performance to be improved.

[0076] As described in Embodiment 2 above, the isolation wall 20 may be configured such that the isolation wall 20 projects toward the flat surface 24 of the main frame 2 from the fixed base plate 4a of the fixed scroll 4. Also in this case, there is no problem even when a space S, which is very small and has a size of, for example, about 10 to 100 μm, exists between the lower end face of the isolation wall 20 and the flat surface 24 of the main frame 2.

[0077] Fig. 16 is an enlarged view of a main part of a first modification of the scroll compressor according to Embodiment 6. Fig. 17 is a plan view illustrating a main frame of the first modification of the scroll compressor according to Embodiment 6 when viewed from the top side. As illustrated in Figs. 16 and 17, a sealing component 9, with which the space S between the isolation wall 20 and the fixed base plate 4a is filled, may be provided at the upper end portion of the isolation wall 20 of the scroll compressor 105 according to Embodiment 6. In this case, a groove 90, into which the sealing component 9 is inserted, is formed in the upper end face of the isolation wall 20, and the sealing component 9 is inserted into and fixed to the groove 90. The sealing component 9 is made of a resin material such as PTFE or PPS.

[0078] In the scroll compressor 105, the sealing component 9 is pushed against the fixed base plate 4a by the isolation wall 20 being subjected to the differential pressure between the high-pressure refrigerant in the communication passage 21 and the low-pressure refrigerant in the compression chamber 30 and being pushed against the fixed base plate 4a. That is, since the space S between the isolation wall 20 and the fixed base plate 4a can be completely filled with the sealing component 9, the scroll compressor 105 is capable of securely preventing leakage of refrigerant from the communication passage 21 into the refrigerant suction space 31 and is capable of improving the performance.

[0079] Fig. 18 is an enlarged view of a main part of a second modification of the scroll compressor according to Embodiment 6. As illustrated in Fig. 18, the isolation wall 20 may be configured such that the isolation wall 20 projects toward the flat surface 24 of the main frame 2 from the fixed base plate 4a of the fixed scroll 4 and is supported by the fixed scroll 4 via the sealing component 9 provided in the lower end face of the isolation wall 20.

[0080] The scroll compressors 100 to 105 have been described above on the basis of the embodiments. However, the configurations of the scroll compressors 100 to 105 are not limited to those in the embodiments described above. For example, the internal configurations of the scroll compressors 100 to 105 illustrated in the figures are not limited to those described above and may include other components. In short, the scroll compressors 100 to 105 encompass the scope of design changes and applications commonly performed by those skilled in the art without departing from the technical ideas.

Reference Signs List

[0081] 1: shell, 1a: main shell, 1b: upper shell, 1c: lower shell, 2: main frame, 3: compression mechanism, 4: fixed scroll, 4a: fixed base plate, 4b: first scroll lap, 4c: outer end portion, 5: orbiting scroll, 5a: orbiting base plate, 5b: second scroll lap, 5c: outer end portion, 6: motor, 6a: stator, 6b: rotor, 7: crankshaft, 8: sub frame, 9: sealing component, 10a: first inner wall surface, 10b: second inner wall surface, 10c: third inner wall surface, 11a: first step portion, 11b: second step portion, 13: suction pipe, 14: discharge pipe, 15: discharge space, 16: motor space, 17: discharge valve, 18: oil pan, 19: power supply terminal, 19a: wiring line, 20: isolation wall, 20a: first wall, 20b: second wall, 21: communication passage, 22: first Oldham groove, 23: main bearing, 24: flat surface, 25: Oldham accommodating portion, 26: first through hole, 27: support wall, 27a: first support wall, 27b: second support wall, 30: compression chamber, 31: refrigerant suction space, 40: discharge port, 41: second through hole, 50: boss, 51: second Oldham groove, 52: Oldham ring, 53: recessed portion, 70: main shaft portion, 71: eccentric shaft portion, 72: oil passage, 73: first balancer, 74: second balancer, 80: sub bearing, 90: groove, 100, 101, 102, 103, 104, 105: scroll compressor, S: space

Claims

1. A scroll compressor comprising:

a shell defining a sealed space;
a main frame fixed to an inner wall surface of the shell;
a fixed scroll including a fixed base plate having a first scroll lap;
an orbiting scroll including an orbiting base plate having a second scroll lap configured to be engaged with the first scroll lap, the orbiting scroll being supported by the main frame such that the orbiting scroll is configured to orbit, the orbiting scroll defining, between the orbiting scroll and the fixed scroll, a compression chamber in which refrigerant is compressed;
a motor disposed below the main frame, the motor being configured to drive the orbiting scroll to revolve relative to the fixed scroll; and
a discharge pipe through which an outside of the shell and a motor space in which the motor is provided are in communication with each other and through which refrigerant compressed in the compression chamber is discharged to the outside of the shell, wherein
the shell has therein

a refrigerant suction space in which refrigerant suctioned from the outside of the shell is positioned before being suctioned into the compression chamber,
a discharge space through which refrigerant compressed in the compression chamber

flows out, the discharge space being positioned above the fixed scroll, and
a communication passage through which the discharge space and the motor space are in communication with each other,

an isolation wall isolating the communication passage from the refrigerant suction space is provided between the main frame and the fixed scroll, and
the fixed base plate is fixed to the inner wall surface of the shell.

2. The scroll compressor of claim 1, wherein the fixed base plate is fixed to the inner wall surface of the shell while being supported by the isolation wall.

3. The scroll compressor of claim 2, wherein the isolation wall is configured such that the isolation wall projects toward the fixed scroll from an upper surface of the main frame and such that an upper end face of the isolation wall supports the fixed scroll.

4. The scroll compressor of claim 2, wherein the isolation wall is configured such that the isolation wall projects toward an upper surface of the main frame from the fixed base plate of the fixed scroll and such that a lower end face of the isolation wall is supported by the main frame.

5. The scroll compressor of claim 2, wherein

the isolation wall includes

a first wall projecting toward the fixed scroll from an upper surface of the main frame, and
a second wall projecting toward the upper surface of the main frame from the fixed base plate, and

the isolation wall is configured such that an upper end face of the first wall and a lower end face of the second wall butt against each other.

6. The scroll compressor of claim 1, wherein

the inner wall surface of the shell has a step portion supporting a peripheral surface of the fixed base plate, and
the fixed base plate is fixed to the inner wall surface of the shell with the peripheral surface supported by the step portion.

7. The scroll compressor of claim 6, wherein the isolation wall is configured such that the isolation wall projects toward the fixed scroll from an upper surface of the main frame and supports the fixed scroll via a sealing component provided in an upper end face of the isolation wall.

8. The scroll compressor of claim 6, wherein the isolation wall is configured such that the isolation wall projects toward an upper surface of the main frame from the fixed base plate of the fixed scroll and is supported by the fixed scroll via a sealing component provided in a lower end face of the isolation wall.

9. The scroll compressor of any one of claims 1 to 8, wherein the communication passage is formed by a space surrounded by the isolation wall and the inner wall surface of the shell.

10. The scroll compressor of any one of claims 1 to 8, wherein

the isolation wall is formed by a structure having a hollow, and
the communication passage is an inside of the hollow of the isolation wall and is isolated from the refrigerant suction space.

