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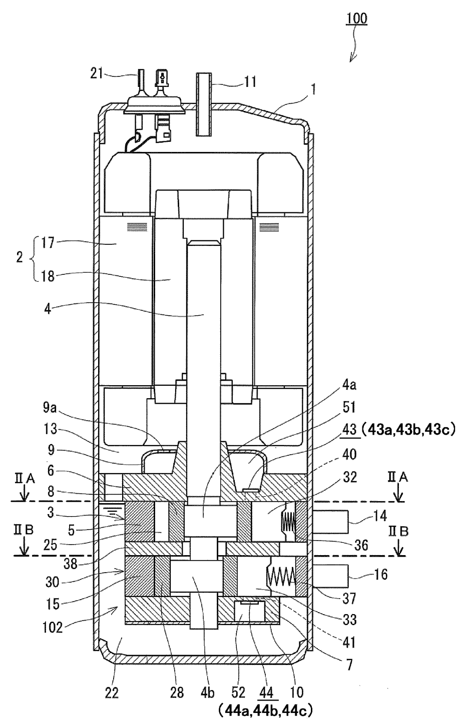
(54) ROTARY COMPRESSOR

(57) A rotary compressor 100 includes a hermetic container 1, a second cylinder 15, a second piston 28, a lower bearing member 7 (end plate member), a second vane 33, a second suction port 20, a second discharge port 41, a second closing member 10 and an oil retaining section 53. The second closing member 10 is mounted on the lower bearing member 7 such that a refrigerant discharge space 52 as a flow path for refrigerant discharged from a second discharge chamber 26b through the second discharge port 41 is formed on the opposite side from a second cylinder chamber 26. The refrigerant discharge space 52 is a space formed by substantially a minimum projection surface of a valve stop, a penetrating flow path 46 and a passage 45. Hence, heat-reception of sucked refrigerant is suppressed.

[Fig. 1]



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Description

[TECHNICAL FIELD]

[0001] The present invention relates to a rotary compressor used in an air conditioner, a freezing machine, a blower and a water heater.

[BACKGROUND TECHNIQUE]

[0002] A rotary compressor is widely used in an electric appliance such as an air conditioner, a heating system and a water heater. As one of methods for enhancing efficiency of the rotary compressor, there is proposed a technique for suppressing deterioration of efficiency caused when refrigerant (sucked refrigerant) sucked into a compression chamber receives heat from environment, i.e., suppressing so-called heat loss.

[0003] A rotary compressor of patent document 1 has a hermetic space in a suction-side portion of a cylinder as means for suppressing heat-reception of sucked refrigerant. This hermetic space restrains heat from being transmitted from high temperature refrigerant in a hermetic container to an inner wall of the cylinder.

[PRIOR ART DOCUMENT]

[PATENT DOCUMENT]

[0004] [PATENT DOCUMENT 1] Japanese Patent Application Laid-open No.H2-140486

[SUMMARY OF THE INVENTION]

[PROBLEM TO BE SOLVED BY THE INVENTION]

[0005] However, it is not always easy to form a hermetic space in a cylinder as in patent document 1. Hence, another technique capable of effectively suppress the heat-reception of sucked refrigerant is desired.

[0006] Hence, it is an object of the present invention to provide a rotary compressor capable of further enhancing a heat-insulating effect by minimizing a range into which high temperature compressed refrigerant can enter.

[MEANS FOR SOLVING THE PROBLEM]

[0007] That is, the present invention provides a rotary compressor comprising: a hermetic container having an oil reservoir; a cylinder placed in the hermetic container; a piston placed in the cylinder; an end plate member mounted on the cylinder to form a cylinder chamber between the cylinder and the piston; a vane which partitions the cylinder chamber into a suction chamber and a discharge chamber; a suction port for supplying refrigerant to be compressed into the suction chamber; a discharge port which is formed in the end plate member and which discharges the compressed refrigerant from the discharge chamber; a valve provided in the discharge port for adjusting a discharge amount of the refrigerant; a valve stop for restricting motion of the valve; a refrigerant discharge space which is provided in the end plate member that closes the cylinder and in which the refrigerant discharged from the discharge chamber through the discharge port can stay; a closing member mounted on the end plate member; and one or more penetrating flow paths for discharging the refrigerant from the refrigerant discharge space into the hermetic container, wherein the refrigerant discharge space is a space formed by substantially a minimum projection surface of the valve stop, the penetrating flow path and a passage which brings the discharge port and the penetrating flow path into communication with each other.

[EFFECT OF THE INVENTION]

[0008] According to the rotary compressor of the present invention, by minimizing a capacity of the refrigerant discharge space formed between the end plate member and the closing member, it is also possible to minimize the range of high temperature compressed refrigerant. According to this, since it is possible to restrain the temperature of the end plate member from rising, it is possible to restrain heat of the compressed refrigerant from moving toward the sucked refrigerant through the end plate member and thus, volume efficiency is enhanced.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0009]

Fig. 1 is a vertical sectional view of a rotary compressor according to an embodiment of the present invention;

Fig. 2 is a transverse sectional view of the rotary compressor shown in Fig. 1 taken along line IIA-IIA;

Fig. 3 is a transverse sectional view of the rotary compressor shown in Fig. 1 taken along line IIB-IIB;

Fig. 4 is a bottom view of a lower bearing member having a refrigerant discharge space formed by a minimum projection plane of valve stop, a penetrating flow path and a passage of the rotary compressor;

Fig. 5 is a bottom view of the lower bearing member in a state where the valve and the valve stop of the rotary compressor are fixed;

Fig. 6 is a bottom view of the lower bearing member including a space (escape portion) into which a device fixing the valve and the valve stop of the rotary compressor is inserted;

Fig. 7 is a bottom view of the lower bearing member which secures a capacity of 3 cc or more around the discharge port of the rotary compressor.

Fig. 8 is a vertical sectional view of a rotary compressor according to another embodiment of the present invention;

Fig. 9 is a bottom view of a lower bearing member on which an escape portion, a passage and a penetrating flow path of the rotary compressor are integrally formed; and

Fig. 10 is a vertical sectional view of an oil retaining section of the rotary compressor.

[EXPLANATION OF SYMBOLS]

[0010]

1	hermetic container
2	motor
3	first compressing block
4	shaft
4a	first eccentric portion
4b	second eccentric portion
5	first cylinder
6	upper bearing member
7	lower bearing member
7p	communication passage
8	first piston
9	first closing member
10	second closing member
11	discharge pipe
13	interior space
14	first suction pipe
15	second cylinder
16	second suction pipe
17	stator
18	rotor
19	first suction port
20	second suction port
21	terminal
22	oil reservoir
25	first cylinder chamber
25a	first suction chamber
25b	first discharge chamber
26	second cylinder chamber
26a	second suction chamber
26b	second discharge chamber
28	second piston
30	second compressing block
32	first vane
33	second vane
34	first vane groove
35	second vane groove
36	first spring
37	second spring
38	middle plate
40	first discharge port
41	second discharge port
43	first discharge valve
43a	first valve
43b	first valve stop
43c	first fixing tool
44	second discharge valve
44a	second valve
44b	second valve stop
44c	second fixing tool
45	passage
46	penetrating flow path
51, 52	refrigerant discharge space
53	oil retaining section
100	rotary compressor
102	compressing mechanism
200	rotary compressor

[MODE FOR CARRYING OUT THE INVENTION]

[0011] A first aspect of the present invention provides a rotary compressor comprising: a hermetic container having an oil reservoir; a cylinder placed in the hermetic container; a piston placed in the cylinder; an end plate member mounted on the cylinder to form a cylinder chamber between the cylinder and the piston; a vane which partitions the cylinder chamber into a suction chamber and a discharge chamber; a suction port for supplying refrigerant to be compressed into the suction chamber; a discharge port which is formed in the end plate member and which discharges the compressed refrigerant from the discharge chamber; a valve provided in the discharge port for adjusting a discharge amount of the refrigerant; a valve stop for restricting motion of the valve; a refrigerant discharge space which is provided in the end plate member that closes the cylinder and in which the refrigerant discharged from the discharge chamber through the discharge port can stay; a closing member mounted on the end plate member; and one or more penetrating flow paths for discharging the refrigerant from the refrigerant discharge space into the hermetic container, wherein the refrigerant discharge space is a space formed by substantially a minimum projection surface of the valve stop, the penetrating flow path and a passage which brings the discharge port and the penetrating flow path into communication with each other. According to this, since it is possible to minimize an area of the refrigerant discharge space where high temperature compressed gas exists, it is possible to restrain heat from moving toward the lower bearing member, a heating amount toward the sucked refrigerant is reduced, and volume efficiency is enhanced.

