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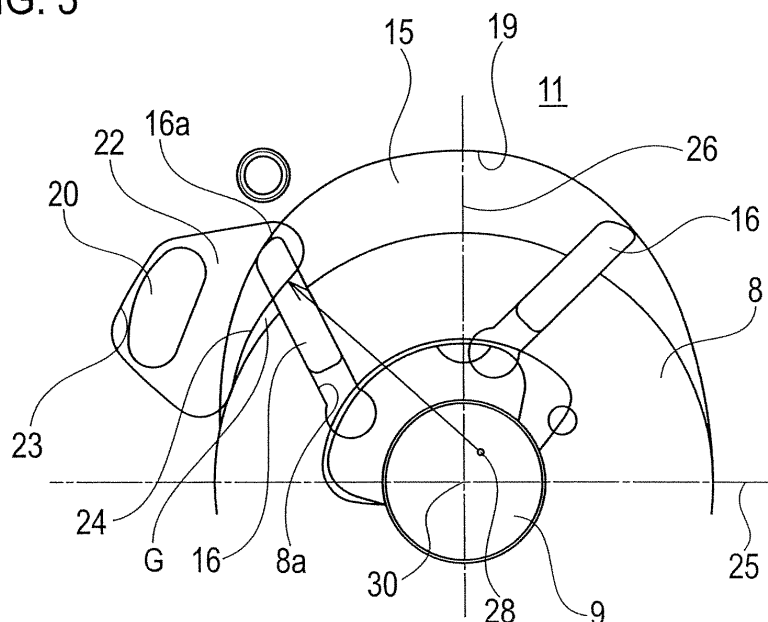
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(54) **GAS COMPRESSOR**

(57) A gas compressor includes a cylinder block, a rear side block, a front side block, a cylinder chamber segmented by the above three blocks, a rotor provided in the cylinder chamber, vane slots formed on the rotor, vanes inserted into the vane slots, and a suction hole provided on at least one of the front and rear side blocks. Refrigerant is suctioned into the cylinder chamber from the suction hole. An opening edge of the suction hole is

composed of an in-chamber opening edge that locates within the cylinder chamber and an in-block opening edge that faces to a sidewall of the cylinder block. The in-chamber opening edge locates on a side of an oval inner wall away from an outer circumference of the rotor. According to the gas compressor, leaning of the vanes is restrained, so that ground damage or attrition of the blocks, vibrations and noises are restrained.

FIG. 3



Description

TECHNICAL FIELD

[0001] The present invention relates to a rotary vane gas compressor that will be applied to an air-conditioner for a vehicle and so on.

BACKGROUND ART

[0002] In a rotary vane gas compressor, cylinder chambers are formed by a cylinder block, and a rear side block and a front side block that are disposed on both sides of the cylinder block. Then, a rotor is disposed rotatably in the cylinder chamber. An internal space of the cylinder chamber is surrounded by an oval inner wall. Vanes inserted in vane slots on the rotor segments the internal space of the cylinder chamber to form plural compression chambers. A suction hole formed on the front side block communicates with the cylinder chamber. Refrigerant is suctioned into the cylinder chamber through the suction hole. Suctioned refrigerant is compressed by the vanes along with a rotation of the rotor, and then discharged to a refrigeration cycle (for example, Japanese Patent Application Laid-Open No. H6-288372 [Patent Document 1], and Japanese Patent Application Laid-Open No. 2005-2826 [Patent Document 2]).

[0003] Fig. 4 shows an internal configuration of a cylinder chamber 100 in a conventional gas compressor. A rotor 120 is housed rotatably in an interior space of the cylinder chamber 100. A shaft 125 is disposed integrally at a center of the rotor 120. Plural vane slots 130 are formed on the rotor 120. Vanes 140 are inserted in the vane slots 130, respectively, so as to be able to reciprocate therewithin.

[0004] An interior space of the cylinder chamber 100 is surrounded by an oval inner wall 110. Each end edge of the vanes 140 contacts with the oval inner wall 110, and the cylinder chamber 100 is segmented into plural compression chambers. A front side block 160 constitutes one wall portion of the cylinder chamber 100. A suction hole 170 is opened on the front side block 160. A suction channel 165 penetrates a cylinder block to communicate the suction hole 170 on the front side block with a suction hole (not shown) on a rear side block. The suction hole 170 communicates with a suction port (not shown) of refrigerant. A portion of the suction hole 170 opens in the cylinder chamber 100 (positions within the oval inner wall 110). The refrigerant is suctioned from the said opening into the cylinder chamber 100. An opening edge (in-chamber opening edge) 175 of the said opening has a circular arch outline about an axis 127 of the rotor 120 (shaft 125), and extends along an outer circumference of the rotor 120. Namely, the outer circumference of the rotor 120 rotates along the in-chamber opening edge 175.

SUMMARY OF INVENTION

[0005] However, in the above-mentioned conventional configuration, it may occur, on an activation of the gas compressor, that the vanes 140 don't contact with the oval inner wall 110. In this case, the vane 140 may lean, so that an end of a side edge of the vane 140 may get into the suction hole 170. If the rotor 120 rotates from this state, the end of the vane 140 may jam with an end edge of the suction hole 170. As a result, problems may occur such as ground damage or attrition of the front side block 160 or the vanes 140, vibrations and noises.