11. The scroll compressor of any one of claims 1 to 10, wherein a peripheral surface of the orbiting base plate has a recessed portion for avoiding interference between the orbiting base plate and the isolation wall.

12. The scroll compressor of claim 11, further comprising:

a boss provided on a lower surface of the orbiting base plate; and
a crankshaft including an eccentric shaft portion inserted into the boss, the crankshaft connecting the motor and the orbiting scroll,
wherein the recessed portion and the communication passage are configured such that a centroid of a transverse section of each of the recessed portion and the communication passage is disposed within a range in which an angle θ is 30 degrees or more and 150 degrees or less in a direction in which an involute angle increases, the angle θ being an angle in a circumferential direction of the orbiting base plate relative to a straight line connecting a center of the boss and an outer end portion of the second scroll lap.

13. The scroll compressor of claim 11 or 12, further comprising:

a boss provided on a lower surface of the orbiting base plate; and
a crankshaft including an eccentric shaft portion inserted into the boss, the crankshaft connecting the motor and the orbiting scroll,

wherein the recessed portion is formed such that a distance from a center of the boss to a part, having the recessed portion, of the peripheral surface is 80 percent or more and 95 percent or less of a maximum distance from the center of the boss to the peripheral surface of the orbiting base plate.

14. The scroll compressor of any one of claims 1 to 13, wherein the main frame has a support wall projecting toward the fixed scroll from the upper surface of the main frame, an upper end face of the support wall supporting the fixed base plate.

15. The scroll compressor of any one of claims 1 to 13, wherein the fixed scroll has a support wall projecting toward the upper surface of the main frame from the fixed base plate, a lower end face of the support wall being supported by the main frame.

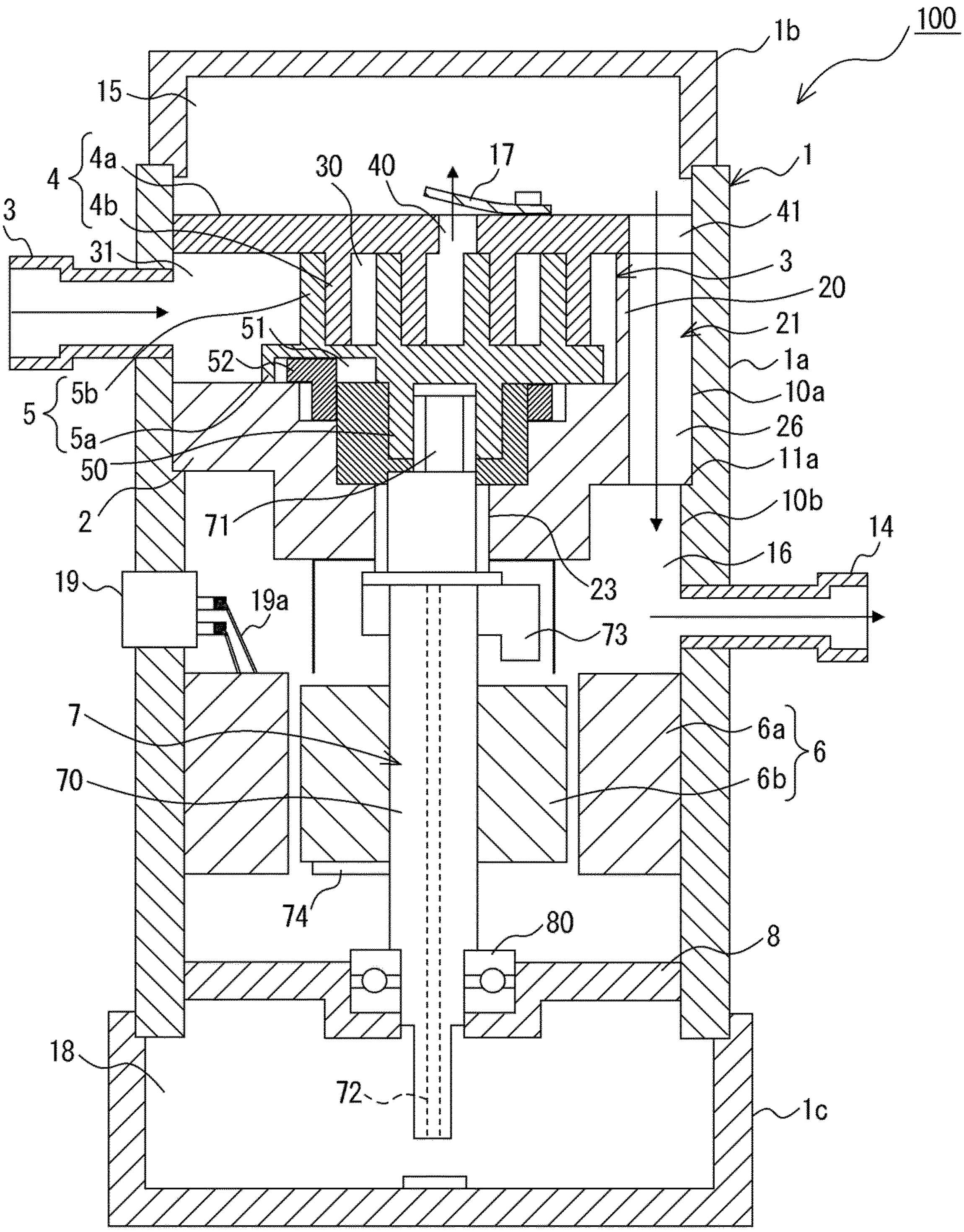
16. The scroll compressor of any one of claims 1 to 13, further comprising

a support wall including

a first support wall projecting toward the fixed scroll from the upper surface of the main frame, and
a second support wall projecting toward the upper surface of the main frame from the fixed base plate,

the support wall supporting the fixed base plate such that an upper end face of the first support wall and a lower end face of the second support wall butt against each other.

FIG. 1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1b
15
1
4a
4
4b
30
40
17
41
13
31
3
20
51
21
52
1a
5b
10a
5
5a
26
50
11a
2
10b
71
16
14
23
19
19a
73
7
6a
6
70
6b
74
80
8
18
72
1c