[0012] A second aspect of the invention provides a rotary compressor comprising: a hermetic container having an oil reservoir; a shaft placed in the hermetic container; a cylinder placed in the hermetic container; a piston placed in the cylinder and connected to the shaft; an end plate member mounted on the cylinder to form a cylinder chamber between the cylinder and the piston; a vane which partitions the cylinder chamber into a suction chamber and a discharge chamber; a suction port for supplying refrigerant to be compressed into the suction chamber; a discharge port which is formed in the end plate member and which discharges the compressed refrigerant from the discharge chamber; a valve provided in the discharge port for adjusting a discharge amount of the refrigerant; a valve stop for restricting motion of the valve; a refrigerant discharge space which is provided in the end plate member that closes the cylinder and in which the refrigerant discharged from the discharge chamber through the discharge port can stay; a closing member mounted on the end plate member; and a penetrating flow path for discharging the refrigerant from the refrigerant discharge space into the hermetic container, wherein the refrigerant discharge space is composed of a possession space when the valve stop, the penetrating flow path and a passage which brings the discharge port and the penetrating flow path into communication with each other are projected in an axial direction of the shaft. According to this aspect, since it is possible to minimize an area of the refrigerant discharge space where high temperature compressed gas exists, it is possible to restrain heat from moving toward the lower bearing member, a heating amount toward the sucked refrigerant is reduced, and volume efficiency is enhanced.

[0013] According to a third aspect of the invention, in the rotary compressor of the first or second aspect, the refrigerant discharge space includes a space into which a device for fixing the valve stop can be inserted. According to this aspect, since it becomes easy to fix the valve stop and the valve by means of a rivet or a bolt, mass productivity is enhanced.

[0014] According to a fourth aspect of the invention, in the rotary compressor of any one of the first to third aspects, the end plate member includes an oil retaining section for taking in a portion of oil stored in the oil reservoir. According to this aspect, since oil retained in the oil retaining section functions as heat insulating material, it is possible to restrain heat of refrigerant (compressed refrigerant) in the refrigerant discharge space from moving toward refrigerant (sucked refrigerant) sucked into the cylinder chamber through the lower bearing member, volume efficiency is enhanced.

[0015] According to a fifth aspect of the invention, in the rotary compressor of any one of the first to fourth aspects, the oil retaining section is configured such that a flow of the oil which is taken in is suppressed more than the oil reservoir. According to this aspect, since heat insulating properties of oil retained in the oil retaining section is enhanced, the volume efficiency is further enhanced.

[0016] According to a sixth aspect of the invention, in the rotary compressor of any one of the first to fifth aspects, a muffler space is provided between the penetrating flow path and an interior of the hermetic container. According to this aspect, refrigerant compressed by the second compressing block merges with refrigerant compressed by the first compressing block in the interior space of the first closing member, i.e., in the refrigerant discharge space (muffler space) on the side of an upper bearing member. Hence, even if the refrigerant discharge space on the side of a lower bearing member is slightly insufficient, a sound deadening effect can be obtained by the refrigerant discharge space (muffler space) on the side of the upper bearing member in the first closing member.

[0017] Embodiments of the present invention will be described below with reference to the drawings. The invention is not limited to the embodiment.

[0018] As shown in Fig. 1, a rotary compressor 100 of the embodiment includes a hermetic container 1, a motor 2, a compressing mechanism 102 and a shaft 4. The compressing mechanism 102 is placed at a lower location in the hermetic container 1. The motor 2 is placed in the hermetic container 1 at a location above the compressing mechanism 102. The compressing mechanism 102 and the motor 2 are connected to each other through the shaft 4. A terminal 21 for supplying electricity to the motor 2 is provided on an upper portion of the hermetic container 1 2. An oil reservoir 22 for retaining lubricant oil is formed in a bottom of the hermetic container 1.

[0019] The motor 2 is composed of a stator 17 and a rotor 18. The stator 17 is fixed to an inner wall of the hermetic container 1. The rotor 18 is fixed to the shaft 4. The rotor 18 and the shaft 4 are driven and rotated by the motor 2. The upper portion of the hermetic container 1 is provided with a discharge pipe 11. The discharge pipe 11 penetrates the upper portion of the hermetic container 1 and opens toward an interior space 13 of the hermetic container 1. The discharge pipe 11 functions as a discharge flow path through which refrigerant compressed by the compressing mechanism 102 is introduced to outside of the hermetic container 1. When the rotary compressor 100 operates, the interior space 13 of the hermetic container 1 is filled with compressed refrigerant. That is, the rotary compressor 100 is a high pressure shell-type compressor. According to the high pressure shell-type rotary compressor 100, since it is possible to cool the motor 2 by refrigerant, it is possible to expect that motor efficiency is enhanced.

[0020] The compressing mechanism 102 is operated by the motor 2 to compress refrigerant. More specifically, the compressing mechanism 102 includes a first compressing block 3, a second compressing block 30, an upper bearing member 6, a lower bearing member 7, a middle plate 38, a first closing member 9 (first muffler member) and a second closing member 10 (second muffler member). Refrigerant is compressed by the first compressing block 3 or the second compressing block 30. The first compressing block 3 and the second compressing block 30 are immersed in oil stored in the oil reservoir 22. In this embodiment, the first compressing block 3 is composed of parts which are in common with parts configuring the second compressing block 30. Therefore, the first compressing block 3 has the same suction capacity as that of the second compressing block 30.

[0021] As shown in Fig. 2, the first compressing block 3 is composed of a first cylinder 5, a first piston 8, a first vane 32, a first suction port 19, a first discharge port 40 and a first spring 36. As shown in Fig. 3, the second compressing block 30 is composed of a second cylinder 15, a second piston 28, a second vane 33, a second suction port 20, a second discharge port 41 and a second spring 37. The first cylinder 5 and the second cylinder 15 are concentrically placed.

[0022] The shaft 4 includes a first eccentric portion 4a and a second eccentric portion 4b. The first eccentric portion 4a and the second eccentric portion 4b project outward in a radial direction of the shaft 4. The first piston 8 and the second piston 28 are placed in the first cylinder 5 and the second cylinder 15, respectively. In the first cylinder 5, the first piston 8 is mounted on the first eccentric portion 4a. In the second cylinder 15, the second piston 28 is mounted on the second eccentric portion 4b. A first vane groove 34 and a second vane groove 35 are formed in the first cylinder 5 and the second cylinder 15, respectively. A position of the first vane groove 34 matches with a position of the second vane groove 35 in a rotation direction of the shaft 4. The first eccentric portion 4a projects in a direction which is 180° opposite from a projecting direction of the second eccentric portion 4b. That is, a phase difference between the first piston 8 and the second piston 28 is 180°. This configuration exerts an effect for reducing vibration and noise.

[0023] The upper bearing member 6 (first end plate member) is mounted on the first cylinder 5 such that a first cylinder chamber 25 is formed between an inner peripheral surface of the first cylinder 5 and an outer peripheral surface of the first piston 8. The lower bearing member 7 (second end plate member) is mounted on the second cylinder 15 such that a second cylinder chamber 26 is formed between an inner peripheral surface of the second cylinder 15 and an outer peripheral surface of the second piston 28. More specifically, the upper bearing member 6 is mounted on an upper portion of the first cylinder 5, and the lower bearing member 7 is mounted on a lower portion of the second cylinder 15. The middle plate 38 is placed between the first cylinder 5 and the second cylinder 15.

[0024] The first suction port 19 and the second suction port 20 are formed in the first cylinder 5 and the second cylinder 15, respectively. The first suction port 19 and the second suction port 20 open toward the first cylinder chamber 25 and the second cylinder chamber 26, respectively. A first suction pipe 14 and a second suction pipe 16 are connected to the first suction port 19 and the second suction port 20, respectively.

