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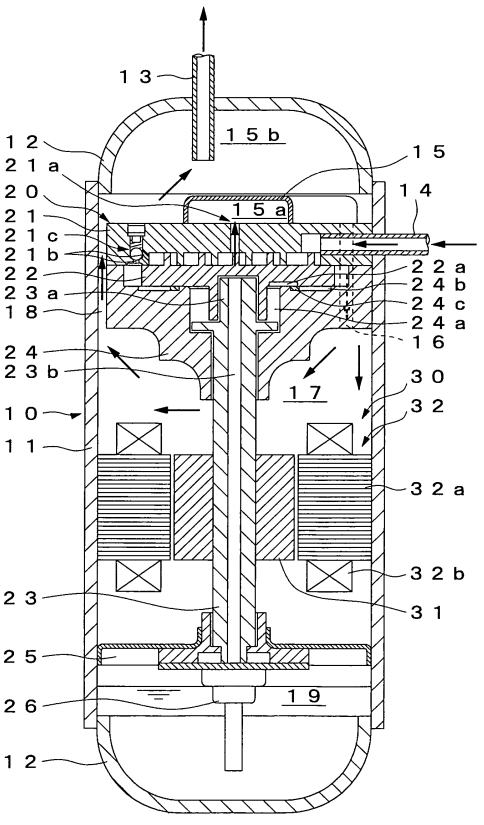
(54) COMPRESSOR

(57) The present invention aims at providing a compressor capable of allowing lubrication oil supplied to a high pressure part of a back pressure chamber to circulate into a low pressure part by a simple structure.

The compressor of the present invention includes an annular partition member dividing a back pressure chamber provided between a revolving scroll member and a bearing frame into a high pressure part located at an inner peripheral part side and a low pressure part located at an outer peripheral part side, and an oil supply groove for bringing the high pressure part and the low pressure part into communication at the predetermined revolving position of the revolving scroll member is provided on the surface opposite to a spiral body of the revolving scroll member. Thereby, the lubrication oil supplied to the high pressure part flows into the low pressure part through the oil supply groove at the predetermined revolving position of the revolving scroll member.

Fig. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a compressor used for an air conditioning device, a cooling device, a hot water supply device, and the like by which a refrigerating cycle or a heat pump cycle is configured.

BACKGROUND ART

[0002] Conventionally, as a compressor of this type, there has been known a compressor which includes a fixed scroll member fixed to a housing and provided with a spiral body at one end surface of an end plate; a revolving scroll member provided opposite to the fixed scroll member and provided with the spiral body at the fixed scroll member side of the end plate; a drive shaft for allowing the revolving scroll member to revolve on a predetermined circular track; a bearing frame provided on an opposite surface side of the spiral body of the revolving scroll member and rotatably supporting the drive shaft; an annular partition member provided in the bearing frame and for dividing a back pressure chamber between the revolving scroll member and the bearing frame into a high pressure part located at a central part in a radial direction and a low pressure part located at the outer side in the radial direction; and an oil supply flow passage provided in the revolving scroll member and bringing the high pressure part and the low pressure part into communication at the predetermined revolving position of the revolving scroll member, thereby enabling a lubrication oil supplied to the high pressure part to circulate into the low pressure part (for example, refer to Patent Document 1).
[Patent Document 1]: Japanese Patent Publication No. 2006-37896

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0003] In the conventional compressor, to form an oil supply flow passage, a hole is linearly opened from the outside of a revolving scroll member by a machine tool such as a drill, thereby the oil supply flow passage is formed in the inside of the end plate of the revolving scroll member. Further, when the oil supply flow passage having a curvature is formed in the revolving scroll member, a plurality of linear holes are opened from the outside of the revolving scroll member, and the holes are brought into communication so as to form the oil supply flow passage. Hence, the formation of the oil supply flow passage requires an operation of opening the holes and an operation of plugging the unused holes, so that the number of processes increases and a manufacturing cost is likely to increase.