FIG. 2

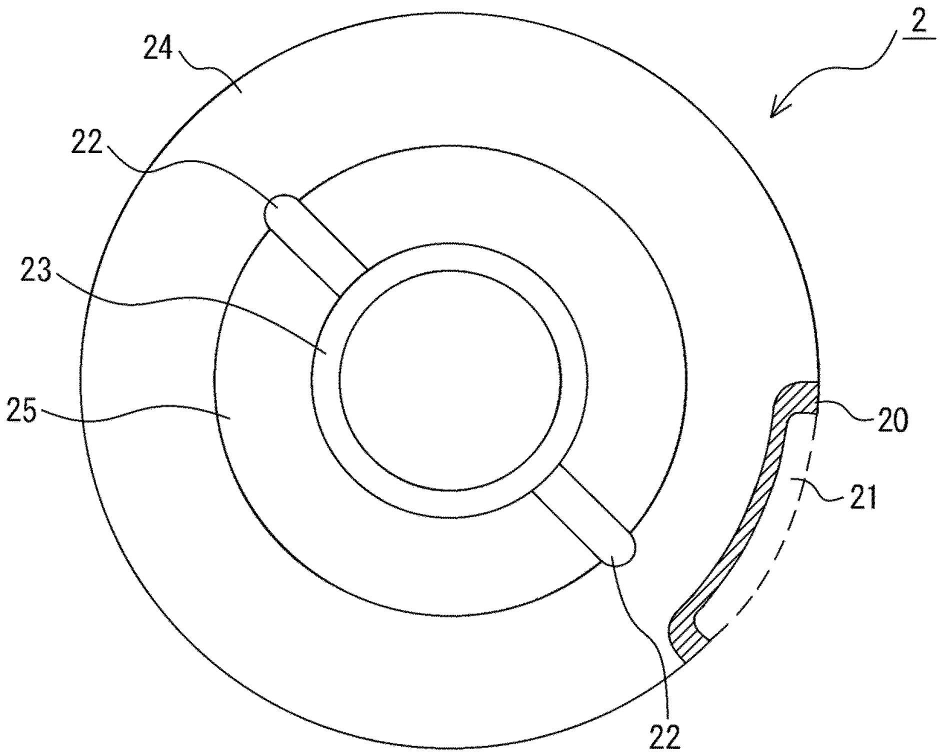


FIG. 3

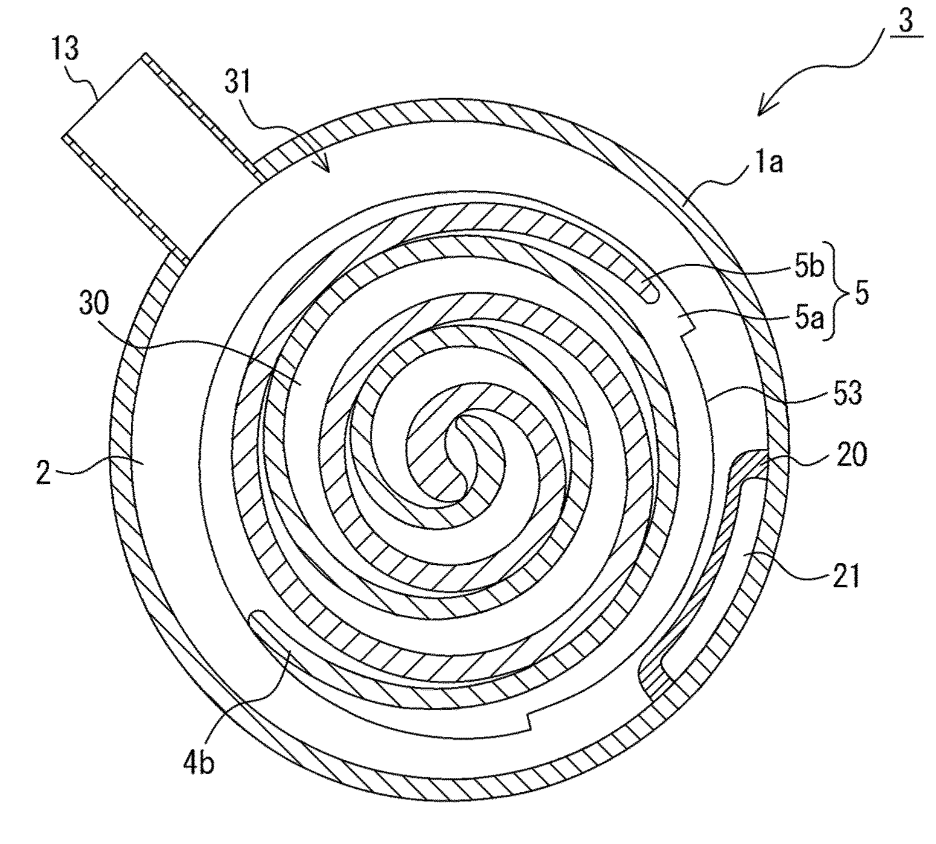


FIG. 4

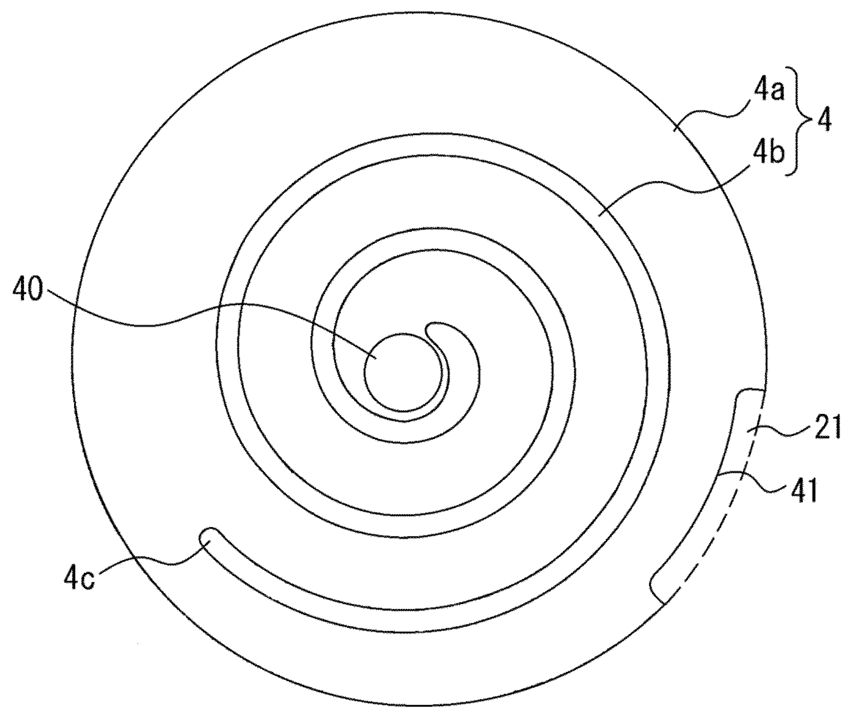