[0025] The first discharge port 40 and the second discharge port 41 are formed in the upper bearing member 6 and the lower bearing member 7, respectively. The first discharge port 40 and the second discharge port 41 open toward the first cylinder chamber 25 and the second cylinder chamber 26, respectively. The first discharge port 40 is provided with a first discharge valve 43 to open and close the first discharge port 40. The first discharge valve 43 is composed of a thin first valve 43a, a first valve stop 43b and a first fixing tool 43c. The first valve 43a adjusts a discharge amount of refrigerant. The first valve stop 43b restricts motion of the first valve 43a. The first fixing tool 43c fixes the first valve 43a and the first valve stop 43b.

[0026] The second discharge port 41 is provided with a second discharge valve 44 to open and close the second discharge port 41. The second discharge valve 44 is composed of a thin second valve 44a, a second valve stop 44b and a second fixing tool 44c. The second valve 44a adjusts a discharge amount of refrigerant. The second valve stop 44b restricts motion of the second valve 44a. The second fixing tool 44c fixes the second valve 44a and the second valve stop 44b.

[0027] The first vane 32 (blade) is placed in the first vane groove 34 such that the first vane 32 can slide therein. The first vane 32 partitions the first cylinder chamber 25 along a circumferential direction of the first piston 8. According to this, the first cylinder chamber 25 is partitioned into a first suction chamber 25a and a first discharge chamber 25b. The second vane 33 (blade) is placed in the second vane groove 35 such that the second vane 33 can slide therein. The second vane 33 partitions the second cylinder chamber 26 along a circumferential direction of the second piston 28. According to this, the second cylinder chamber 26 is partitioned into a second suction chamber 26a and a second discharge chamber 26b. The first suction port 19 and the first discharge port 40 are located on left and right sides of the first vane 32, respectively. The second suction port 20 and the second discharge port 41 are located on left and right sides of the second vane 33. Refrigerant to be compressed is supplied to the first cylinder chamber 25 (first suction chamber 25a) through the first suction port 19. Refrigerant to be compressed is supplied to the second cylinder chamber 26 (second suction chamber 26a) through the second suction port 20. Refrigerant compressed in the first cylinder chamber 25 pushes and opens the first discharge valve 43, and is discharged from the first discharge chamber 25b through the first discharge port 40. Refrigerant compressed in the second cylinder chamber 26 pushes and opens the second discharge valve 44, and is discharged from the second discharge chamber 26b through the second discharge port 41.

[0028] The first piston 8 and the first vane 32 may be composed of a single part, i.e., a swing piston. The second piston 28 and the second vane 33 may be composed of a single part, i.e., a swing piston. The first vane 32 and the second vane 33 may be coupled to the first piston 8 and the second piston 28, respectively.

[0029] The first spring 36 and the second spring 37 are placed behind the first vane 32 and the second vane 33, respectively. The first spring 36 and the second spring 37 respectively push the first vane 32 and the second vane 33 toward a center of the shaft 4. A rear portion of the first vane groove 34 and a rear portion of the second vane groove 35 are in communication with the interior space 13 of the hermetic container 1. Therefore, pressure in the interior space 13 of the hermetic container 1 is applied to a back surface of the first vane 32 and a back surface of the second vane 33. Lubricant oil stored in the oil reservoir 22 is supplied to the first vane groove 34 and the second vane groove 35.

[0030] Refrigerant discharged from the first discharge chamber 25b through the first discharge port 40 can stay in a refrigerant discharge space 51. As shown in Fig. 1, the first closing member 9 is mounted on the upper bearing member 6 (first end plate member) such that the refrigerant discharge space 51 is formed on the opposite side from the first cylinder chamber 25. More specifically, the first closing member 9 is mounted on an upper portion of the upper bearing member 6 such that the refrigerant discharge space 51 is formed above the upper bearing member 6. The first discharge valve 43 is covered with the first closing member 9. A discharge port 9a is formed in the first closing member 9 for guiding refrigerant from the refrigerant discharge space 51 into the interior space 13 of the hermetic container 1. Refrigerant discharged from the second discharge chamber 26b through the second discharge port 41 can stay in a refrigerant discharge space 52. The second closing member 10 is mounted on the lower bearing member 7 (second end plate member) such that the refrigerant discharge space 52 is formed on the opposite side from the second cylinder chamber 26. More specifically, the second closing member 10 is mounted on a lower portion of the lower bearing member 7 such that the refrigerant discharge space 52 is formed below the lower bearing member 7. The second discharge valve 44 is covered with the second closing member 10. The refrigerant discharge spaces 51 and 52 function as flow paths for refrigerant. The shaft 4 penetrates a central portion of the first closing member 9 and a central portion of the second closing member 10. The shaft 4 is supported by the upper bearing member 6 and the lower bearing member 7. According to this, the shaft 4 can rotate.

[0031] In the rotary compressor configured as described above, the refrigerant discharge space 52 is composed of a possession space (space formed by minimum projection surface) when the second valve stop 44b, the penetrating flow path 46 and a passage 45 which brings the second discharge port 41 and the penetrating flow path 46 into communication with each other are projected in an axial direction of the shaft 4 as shown in Figs. 4 and 5.

[0032] The second valve stop 44b and the second valve 44a are fixed to each other through a rivet. They may be fixed to each other through a bolt instead of the rivet.

[0033] According to this, since an area of the refrigerant discharge space 52 where high temperature compressed gas exists can be minimized, heat is restrained from moving toward the lower bearing member and thus, a heating amount toward the suction is reduced and volume efficiency is enhanced.

[0034] As shown in Fig. 6, the refrigerant discharge space 52 includes a space (escape portion) 47, and a device which fixes the second valve 44a and the second valve stop 44b to each other can be inserted into the space 47. According to this, since it becomes easy to fix the second valve stop 44b and the second valve 44a to each other through a rivet or a bolt, mass productivity is enhanced.

[0035] As shown in Fig. 7, an escape portion 47, the passage 45 and the penetrating flow path 46 may integrally formed together in the refrigerant discharge space 52. According to this, a flow of high pressure gas becomes excellent, and pressure loss is reduced.

[0036] As shown in Fig. 1, the refrigerant discharge space 52 is in communication with the refrigerant discharge space 51 through a penetrating flow path 46. The penetrating flow path 46 penetrates the lower bearing member 7, the second cylinder 15, the middle plate 38, the first cylinder 5 and the upper bearing member 6 in a direction parallel to a rotation axis of the shaft 4. Refrigerant compressed by the second compressing block 30 merges with refrigerant compressed by the first compressing block 3 in an interior space of the first closing member 9, i.e., in the refrigerant discharge space 51. Hence, even if a volume of the refrigerant discharge space 52 is slightly insufficient, a sound deadening effect can be obtained by the refrigerant discharge space 51 in the first closing member 9. A cross sectional area (area of flow path) of the penetrating flow path 46 is greater than a cross sectional area (area of flow path) of the second discharge port 41. According to this, it is possible to prevent pressure loss from increasing.

[0037] As shown Fig. 3, in the present invention, a first reference plane H1, a second reference plane H2 and a third reference plane H3 are defined as follows. A plane which includes a center axis O_1 of the second cylinder 15 and a center of the second vane 33 when the second vane 33 most projects toward the center axis O_1 of the second cylinder 15 is defined as the first reference plane H1. The first reference plane H1 passes through a center of the second vane groove 35. A plane which includes the center axis O_1 and which is perpendicular to the first reference plane H1 is defined as the second reference plane H2. A plane which includes a center of the second suction port 20 and the center axis O_1 is defined as the third reference plane H3. The center axis O_1 of the second cylinder 15 substantially matches with the rotation axis of the shaft 4 and a center axis of the first cylinder 5.

[0038] Next, the oil retaining section 53 will be described.

[0039] As shown in Fig. 8, the compressing mechanism 102 further includes an oil retaining section 53. The oil retaining section 53 is formed on the same side as the second suction port 20 as viewed from the first reference plane H1 and on the opposite side from the second cylinder chamber 26 while sandwiching the lower bearing member 7 between the oil retaining section 53 and the second cylinder chamber 26. More specifically, the oil retaining section 53 is in contact with a lower surface of the lower bearing member 7. The oil retaining section 53 is configured such that oil stored in the oil reservoir 22 is taken into the oil retaining section 53 and a flow of the oil which is taken is suppressed more than a flow of oil in the oil reservoir 22. The flow of oil in the oil retaining section 53 is slower than the flow of oil in the oil reservoir 22.