[0006] If a reciprocating amount of the vanes 140 is made small in order to prevent these problems, it will be needed to enlarge the cylinder chamber 100 along the axis 127 in order to ensure a capacity. In this case, problems such as expansion in size or increase of weight of the gas compressor may occur.

[0007] Therefore, an object of the present invention is to provide a gas compressor that can restrain ground damage or attrition of side blocks or vanes, vibrations and noises by restraining leaning of the vanes.

[0008] An aspect of the present invention provides a gas compressor that includes: a cylinder block; a rear side block and a front side block that are disposed on both sides of the cylinder block, respectively; a cylinder chamber that is formed in the cylinder block so as to be surrounded by the cylinder block, the rear side block and the front side block; an oval inner wall that is formed by an inner wall of the cylinder block and faces to the cylinder chamber; a rotor rotatably provided in the cylinder chamber; a plurality of vane slots that is formed on the rotor; a plurality of vanes that is inserted in the plurality of vane slots, respectively, so as to be able to reciprocate therewithin; and a suction hole that is provided at least one of the front side block and the rear side block and through which refrigerant is suctioned into the cylinder chamber. An opening edge of the suction hole is composed of an in-chamber opening edge that locates between the oval inner wall and an outer circumference of the rotor and an in-block opening edge that faces to a sidewall of the cylinder block. The in-chamber opening edge locates on a side of the oval inner wall away from the outer circumference of the rotor.

[0009] According to the above aspect, a side end edge of the vane is faultlessly supported by the front side block by locating the in-chamber opening edge of the suction hole on a side of the oval inner wall away from the outer circumference of the rotor. Therefore, leaning of the vanes is restrained, so that ground damage or attrition of the front side block, vibrations and noises are restrained.

[0010] Here, it is preferable that a contact portion with which a side edge of the vane contacts is provided, on at least one of the front side block and the rear side block, between the in-chamber opening edge and the outer circumference of the rotor.

[0011] In addition, it is preferable that the in-chamber

opening edge has an arch shape from a vicinity of a minor axis line of the cylinder chamber toward a major axis line thereof.

[0012] In addition, it is preferable that the in-chamber opening edge has an arch shape, and a center of the arch shape is offset to a rotational center of the rotor so as to distance the in-chamber opening edge gradually away from the outer circumference of the rotor.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

[Fig. 1] is a cross-sectional view of a gas compressor in an embodiment according to the present invention.

[Fig. 2] is an explanatory drawing of a cylinder chamber in the gas compressor.

[Fig. 3] is an enlarged explanatory drawing showing an interior of the cylinder chamber.

[Fig. 4] is an enlarged explanatory drawing of a cylinder chamber in a conventional gas compressor.

DESCRIPTION OF EMBODIMENT

[0014] Hereinafter, an embodiment according to the present invention will be explained with reference to drawings.

[0015] A gas compressor 1 in the present embodiment is a rotary vane compressor. As shown in Fig. 1, the gas compressor 1 includes a case 2 and a compression mechanism 5.

[0016] The case 2 has a bottomed cylindrical shape in which its rear end is closed by a bottom wall 2b. The compression mechanism 5 and a gas-fluid separation unit 6 are housed in a housing portion 2c of the case 2. A discharge port 18 of the refrigerant is formed at an upper portion of the case 2. An opening 2a is formed at a front end of the case 2. A front head 3 is fixed to the case 2 on its side of the opening 2a. A suction port 17 for suctioning the refrigerant toward the compression mechanism 5 is formed on the front head 3. The suction port 17 communicates with a suction chamber 10, and the suction chamber 10 communicates with suction hole 22 (see Fig. 3) formed on a front side block 13. Therefore, the refrigerant passes through the suction port 17, the suction chamber 10 and the suction hole 22, and then suctioned into the compression mechanism 5. The suction hole 22 on the front side block 13 will be explained later.

[0017] The compression mechanism 5 includes a cylinder housing 7 and a rotor 8 disposed in the cylinder housing 7. The cylinder housing 7 includes a cylinder block 11, and a rear side block 12 and the front side block 13 that are disposed on both sides of the cylinder block 11. A cylinder chamber 15 is formed so as to be surrounded by the cylinder block 11, the rear side block 12 and the front side block 13. Namely, an end face 13a, which is on a side of the cylinder block 11, of the front

side block 13 abuts on the cylinder block 11, and an end face 12a, which is on a side of the cylinder block 11, of the rear side block 12 abuts on the cylinder block 11. Therefore, the cylinder chamber 15 is formed by the cylinder block 11 and both of the side blocks 12 and 13.

[0018] As shown in Fig. 2, the cylinder chamber 15 has an oval shape, and its inner wall surface is an oval inner wall 19.