FIG. 5

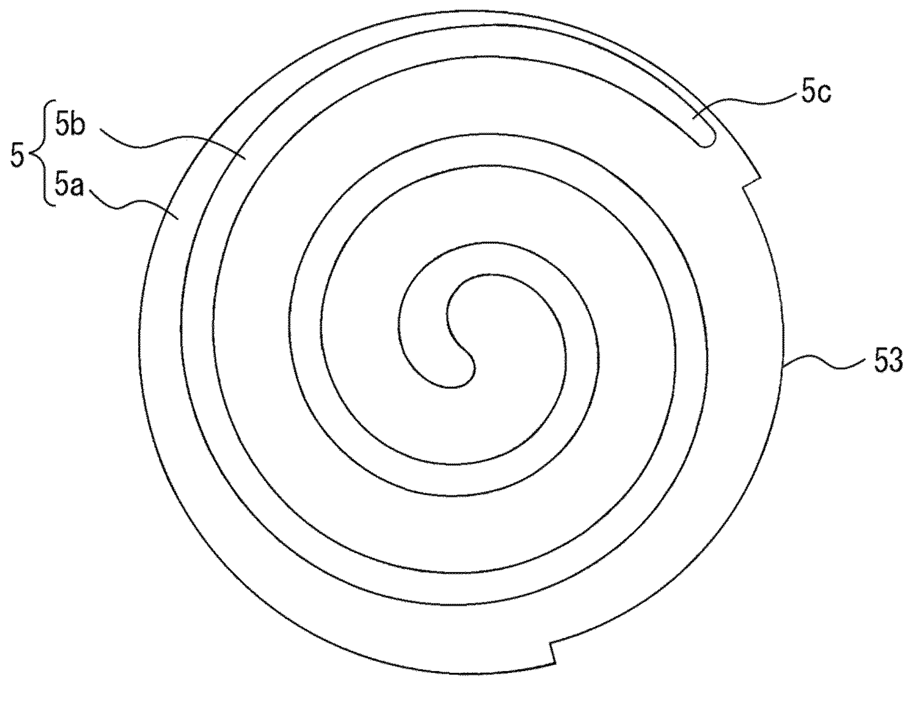


FIG. 6

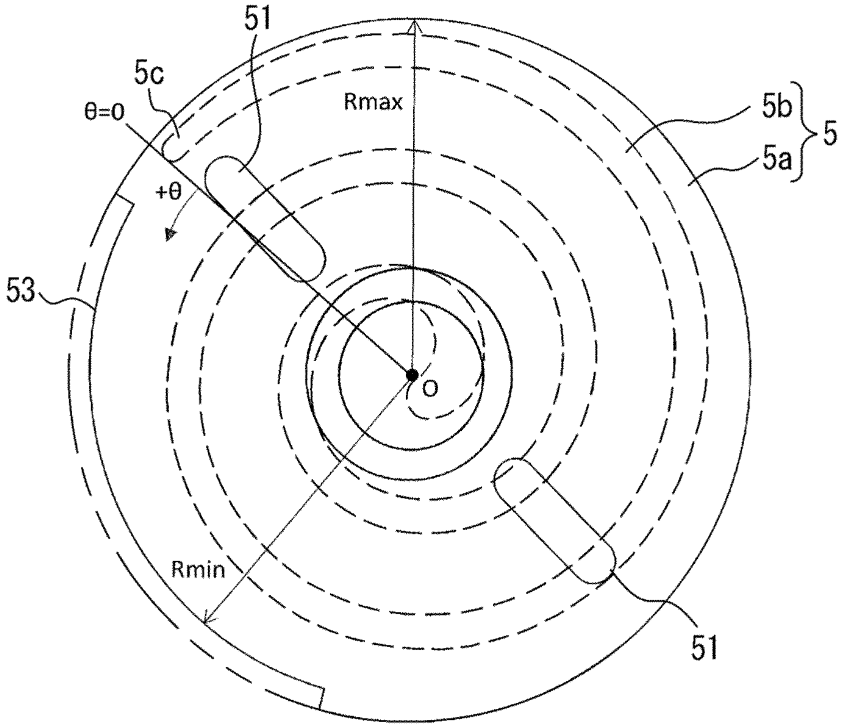
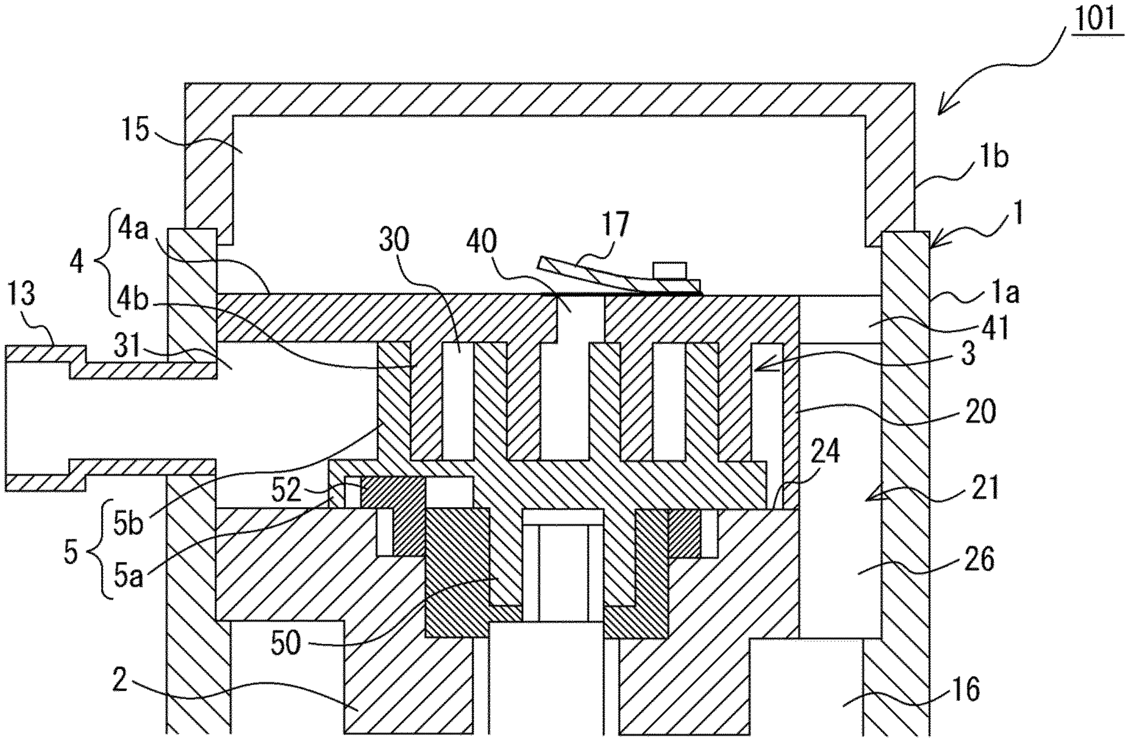