[0040] 1 In the rotary compressor 200, an oil surface in the oil reservoir 22 is located higher than a lower surface of the first cylinder 5. To secure reliability, it is preferable that the oil surface in the oil reservoir 22 is higher than an upper surface of the first cylinder 5 and lower than a lower surface of the motor 2 during operation of the rotary compressor. The second cylinder 15, the lower bearing member 7 and the second closing member 10 are immersed in oil in the oil reservoir 22. Therefore, oil in the oil reservoir 22 can flow into the oil retaining section 53.

[0041] Refrigerant to be compressed is in a low temperature and low pressure state. On the other hand, compressed refrigerant is in a high temperature and high pressure state. Hence, during operation of the rotary compressor 100, a specific temperature distribution is generated in the lower bearing member 7. More specifically, when the lower bearing member 7 is divided into a suction-side portion and a discharge-side portion, temperature of the suction-side portion is relatively low, and temperature of the discharge-side portion is relatively high. The lower bearing member 7 is divided into a suction-side portion and a discharge-side portion by the first reference plane H1. The suction-side portion includes a portion directly below the second suction port 20, and the second discharge port 41 is provided in the discharge-side portion.

[0042] In this embodiment, the oil retaining section 53 is formed on the same side as the second suction port 20 as viewed from the first reference plane H1. The oil retaining section 53 is in contact with a lower surface of the lower bearing member 7. In this case, since oil retained by the oil retaining section 53 functions as heat insulating material, it is possible to restrain heat of refrigerant (compressed refrigerant) of the refrigerant discharge space 52 from moving toward refrigerant (sucked refrigerant) sucked into the second cylinder chamber 26 through the lower bearing member 7. Even if another member is placed between the oil retaining section 53 and the lower surface of the lower bearing member 7, this other member can be regarded as a portion of the lower bearing member 7.

[0043] As shown in Figs. 8 and 9, in this embodiment, a first recess formed in the lower bearing member 7 is closed by the second closing member 10. According to this, the oil retaining section 53 is formed. According to this structure, since it is possible to avoid increase in the thickness of the lower bearing member 7, it is possible to avoid increase in cost of parts, and this is also an advantage in reduction in weight of the rotary compressor 200. Alternatively, the oil retaining section 53 may be formed by closing the first recess by a member which is different from the second closing member 10.

[0044] The lower bearing member 7 is further provided with communication passages 7p. The communication passages 7p extend in a lateral direction to bring the oil reservoir 22 and the oil retaining section 53 into communication with each other. Oil in the oil reservoir 22 can flow into the oil retaining section 53 through the communication passages 7p (communication hole). If the plurality of communication passages 7p are formed, oil in the oil reservoir 22 can reliably flow into the oil retaining section 53. A size of each of the communication passages 7p is adjusted to such a necessary and sufficient size that oil in the oil reservoir 22 flows into the oil retaining section 53. Hence, a flow of oil in the oil retaining section 53 is slower than a flow of oil in the oil reservoir 22. Therefore, in the oil retaining section 53, oil forms relatively stable thermal stratification.

[0045] In this embodiment, the communication passages 7p are composed of small through holes. The communication passages 7p may be composed of other structures such as slits . As shown in Figs. 9 and 10, in a direction parallel to the rotation axis of the shaft 4, upper ends of the communication passages 7p is located in a lower surface 7h of the lower bearing member 7, or exist at a location higher than the lower surface 7h of the lower bearing member 7. According to such a configuration, it is possible to prevent air or refrigerant from remaining in the oil retaining section 53.

[0046] A second recess formed in the lower bearing member 7 is closed by the second closing member 10. According to this, the refrigerant discharge space 52 is formed. That is, the first recess which functions as the oil retaining section 53 and the second recess which functions as the refrigerant discharge space 52 are formed in the lower bearing member 7. The second closing member 10 is composed of a single plate-shaped member. An opening end surface of the first recess and an opening end surface of the second recess exist on the same plane so that both the first recess and the second recess are closed by the second closing member 10. Such a structure is extremely simple, and it is possible to avoid increase in the number of parts.

[0047] As shown in Fig. 9, the oil retaining section 53 is formed in a zone of a portion of a peripheral environment of the shaft 4, and the refrigerant discharge space 52 is formed in a zone of other portion of the peripheral environment of the shaft 4. The oil retaining section 53 is completely isolated from the refrigerant discharge space 52 by ribs 7k provided on the lower bearing member 7. Most of the refrigerant discharge space 52 is formed on the same side as the second discharge port 41 as viewed from the first reference plane H1. On the other hand, the oil retaining section 53 is formed on the same side of the second suction port 20 as viewed from the first reference plane H1. According to this positional relationship, it is possible to restrain heat of refrigerant discharged into the refrigerant discharge space 52 from moving toward refrigerant sucked into the second cylinder chamber 26.

[0048] Although it is not illustrated in the drawings, the first compressing block 3 may be omitted from a rotary compressor 200 shown in Fig. 8. That is, this is a one-piston rotary compressor having only one cylinder. The present invention can be applied to the one-piston rotary compressor.

[0049] Further, although it is not likewise illustrated in the drawings, the oil retaining section 53 may be formed in the upper bearing member 6 of the rotary compressor. According to the structure described with reference to Fig. 8, it is also possible to form the oil retaining section 53 above the upper bearing member 6. The oil retaining section 53 may be formed on the upper side or on the lower side as viewed from the second cylinder chamber 26.

[INDUSTRIAL APPLICABILITY]

[0050] The present invention is useful for a compressor of a refrigeration cycle device which can be utilized for an electric appliance such as a water heater, a hot-water heating device and an air conditioner.

Claims

1. A rotary compressor comprising:

   a hermetic container having an oil reservoir;
   a cylinder placed in the hermetic container;
   a piston placed in the cylinder;
   an end plate member mounted on the cylinder to form a cylinder chamber between the cylinder and the piston;
   a vane which partitions the cylinder chamber into a suction chamber and a discharge chamber;
   a suction port for supplying refrigerant to be compressed into the suction chamber;
   a discharge port which is formed in the end plate member and which discharges the compressed refrigerant from the discharge chamber;
   a valve provided in the discharge port for adjusting a discharge amount of the refrigerant;
   a valve stop for restricting motion of the valve;
   a refrigerant discharge space which is provided in the end plate member that closes the cylinder and in which the refrigerant discharged from the discharge chamber through the discharge port can stay;
   a closing member mounted on the end plate member; and
   one or more penetrating flow paths for discharging the refrigerant from the refrigerant discharge space into the hermetic container, wherein
   the refrigerant discharge space is a space formed by substantially a minimum projection surface of the valve stop, the penetrating flow path and a passage which brings the discharge port and the penetrating flow path into communication with each other.

2. A rotary compressor comprising:

   a hermetic container having an oil reservoir;
   a shaft placed in the hermetic container;
   a cylinder placed in the hermetic container;
   a piston placed in the cylinder and connected to the shaft;
   an end plate member mounted on the cylinder to form a cylinder chamber between the cylinder and the piston;
   a vane which partitions the cylinder chamber into a suction chamber and a discharge chamber;
   a suction port for supplying refrigerant to be compressed into the suction chamber;
   a discharge port which is formed in the end plate member and which discharges the compressed refrigerant from the discharge chamber;
   a valve provided in the discharge port for adjusting a discharge amount of the refrigerant;
   a valve stop for restricting motion of the valve;
   a refrigerant discharge space which is provided in the end plate member that closes the cylinder and in which the refrigerant discharged from the discharge chamber through the discharge port can stay;
   a closing member mounted on the end plate member; and
   a penetrating flow path for discharging the refrigerant from the refrigerant discharge space into the hermetic container, wherein
   the refrigerant discharge space is composed of a possession space when the valve stop, the penetrating flow path and a passage which brings the discharge port and the penetrating flow path into communication with each other are projected in an axial direction of the shaft.

3. The rotary compressor according to claim 1 or 2, wherein the refrigerant discharge space includes a space into which a device for fixing the valve stop can be inserted.