[0004] The present invention aims at providing a compressor capable of circulating lubrication oil supplied to the high pressure part of the back pressure chamber into the low pressure part by a simple structure.

MEANS FOR SOLVING THE PROBLEMS

[0005] In order to achieve the above described object, the present invention includes a fixed scroll member fixed to a housing and provided with a spiral body at one end surface of an end plate; a revolving scroll member provided opposite to the fixed scroll member and provided with the spiral body on the fixed scroll member side of the end plate; a drive shaft for allowing the revolving scroll member to revolve on a predetermined circular track; a bearing frame provided on an opposite surface side of the spiral body of the revolving scroll member and rotatably supporting the drive shaft; and an annular partition member provided in the bearing frame and for dividing a back pressure chamber between the revolving scroll member and the bearing frame into a high pressure part located at a central part side in a radial direction and a low pressure part located at an outer peripheral part in the radial direction, wherein, at the opposite surface side of the spiral body of the revolving scroll member, an oil supply groove for bringing the high pressure part and the low pressure part into communication at a predetermined revolving position of the revolving scroll member is provided.

[0006] Thereby, by a simple process of forming the oil supply groove in the revolving scroll member, the high pressure part and the low pressure part of the back pressure chamber are brought into communication at the predetermined revolving position of the revolving scroll member.

ADVANTAGES OF THE INVENTION

[0007] According to the present invention, with the simple processing made to the revolving scroll member, the high pressure part and the low pressure part of a back pressure chamber can be brought into communication at the predetermined revolving position of the revolving scroll member, and therefore, a manufacturing cost can be reduced.

[0008] These and other objects, features and advantages of the present invention will become apparent by referring to the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Figure 1 is a sectional view of a compressor showing one embodiment of the present invention;
Figure 2 is a view showing a positional relationship between a revolving scroll member and a partition member; and

Figure 3 is a sectional view of main parts of the compressor showing a state in which the high pressure part and the low pressure part are brought into communication by an oil supply groove.

[0010] DESCRIPTION OF SYMBOLS

[0011] 10 ... housing, 20 ... compressing part, 21 ... fixed scroll member, 22 ... revolving scroll member, 22a ... oil supply groove, 23 ... drive shaft, 24 ... upper frame, 24a ... high pressure part, 24b ... low pressure part, 24c ... partition member

BEST MODE FOR CARRYING OUR THE INVENTION

[0012] This compressor is a hermetic compressor including a longitudinally longer shaped housing 10; a compressing part 20 provided on the upper part inside the housing 10 and compressing an absorbed refrigerant; and an electric motor 30 provided below the compressing part 20 inside the housing 10 and driving the compressing part 20. Further, this compressor uses carbon dioxide, which is put into a supercritical state by being compressed, as refrigerant.

[0013] The housing 10 consists of a housing main body 11 composed of a cylindrical member disposed with a central axis vertically oriented, and a pair of caps 12 formed in a semi-spherical shape closing the upper end opening and a lower end opening of the housing main body 11. The cap 12 closing the upper end opening of the housing main body 10 is connected with a refrigerant discharge pipe 13 discharging the refrigerant compressed in the compressing part 20. Further, the peripheral surface of the housing main body 11 on which the compressing part 20 is located is connected with a refrigerant suction pipe 14 for absorbing the refrigerant.

[0014] The compressing part 20 consists of a fixed scroll member 21 fixed to the upper side of the housing main body 11 so as to divide the inside of the housing 10 into an upper portion and a lower portion, and an revolving scroll member 22 provided below the fixed scroll member 21 and capable of revolving with respect to the fixed scroll member 21 without rotating on its axis.