51
5c
θ=0
Rmax
5b
5
5a
+θ
53
O
Rmin
51

FIG. 7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4b
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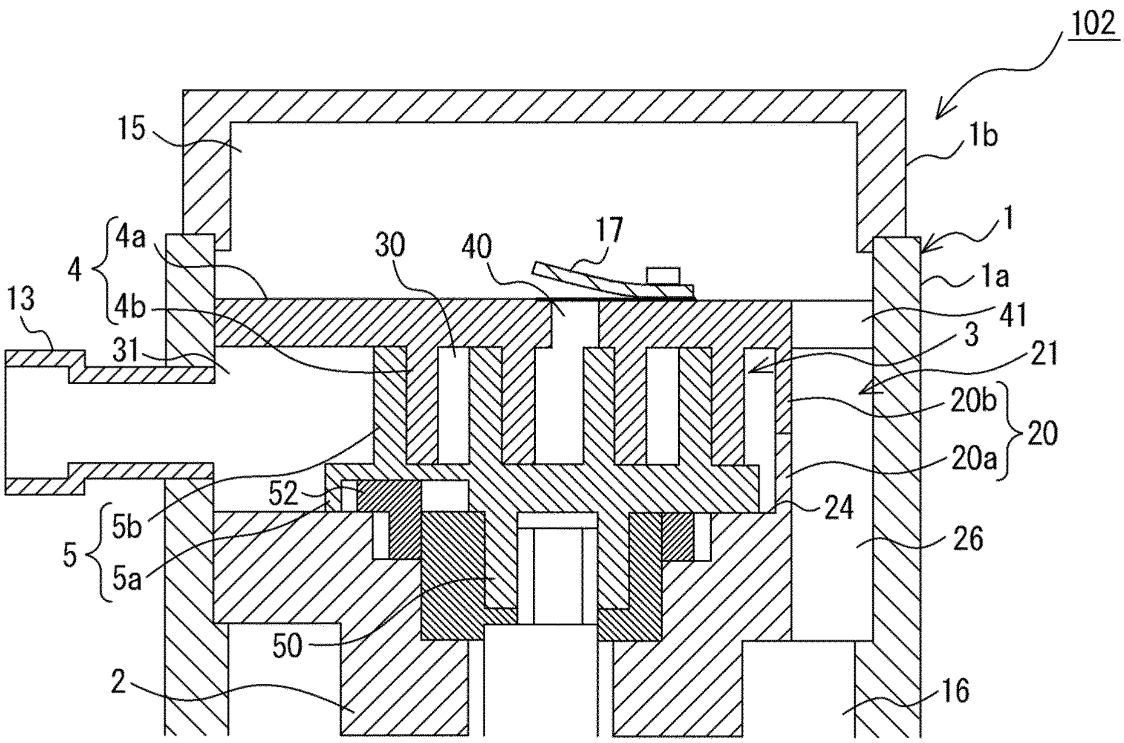
52
5b
5
5a
26
50
2
16

FIG. 8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1a
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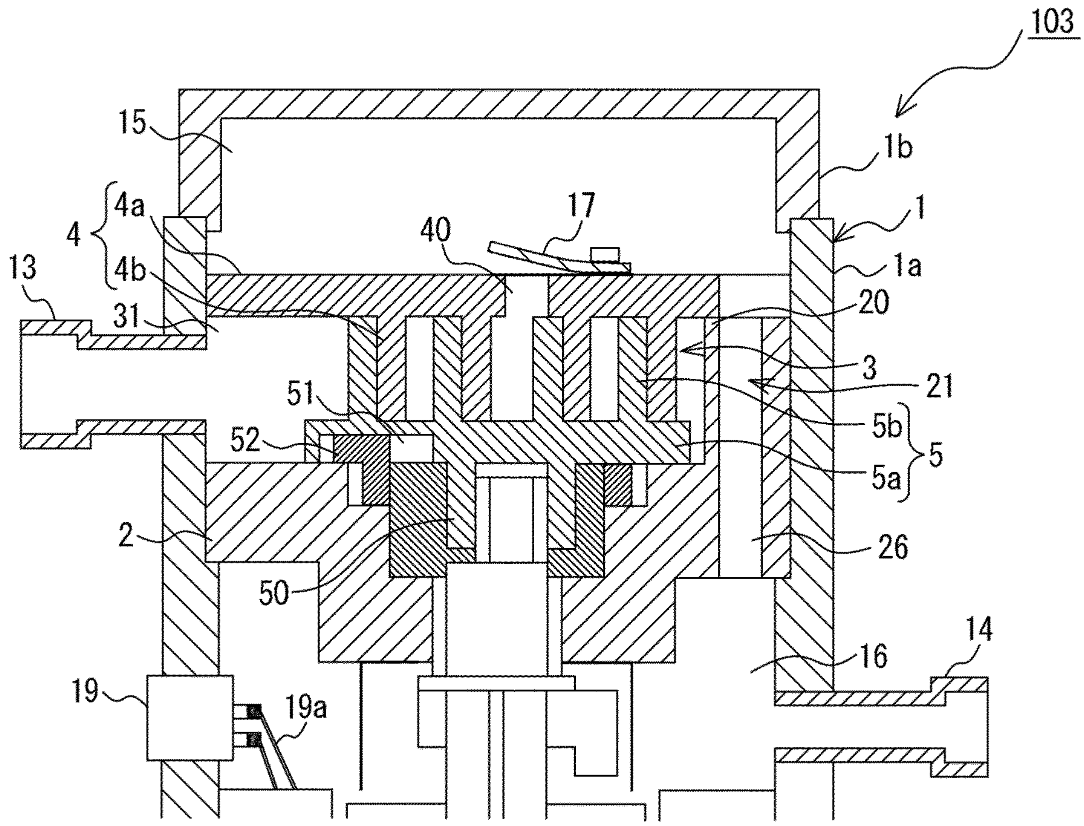
20a
52
24
5b
5
5a
26
50
2
16

FIG. 9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4b
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1a
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5b
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5
5a
2
26
50
16
14
19
19a