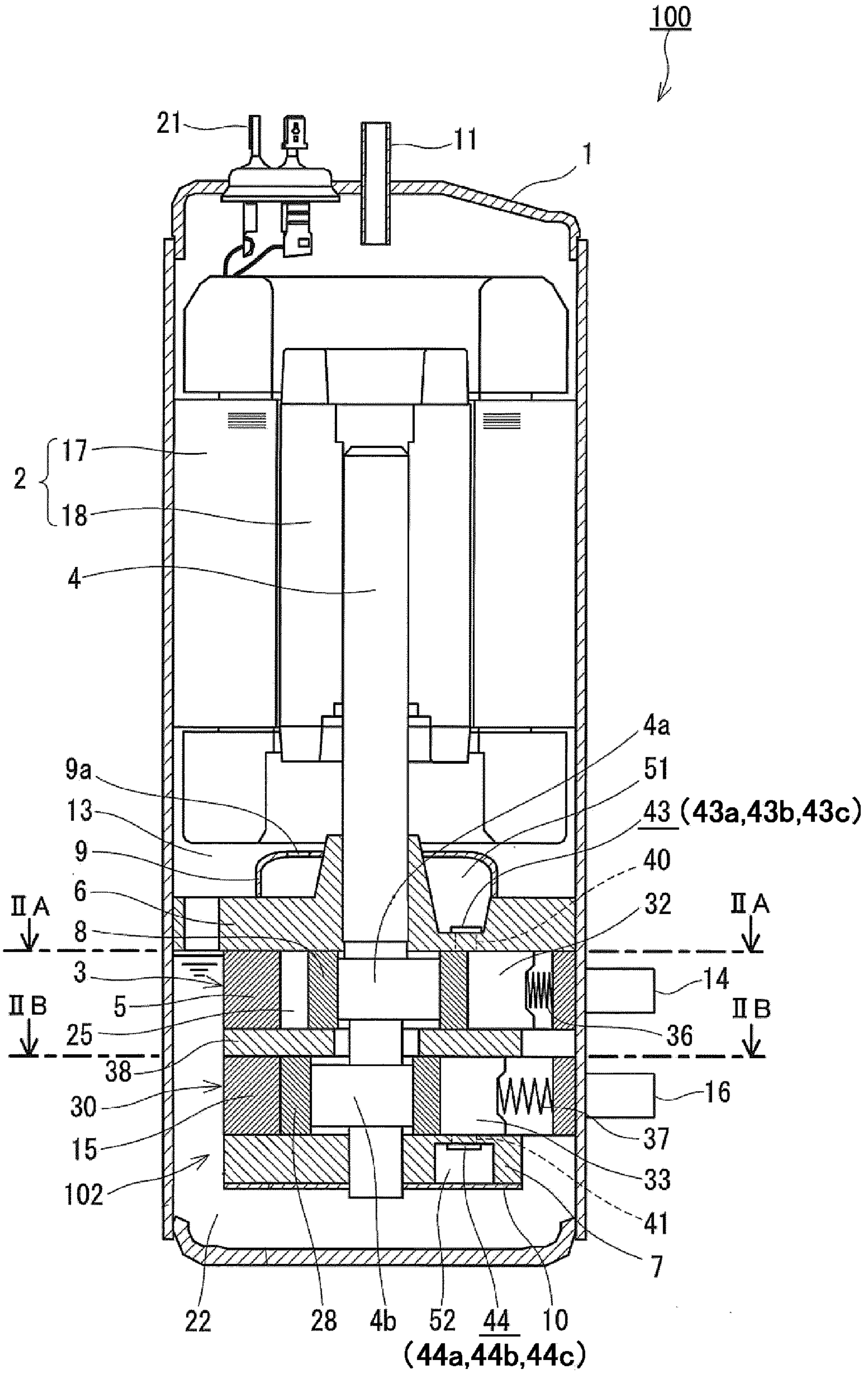
4. The rotary compressor according to any one of claims 1 to 3, wherein the end plate member includes an oil retaining section for taking in a portion of oil stored in the oil reservoir.

5. The rotary compressor according to any one of claims 1 to 4, wherein the oil retaining section is configured such that a flow of the oil which is taken in is suppressed more than the oil reservoir.

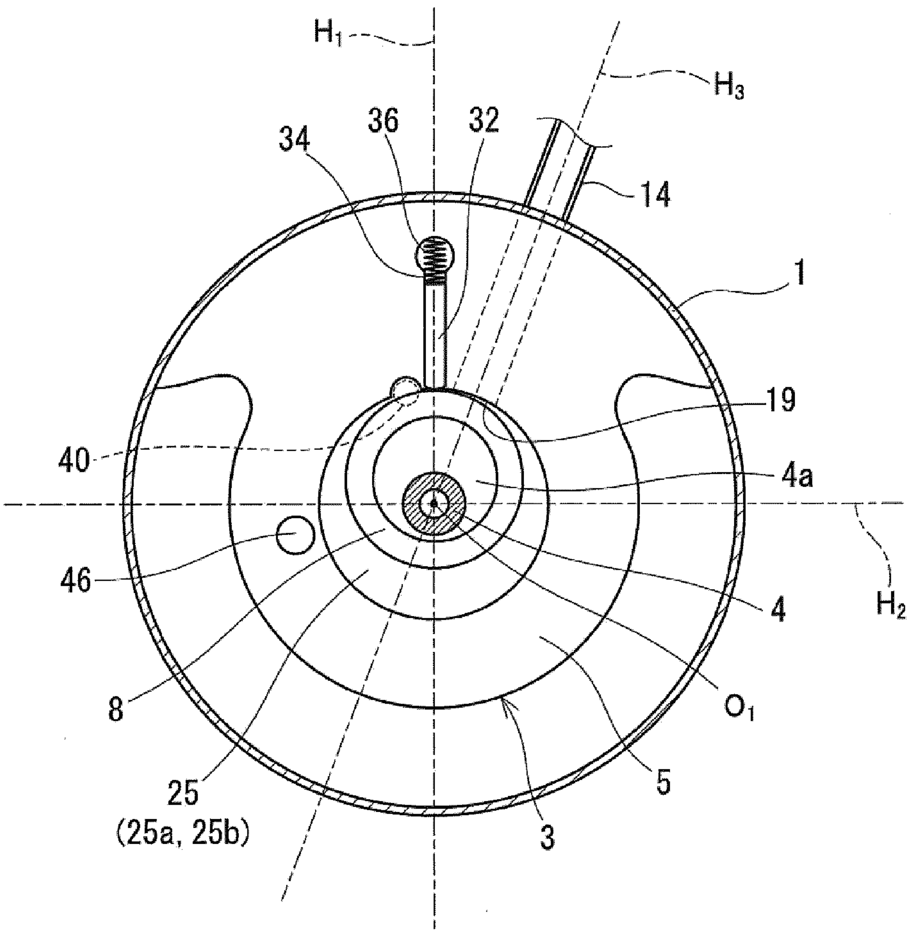
6. The rotary compressor according to any one of claims 1 to 5, wherein a muffler space is provided

between the penetrating flow path and an interior of the hermetic container.