[0015] The fixed scroll member 21 consists of a disc-like member provided with the central axis vertically oriented, and is provided with a spiral body at the lower surface side. The central part in the radial direction of the fixed scroll member 21 is provided with a refrigerant discharge hole 21a for discharging the compressed refrigerant. Further, the fixed scroll member 21 is formed with a communication passage 21b to bring the inner side of the spiral body of the fixed scroll member 21 and the low pressure part of a back pressure chamber to be described later into communication, and the communication passage 21b is provided with a back pressure adjusting valve 21c.

[0016] The revolving scroll member 22 consists of a disc-like member provided opposite to the fixed scroll member 21, and the spiral body is provided on the upper surface side. The lower surface side of the revolving scroll member 22 is connected with the upper end of a drive shaft 23. Further, the lower surface side of the revolving scroll member 22 is provided with an oil supply groove 22a extending in a radial direction at the inner side in the radial direction, which brings the high pressure part and the low pressure part of the back pressure chamber to be described later into communication at the predetermined revolving position of the revolving scroll member 22.

[0017] The drive shaft 23 is disposed with the central axis vertically oriented which becomes a rotation center, and a communication part 23a with the revolving scroll member is provided eccentrically to the rotation center of the drive shaft 23. The drive shaft 23 is rotatably supported by an upper frame 24 as a bearing frame whose upper end side is provided so as to divide the inside of the housing 10 into an upper portion and a lower portion, and the lower side is rotatably supported by a lower frame 25 provided so as to divide the inside of the housing 10 into an upper portion and a lower portion. The drive shaft 23 is rotated with the electric motor 30 as a power, and by the rotation of the drive shaft 23, the revolving scroll member 22 revolves on the predetermined circular track. Further, the drive shaft 23 is provided with a lubrication oil flow passage 23b along the central axis, and the lubrication oil absorbed by an oil pump 26 connected to the lower end side circulates in the lubrication oil flow passage 23b.

[0018] The upper frame 24 is provided such that the outer side in the radial direction of the upper surface side is provided so as to extend upward through the peripheral direction, and is connected to the lower surface of the fixed scroll member 21. The revolving scroll member 22 is in a state of being accommodated into a space between the upper frame 24 and the fixed scroll member 21. Further, the upper surface of the upper frame 24 is provided with a partition member 24c for dividing the back pressure chamber provided in the space between the lower surface of the revolving scroll member 22 and the upper surface of the upper frame 24 into the high pressure part 24a located at the inner peripheral part side and the low pressure part 24b located at the outer peripheral part side. The partition member 24c consists of the member such as synthetic resin annularly formed, and the lower surface of the revolving scroll member 22 slides on the upper surface.

[0019] The oil supply groove 22a provided in the lower surface of the revolving scroll member 22 is provided to be located at the high pressure part 24a side with respect to the partition member 24c, and the end part of the oil supply groove 22a is located at the low pressure part 24b side at the predetermined revolving position of the revolving scroll member 22 when the high pressure part 24a and the low pressure part 24b are brought into communication.

[0020] The space above the fixed scroll member 21 inside the housing 10 is divided by a partition member

15 into a space 15a at a refrigerant discharge hole 21a side of the fixed scroll member 21 and a space 15b at a refrigerant discharge pipe 13 side. The space 15a at the refrigerant discharge hole 21a side is brought into communication with a space 17 between the upper frame 24 and the lower frame 25 by a communication passage 16 provided in the fixed scroll member 21 and the upper frame 24. Further, the space 17 is brought into communication with the space 15b at the refrigerant discharge pipe 13 side by a communication passage 18 provided in the fixed scroll member 21 and the upper frame 24. Further, a space 19 below the lower frame 25 inside the housing 10 is stored with the lubrication oil for lubricating each sliding part inside the housing 10, and the stored lubrication oil circulates in the lubrication oil flow passage 23b of the drive shaft 23 by the oil pump 26.