FIG. 10

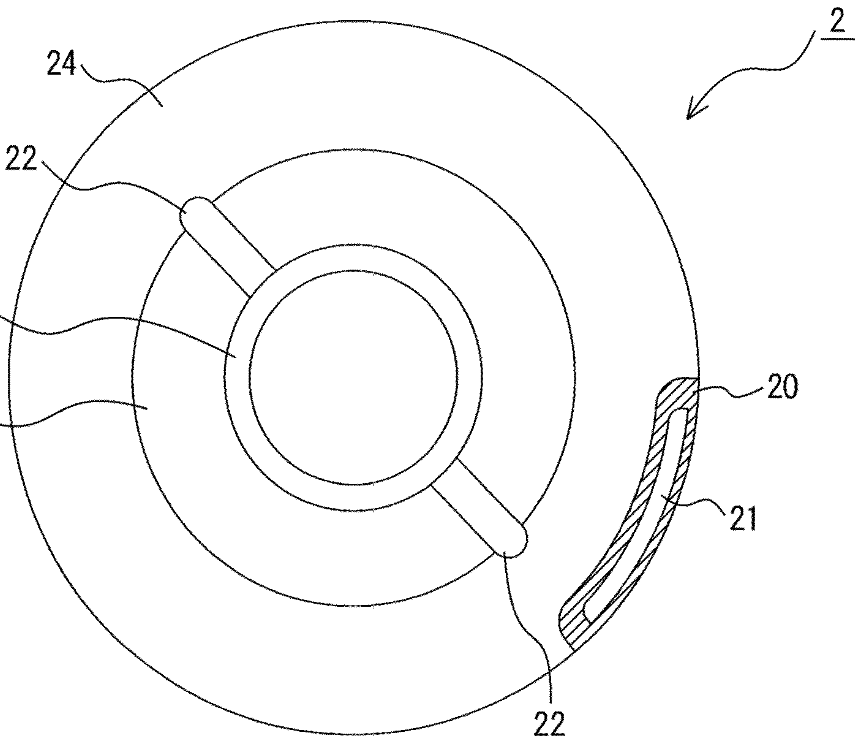
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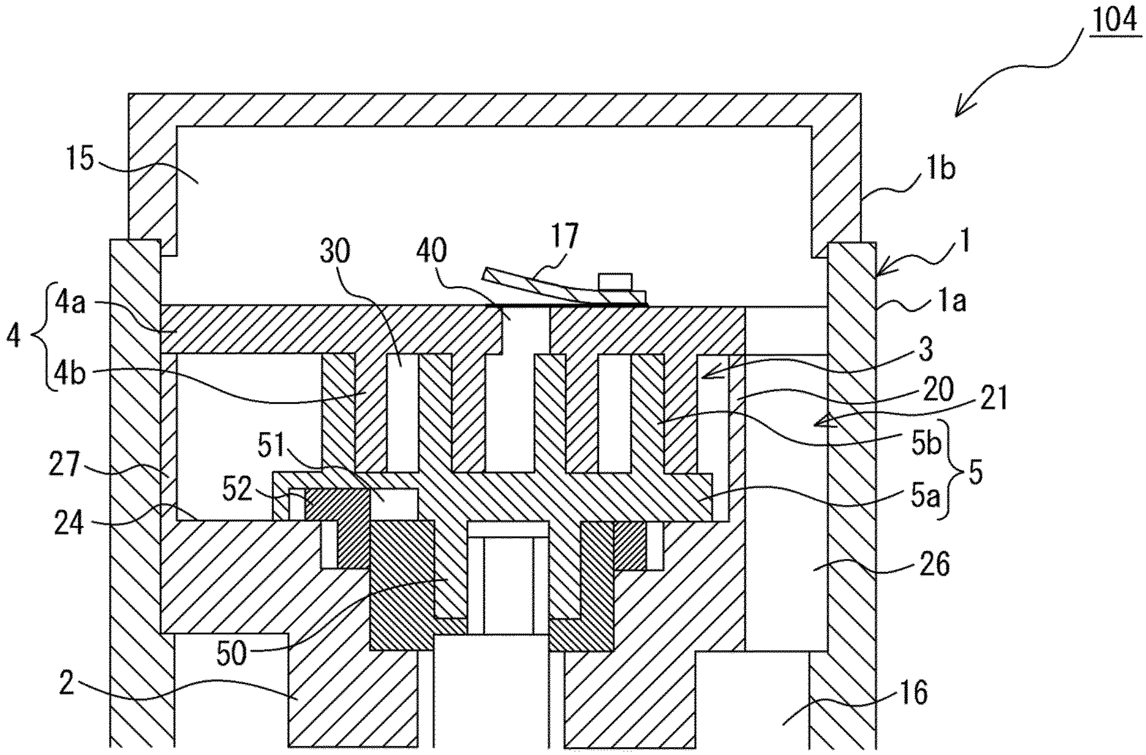
FIG. 11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1a
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4b
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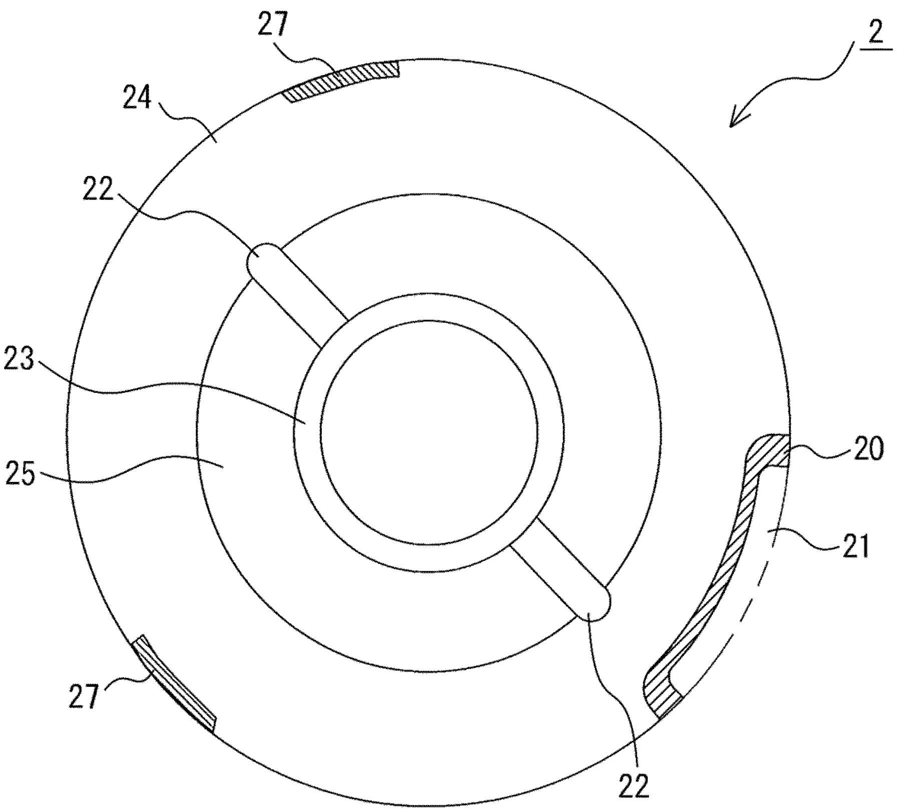
5b
5
5a
27
51
52
24
26
50
2
16

FIG. 12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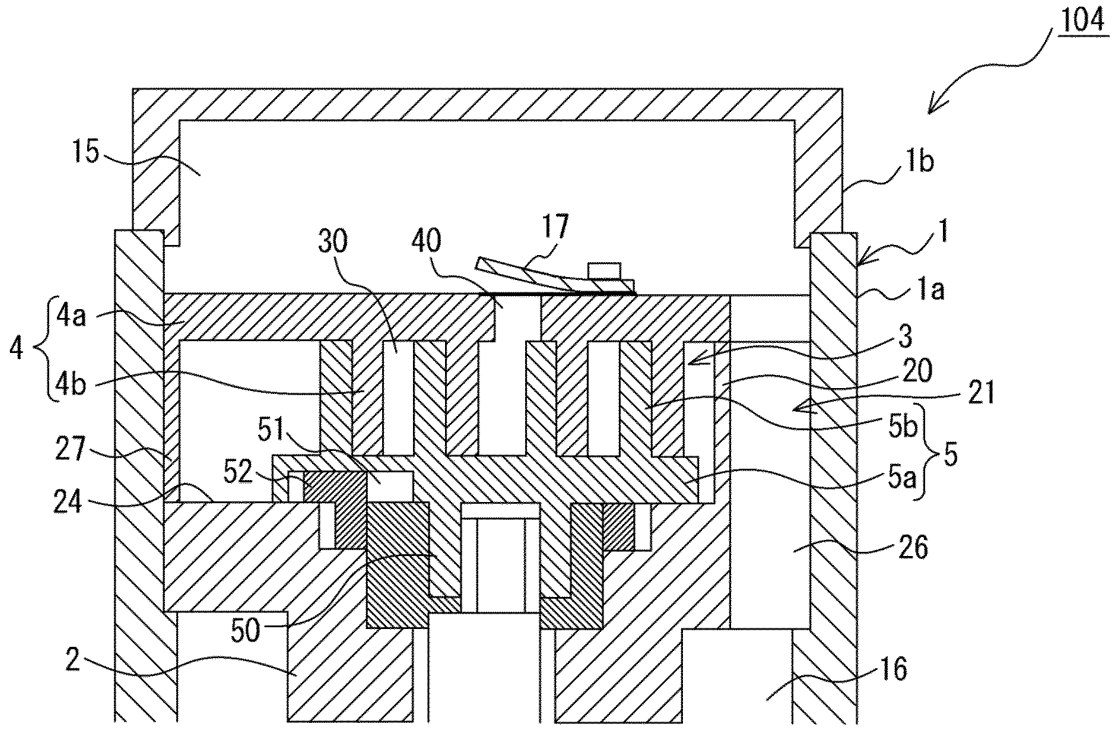
22