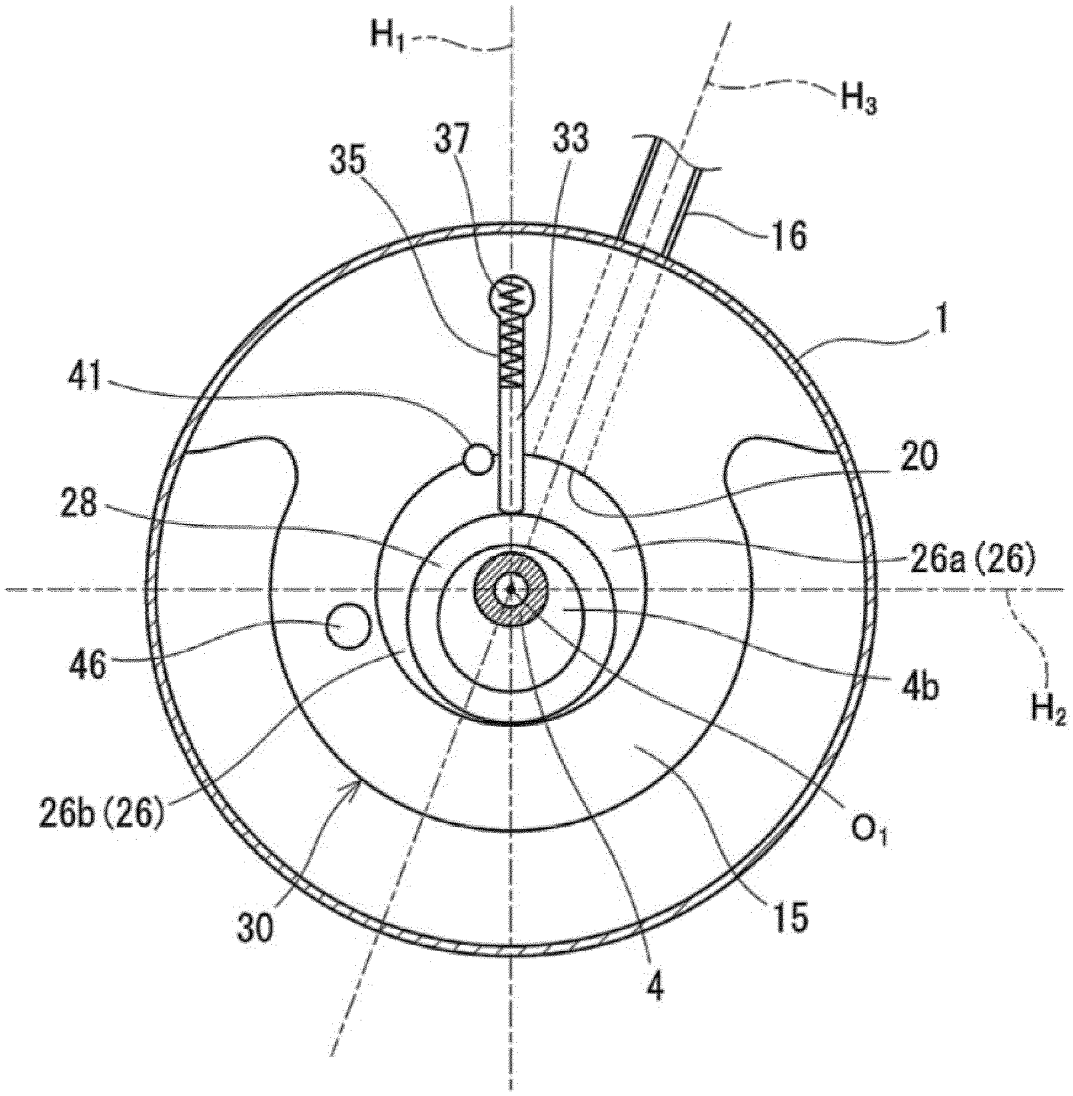
[Fig. 1]


100
21
11
1
2
17
18
4
4a
9a
51
13
43 (43a,43b,43c)
9
40
6
ⅡA
32
ⅡA
8
3
14
5
ⅡB
ⅡB
25
36
38
30
16
15
37
33
102
41
7
22
28
4b
52
44
10
(44a,44b,44c)

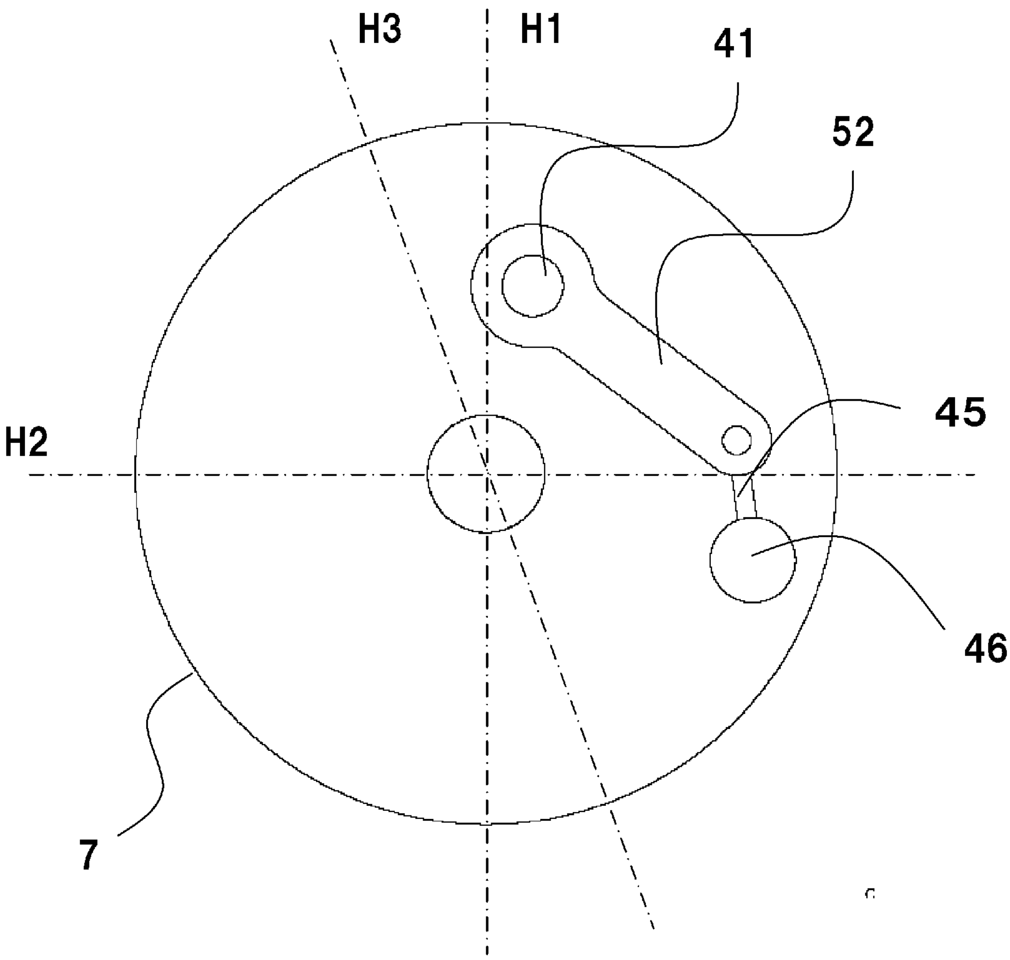
[Fig. 2]



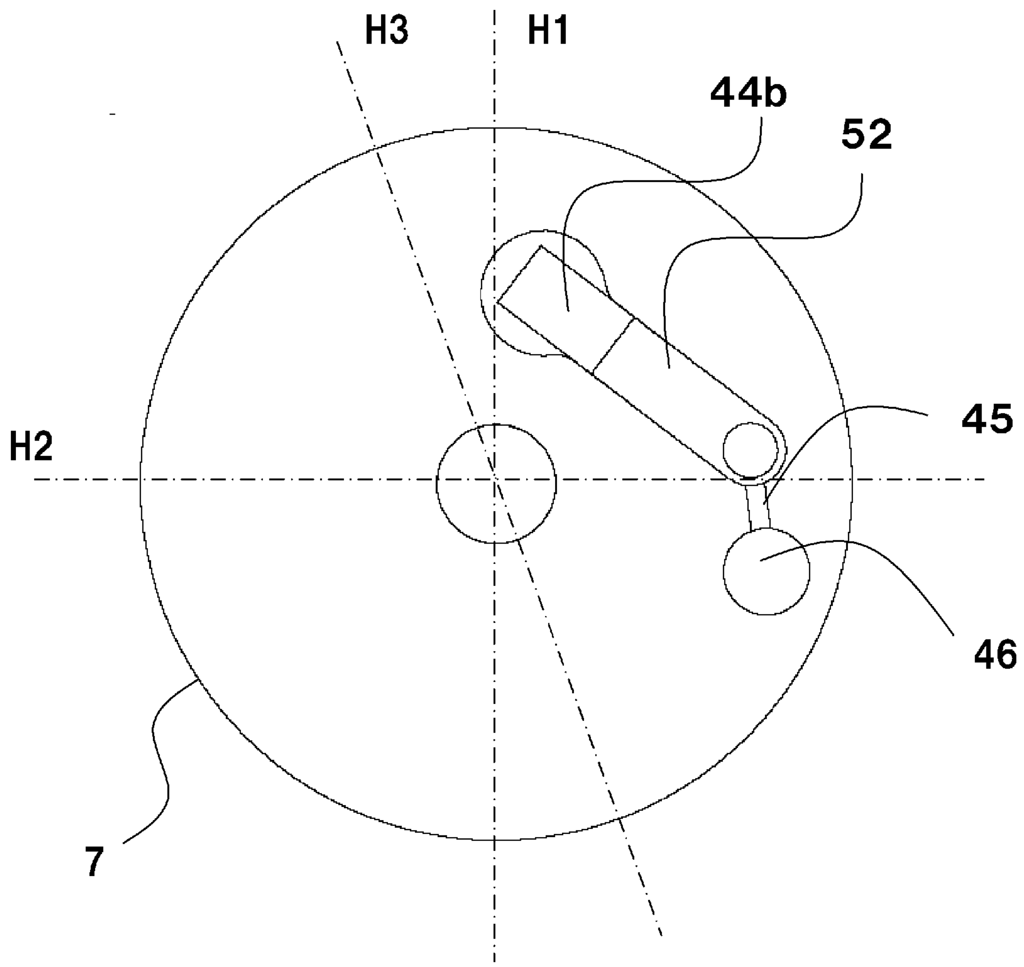
[Fig. 3]