[0021] The electric motor 30 is provided in the space 17, and has a rotor 31 composed of a permanent magnet fixed to the drive shaft 23, and a stator 32 provided to surround the rotor 31 and fixed to the housing main body 11. The stator 32 includes a stator core 32a provided by laminating a plurality of magnetic steel sheets in a direction of the central axis of the housing main body 11, and a coil 32b wound around the stator core 32a.

[0022] In the compressor configured as described above, when the drive shaft 23 is rotated by energizing the electric motor 30, the revolving scroll member 22 revolves with respect to the fixed scroll member 21 in the compressing part 20. At this time, the positional relationship between the revolving scroll member 22 and the partition member 24c becomes as shown in Figure 2.

[0023] Thereby, the refrigerant flowing into the housing 10 from the refrigerant suction pipe 14 flows into the compressing part 20, and is compressed between the spiral body of the fixed scroll member 21 and the spiral body of the revolving scroll member 22, and is discharged into the space 15a from the refrigerant discharge hole 21a. The refrigerant discharged into the space 15a circulates in the communication passage 16 and flows into the space 17 so as to cool the electric motor 30, and circulates in the communication passage 18 and flows into the space 15b, and flows out to the outside of the housing 10 from the refrigerant discharge pipe 13. Here, since the space 17 is brought into communication with the back pressure chamber through a gap between the upper frame 24 and the drive shaft 23, the revolving scroll member 22 is acted upon with a force pushing up the revolving scroll member 22 upward by the pressure of the space 17.

[0024] Further, the lubrication oil stored in the space 19 below the lower frame 25 is absorbed by the oil pump 26, and circulates in the lubrication oil flow passage 23b of the drive shaft 23, and flows out from the upper end side of the drive shaft 23, and lubricates each sliding part. The lubrication oil flowed into the high pressure part 24a of the back pressure chamber, as shown in Figure 2(b) and Figure 3, flows into the low pressure part 24b through the oil supply groove 22a at the predetermined revolving position of the revolving scroll member 22 revolving on the predetermined circular track, and lubricates an unillustrated rotation regulation mechanism and the like of the revolving scroll member 22 provided in the low pressure part 24b. When the pressure of the low pressure part 24b reaches or exceeds the predetermined pressure, the back pressure adjusting valve 21c is released and the lubrication oil flowed into the low pressure part 24b circulates in the communication passage 21b, and flows into between the spiral body of the fixed scroll member 21 and the spiral body of the revolving scroll member 22, thereby lubricating the sliding part between the fixed scroll member 21 and the revolving scroll member 22.

[0025] Thus, according to the compressor of the present embodiment, the annular partition member 24c for dividing the back pressure chamber provided in the space between the revolving scroll member 22 and the upper frame 24 into the high pressure part 24a located at the inner peripheral part and the low pressure part 24b located at the outer peripheral part is provided, and the oil supply groove 22a is provided below the revolving scroll member 22 which is capable of circulating the lubrication oil supplied to the high pressure part 24a into the low pressure part 24b when the high pressure part 24a and the low pressure part 24b are brought into communication at the predetermined revolving position of the revolving scroll member 22. As a result, by applying a simple machining at the revolving scroll member 22, the high pressure part 24a and the low pressure part 24b can be brought into communication at the predetermined revolving position of the revolving scroll member 22, and therefore, the reduction of a manufacturing cost can be achieved.

[0026] Further, the oil supply groove 22a is provided so as to be located at the high pressure part 24a side, and the end part is made to be located at the low pressure part 24b side only at the predetermined revolving position of the revolving scroll member 22 when the high pressure part 24a and the low pressure part 24b are brought into communication. As a result, an upward pressure can always be applied to the oil supply groove 22a from below, and therefore, the partition member 24c is not harmed by the peripheral member of the oil supply groove 22a.

[0027] Further, the oil supply groove 22a is provided so as to extend in the radial direction of the revolving scroll member 22. As a result, by the minimum machining of the revolving scroll member 22, the high pressure part 24a and the low pressure part 24b can be brought into communication, and therefore, the reduction of the manufacturing cost can be achieved.