FIG. 13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5b
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5a
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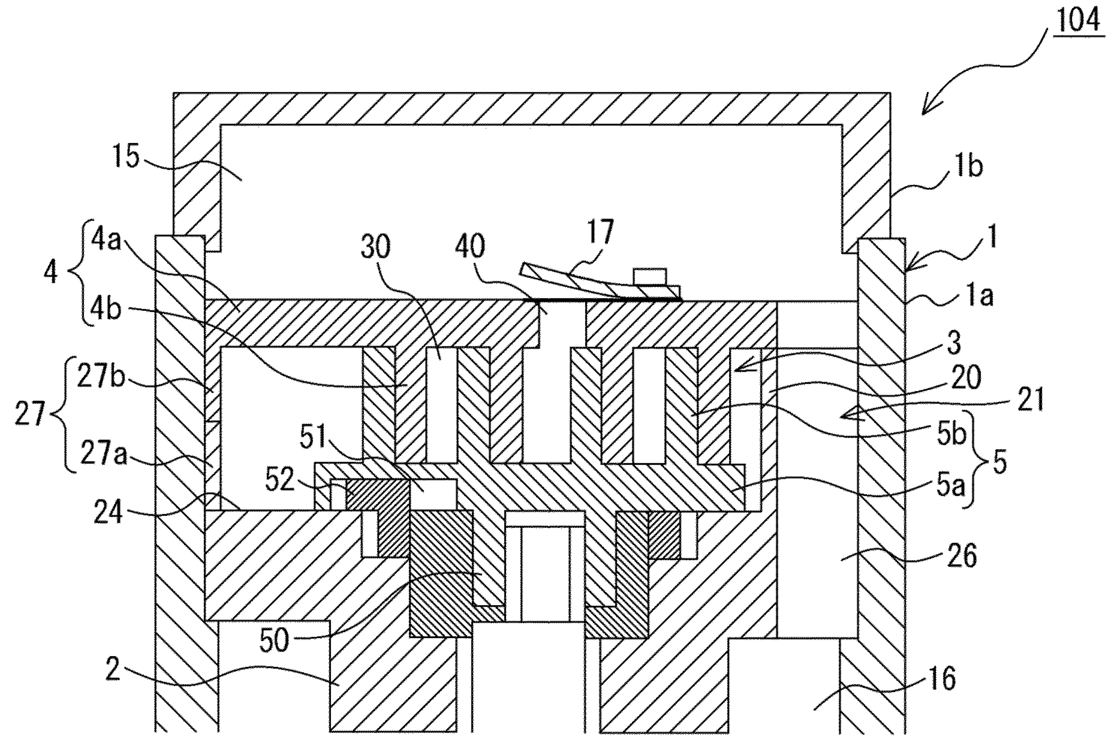
52
24
26
50
2
16

FIG. 14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27b
27a
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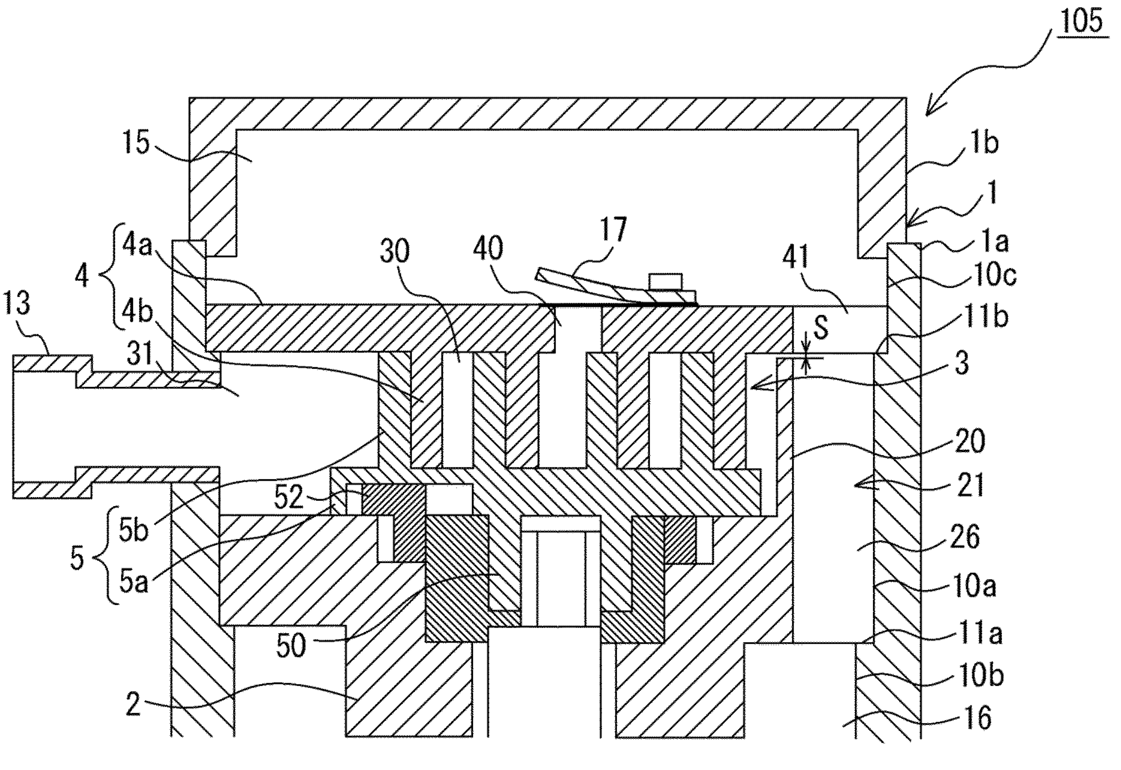
24
5b
5a
5
26
50
2
16