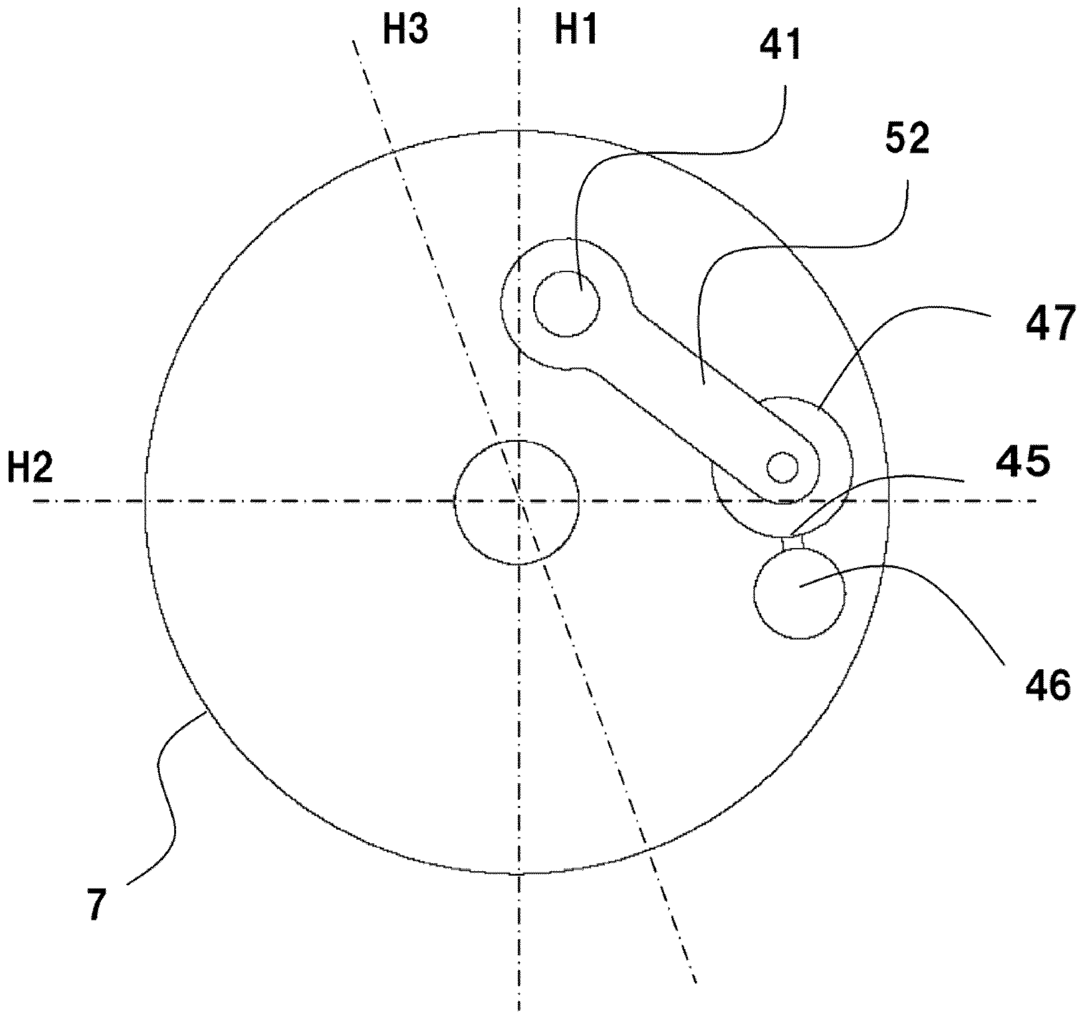
[Fig. 4]



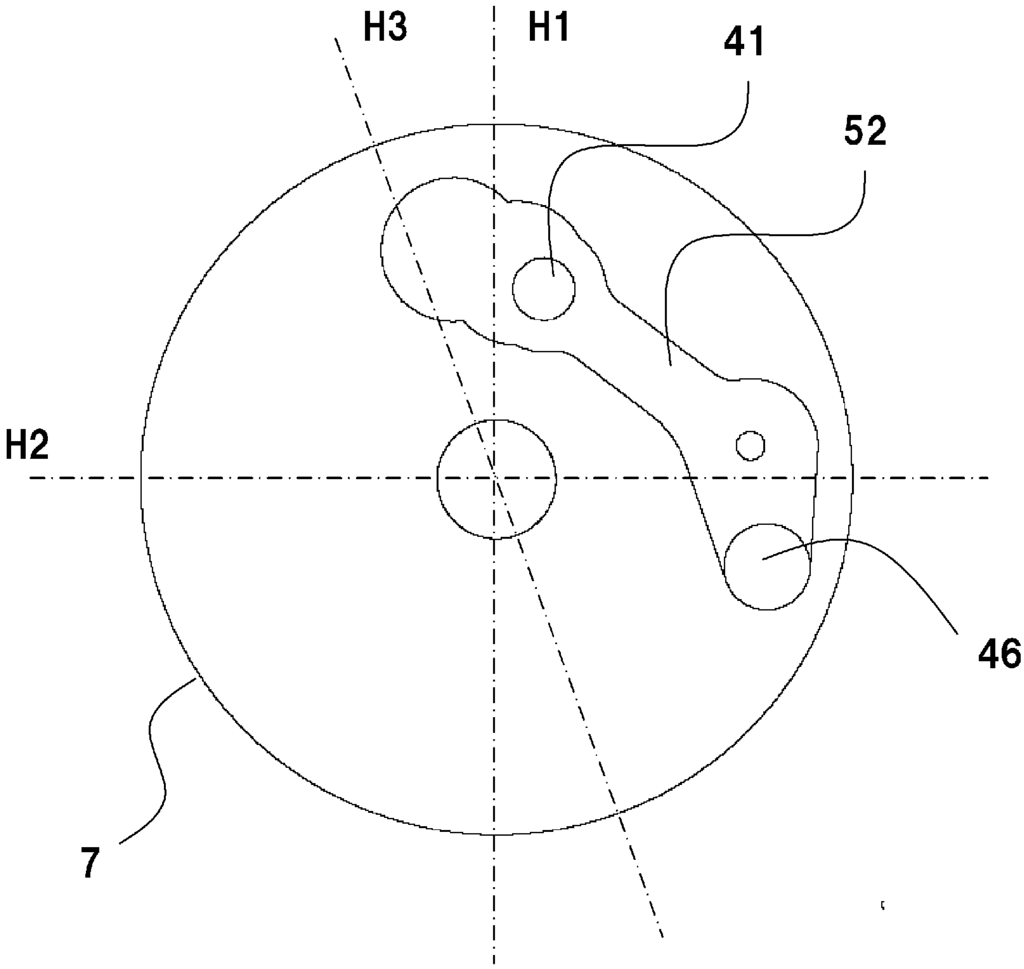
[Fig. 5]