[0028] Further, since carbon dioxide is used as the refrigerant, effect on the environment such as global heating and ozone layer destruction due to the leakage of the refrigerant and the like can be kept to the minimum.

[0029] The preferred mode described in the present specification is exemplary and is not restrictive. The scope of the invention is shown by the accompanying claims, and all the modifications included in the meaning of those claims are contained in the present invention.

Claims

1. A compressor, comprising:

a fixed scroll member (21) fixed to a housing (10) and provided with a spiral body on one end surface of an end plate;
a revolving scroll member (22) provided opposite to the fixed scroll member (21) and provided with the spiral body on the fixed scroll member (21) side of the end plate;
a drive shaft (23) for allowing the revolving scroll member (22) to revolve on a predetermined circular track;
a bearing frame (24) provided on an opposite surface side of the spiral body of the revolving scroll member (22) and rotatably supporting the drive shaft (23); and
an annular partition member (24c) provided in the bearing frame (24) and for dividing a back pressure chamber between the revolving scroll member (22) and the bearing frame (24) into a high pressure part (24a) located at a central part side in a radial direction and a low pressure part (24b) located at an outer peripheral part side in the radial direction,
wherein, at the opposite surface side of the spiral body of the revolving scroll member (22), an oil supply groove (22a) for bringing the high pressure part (24a) and the low pressure part (24b) into communication at a predetermined revolving position of the revolving scroll member (22) is provided.

2. The compressor according to claim 1, wherein:

said oil supply groove (22a) is provided in the revolving scroll member (22) so as to be located at the high pressure part (24a) except when the high pressure part (24a) and the low pressure part (24b) are brought into communication.

3. The compressor according to claim 1, wherein:

said oil supply groove (22a) is provided so as to extend in the radial direction of the revolving scroll member (22).

4. The compressor according to claim 2, wherein:

said oil supply groove (22a) is provided so as to extend in the radial direction of the revolving scroll member (22).