FIG. 15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11b
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4a
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17
41
S
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52
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11a
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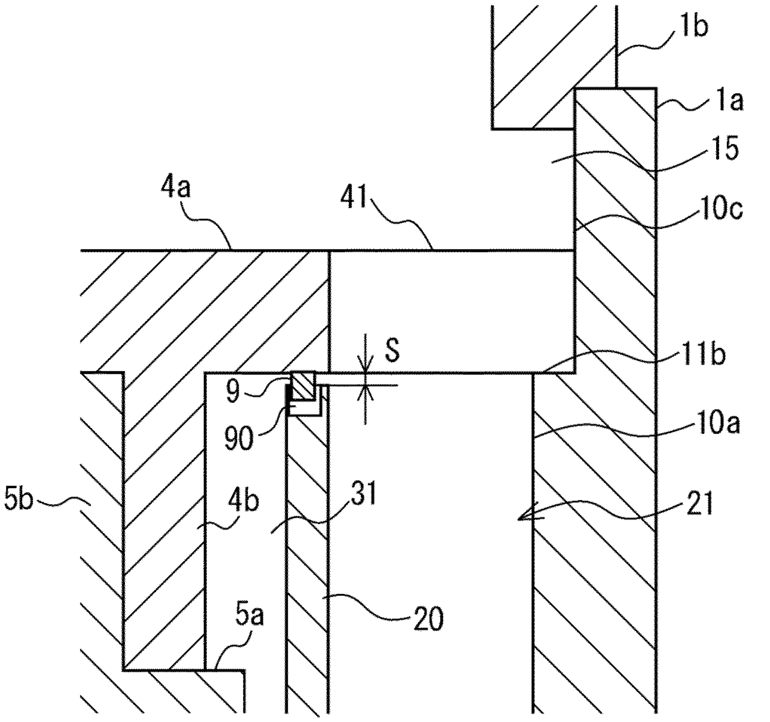
50
2
16

FIG. 16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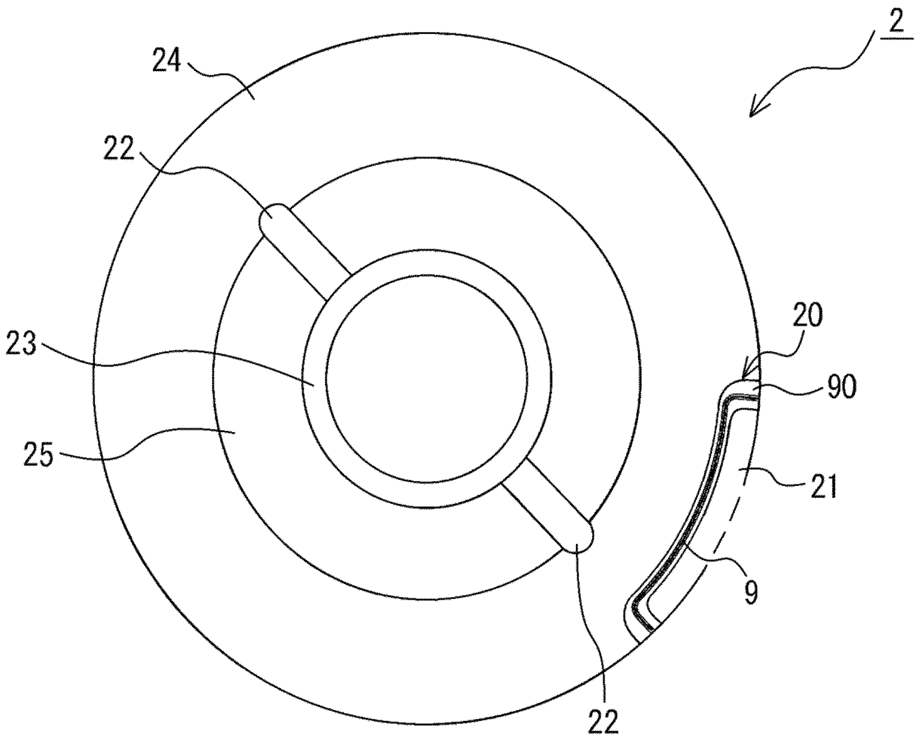
10a
5b
4b
31
21
5a
20

FIG. 17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24
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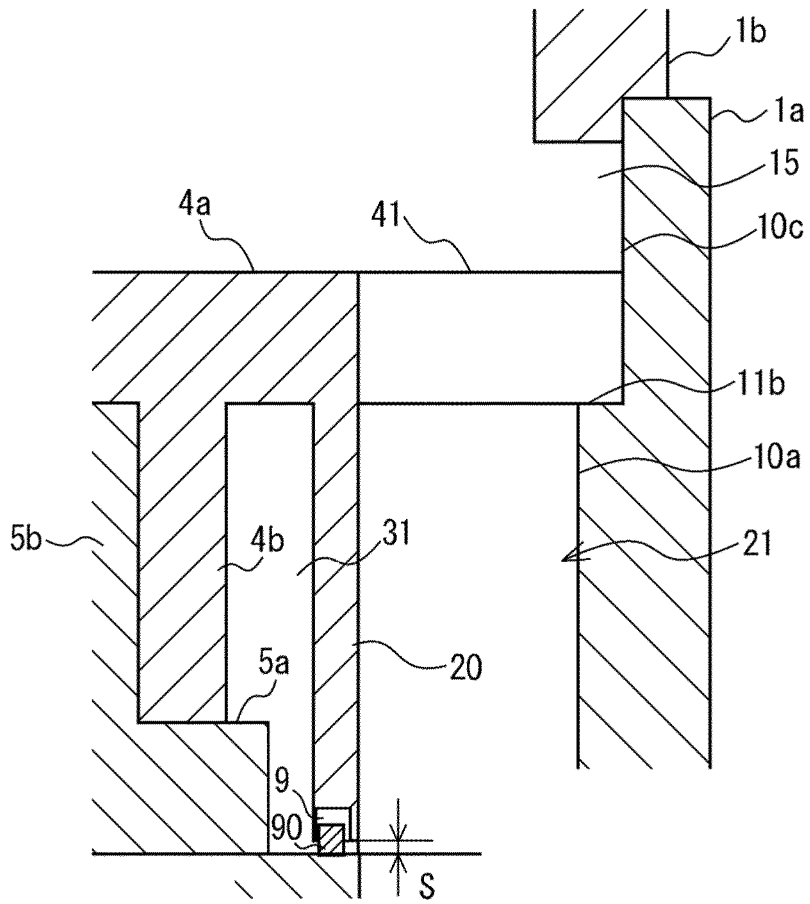
90
25
21
9
22

FIG. 18



INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2019/027902

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F04C18/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. F04C18/C12

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 Y	JP 2006-97517 A (FUJITSU GENERAL LTD.) 13 April 2006, paragraphs [0027]-[0038], fig. 1 (Family: none)	1-5, 10, 14-16 6-9
Y	WO 2018/163233 A1 (MITSUBISHI ELECTRIC CORP.) 13 September 2018, paragraphs [0060]-[0064], fig. 6-7 (Family: none)	6-8
Y	JP 2010-1816 A (SANDEN CORP.) 07 January 2010, paragraphs [0022]-[0027], fig. 1-2 (Family: none)	7-8

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

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Date of the actual completion of the international search	Date of mailing of the international search report
01 October 2019 (01.10.2019)	15 October 2019 (15.10.2019)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/027902

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2003-148348 A (MITSUBISHI ELECTRIC CORP.) 21 May 2003, paragraphs [0018]-[0023], fig. 1-2 (Family: none)	9
X	JP 2018-141444 A (SANDEN ENVIRONMENTAL PRODUCTS CORPORATION) 13 September 2018, paragraphs [0009]-[0030], fig. 1-4, 8 (Family: none)	1-3, 9, 11-14

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Patent documents cited in the description

- JP 2003286949 A **[0004]**