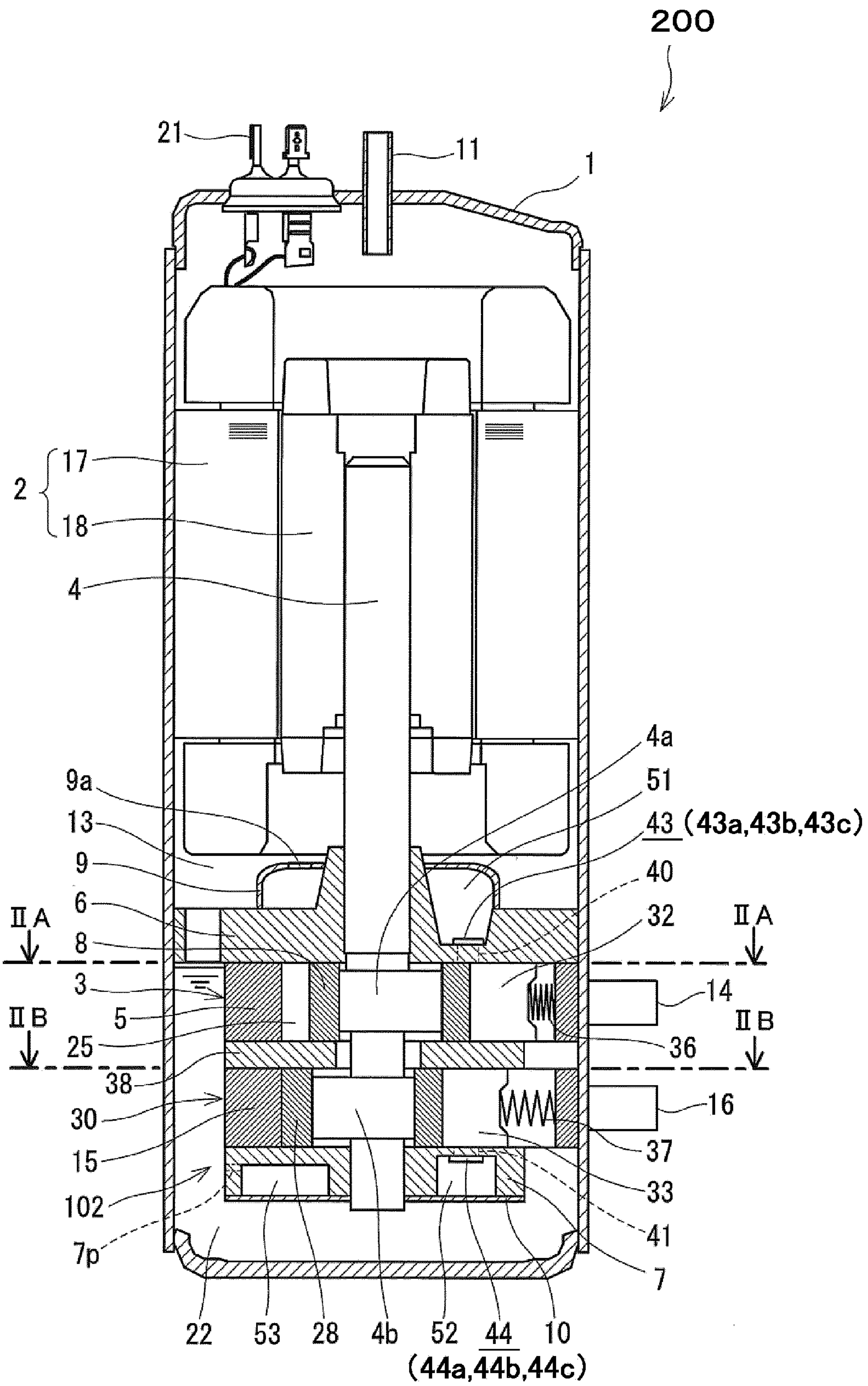
[Fig. 6]



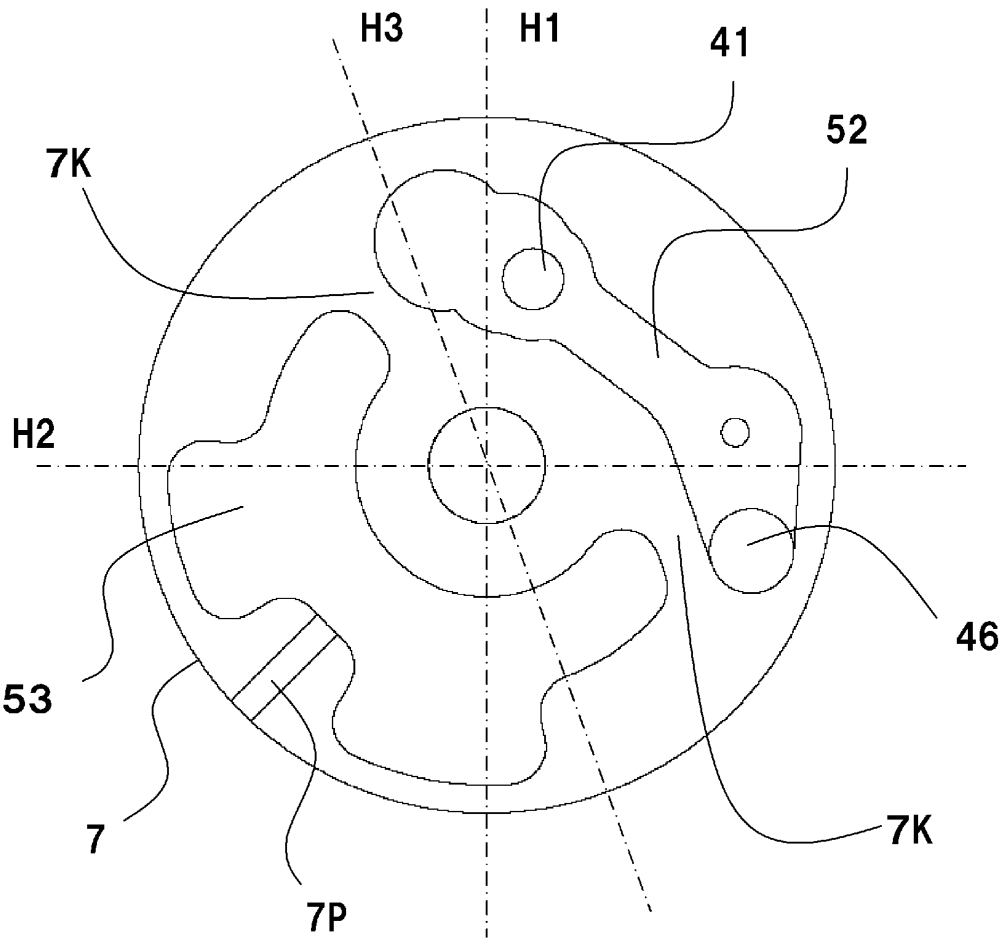
[Fig. 7]



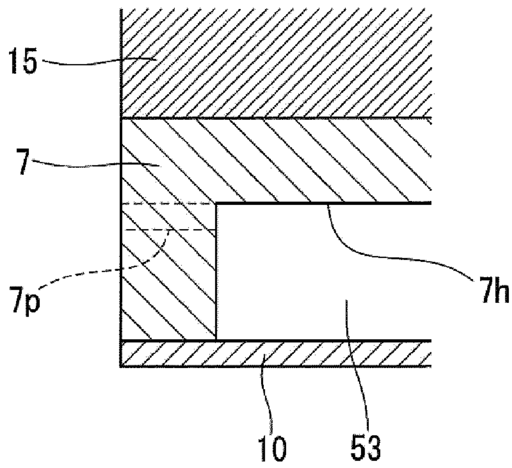
[Fig. 8]


200
21
11
1
2
17
18
4
4a
51
9a
13
43 (43a,43b,43c)
9
40
6
ⅡA
32
ⅡA
8
3
14
5
ⅡB
25
36
ⅡB
38
30
16
15
37
33
102
41
7p
7
22
53
28
4b
52
44
10
(44a,44b,44c)

[Fig. 9]



[Fig. 10]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/003893

A. CLASSIFICATION OF SUBJECT MATTER
F04C18/356(2006.01)i, *F04C23/00*(2006.01)i, *F04C29/04*(2006.01)i, *F04C29/06*(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)
F04C18/356, F04C23/00, F04C29/04, F04C29/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

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.
A	JP 2010-209865 A (Mitsubishi Electric Corp.), 24 September 2010 (24.09.2010), paragraph [0023]; fig. 1, 2 (Family: none)	1-6
A	JP 11-132177 A (Toshiba Corp.), 18 May 1999 (18.05.1999), paragraph [0036]; fig. 5, 6 (Family: none)	1-6
A	JP 2009-002299 A (Daikin Industries, Ltd.), 08 January 2009 (08.01.2009), paragraph [0049]; fig. 1 to 6 (Family: none)	4-6

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

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 September, 2013 (10.09.13)	24 September, 2013 (24.09.13)

Name and mailing address of the ISA/	Authorized officer
Japanese Patent Office	
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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