5. The compressor according to any one of claims 1 to 4,
wherein:
refrigerant is carbon dioxide.

Fig. 1

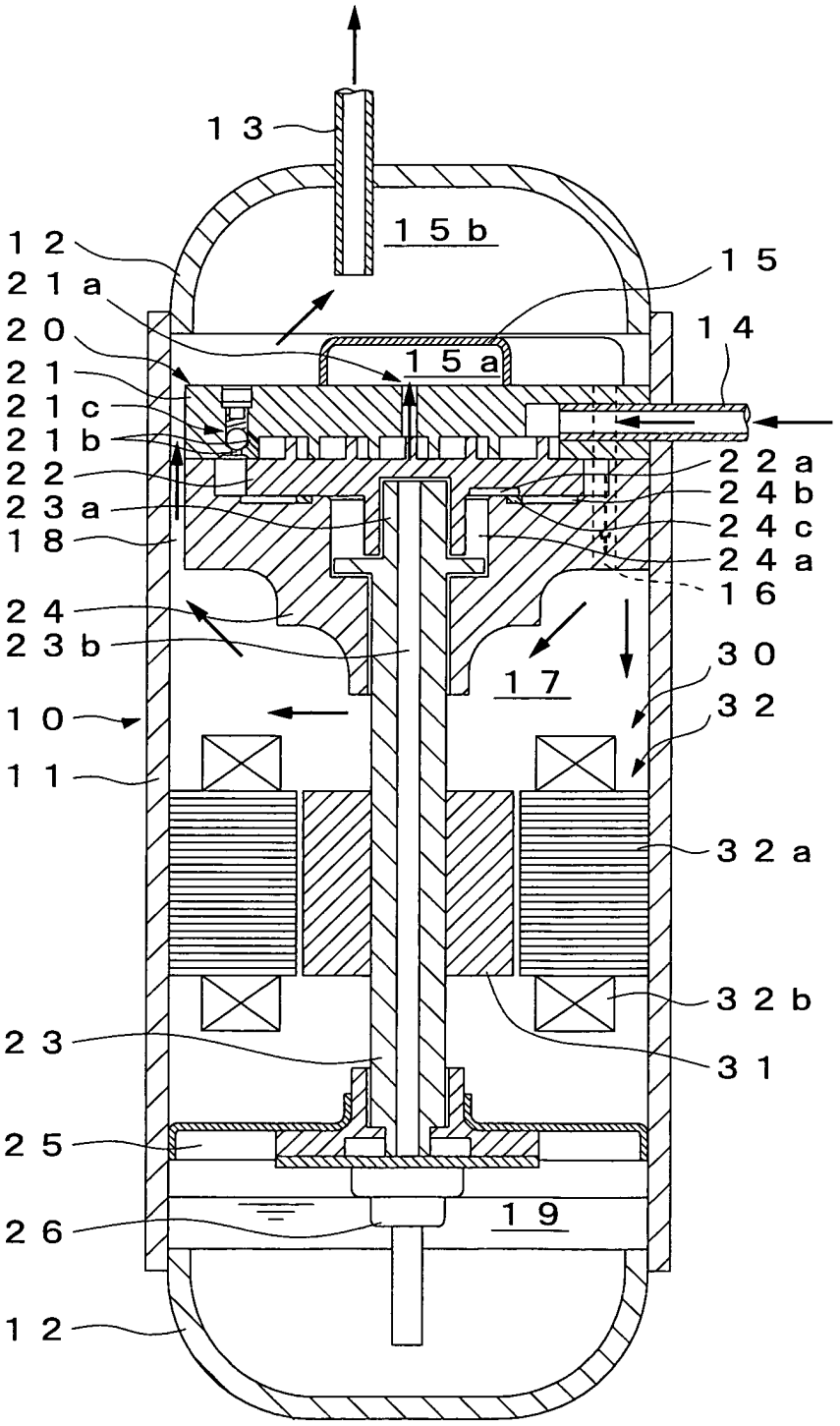

13
15b
12
21a
20
21
21c
21b
22
23a
18
24
23b
10
11
15
14
15a
22a
24b
24c
24a
16
30
17
32
32a
32b
31
23
25
26
19
12

Fig. 2

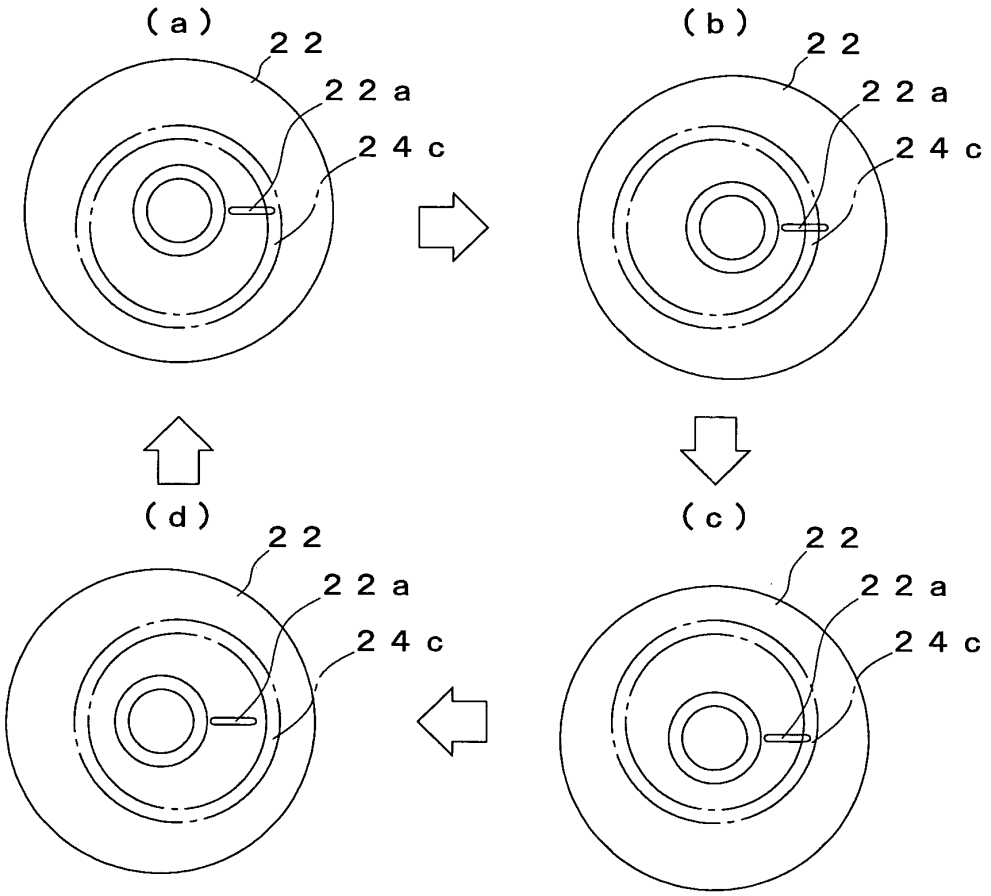
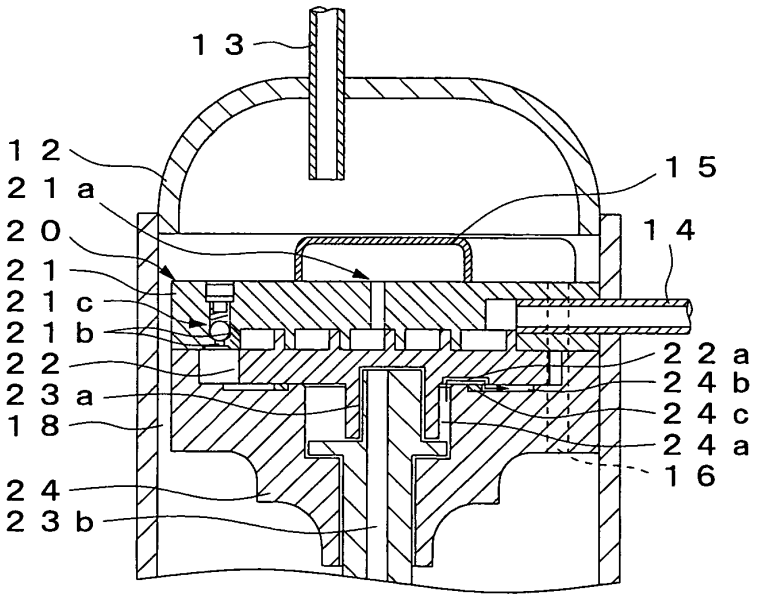

(a)
22
22a
24c
(b)
22
22a
24c
(c)
22
22a
24c
(d)
22
22a
24c

Fig. 3


13
12
21a
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21
21c
21b
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23a
18
24
23b
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14
22a
24b
24c
24a
16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/062241

A. CLASSIFICATION OF SUBJECT MATTER
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)
F04C18/02

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 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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 11-280678 A (Fujitsu General Ltd.), 15 October, 1999 (15.10.99), Full text; all drawings (Family: none)	1-4 5
X Y	JP 11-22665 A (Matsushita Electric Industrial Co., Ltd.), 26 January, 1999 (26.01.99), Par. No. [0020]; Figs. 5 to 6 (Family: none)	1,3 5
Y	JP 2006-37896 A (Matsushita Electric Industrial Co., Ltd.), 09 February, 2006 (09.02.06), Par. No. [0005] (Family: none)	5

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
13 August, 2007 (13.08.07)	21 August, 2007 (21.08.07)
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006037896 A **[0002]**