[0019] The rotor 8 is disposed rotatably in the cylinder chamber 15. The rotor 8 is integrated with a shaft 9. A rear portion of the shaft 9 is rotatably supported by the rear side block 12, and a front portion thereof is rotatably supported by the front side block 13. When a rotational drive force of the engine is transmitted to the shaft 9, the rotor 8 rotates in the cylinder chamber 15 to compress the refrigerant.

[0020] As shown in Fig. 2, plural vane slots 8a is formed on the rotor 8 long its circumferential direction. Vane 16 are inserted the vane slots 8a, respectively, so as to be able to reciprocate therewithin. The plural vanes 16 are disposed in the cylinder chamber 15 along an axial direction of the shaft 9 (lateral direction in Fig. 1). Then, side end edges of each of the vanes 16 in the axial direction abut on the above-explained end faces 12a and 13a of the rear side block 12 and the front side block 13. In addition, the vanes 16 protrude from the vane slots 8a, respectively, and each end edge 16a thereof contacts with the oval inner wall 19. The side end edges of the vanes 16 contact with the end faces 12a and 13a and the end edges 16a of the vanes 16 contact with the oval inner wall 19, so that the cylinder chamber 15 is segmented into plural compression chambers.

[0021] The gas-fluid separation unit 6 is disposed on a rear side of the rear side block 12, as shown in Fig. 1. The refrigerant that has been compressed in the cylinder chamber 15 is introduced into the gas-fluid separation unit 6. The introduced refrigerant is separated into gas and fluid in the gas-fluid separation unit 6. Separated oil drops off to a lower portion of the gas-fluid separation unit 6, and thereby is circulated in the compressor 1 to lubricate parts of the compressor 1.

[0022] In the above-explained configuration, the refrigerant is suctioned from the suction port 17 provided on the front head 3, and the supplied to the compression chambers of the cylinder chamber 15 through the suction chamber 10 and the suction hole 22. At this moment, the refrigerant is supplied to the compression chambers also from a suction hole on the rear side block through a suction channel 20 (explained later) formed on the cylinder block 11. Then, the refrigerant is compressed due to volume decreasing of the compression chamber along with the rotation of the rotor 8. The refrigerant compressed in the compression chambers is introduced into the gas-fluid separation unit 6, and then discharged to the refrigeration cycle from the discharge port 18 after oils are separated away in the gas-fluid separation unit 6.

[0023] The oil separated in the gas-fluid separation unit 6 drops off to the housing portion 2c of the case 2, and

then it is circulated among the shaft 9 and the blocks 11, 12 and 13 through an oil channel 32 formed on the rear side block 12, an oil channel 33 formed on the cylinder block 11 and an oil channel 34 formed on the front side block 13 to lubricate various parts.

[0024] Next, suction mechanism of the refrigerant into the cylinder chamber 15 in the present embodiment will be explained with reference to Fig. 3. The rotor 8 is provided rotatably in the cylinder chamber 15 having the oval inner wall 19, and the refrigerant is suctioned into the cylinder chamber 15 from the suction hole 22 on the front side block 13. In addition, one of the side end edges of the vane 16 abuts on the end face 13a of the front side block 13. In this manner, the one of the side end edges of the vane 16 is supported by the end face 13a because the one of the side end edges of the vane 16 abuts on the end face 13a.

[0025] The suction hole 22 on the front side block 13 communicates with the suction hole (not shown) formed on the rear side block 12 via the suction channel 20 formed on the cylinder block 11. The refrigerant is supplied into the cylinder chamber 15 from the suction hole 22 and also supplied into the cylinder chamber 15 from the suction hole on the rear side block through the suction channel 20. The suction hole (not shown) on the rear side block 12 has a shape symmetrical to a shape of the suction hole 22 on the front side block 13 and communicates with the suction channel 20.

[0026] In this case, the suction hole 22 is formed as a larger passage than the suction channel 20.

[0027] An opening edge of the suction hole 22 has a combined shape of an in-block opening edge 23 and an in-chamber opening edge 24. The in-block opening edge 23 faces to a sidewall of the cylinder block 11. On the other hand, the in-chamber opening edge 24 is located between the oval inner wall 19 of the cylinder chamber 15 and the outer circumference of the rotor 8. Therefore, the in-chamber opening edge 24 is located within the cylinder chamber 15. The refrigerant is suctioned from an area on a side of the in-chamber opening edge 24 within the suction hole 22.

[0028] In the present embodiment, the in-chamber opening edge 24 is formed so as to locate on a side of the oval inner wall 19 away from the outer circumference (outer circumferential edge) of the rotor 8. In other words, the in-chamber opening edge 24 and the outer circumference of the rotor 8 don't coincide with each other, the end face 13a (an after-mentioned contact portion G) of the front side block 13 exists between the outer circumference (outer circumferential edge) of the rotor 8 and the in-chamber opening edge 24. In further other words, the in-chamber opening edge 24 is distanced from the outer circumference (outer circumferential edge) of the rotor 8.

[0029] In addition, the in-chamber opening edge 24 has an arch shape from a vicinity of a minor axis line 25 of the cylinder chamber 15 having an oval shape toward a major axis line 26 thereof. A center 28 of the arch shape

of the in-chamber opening edge 24 is located offset to a rotational center 30 of the rotor 8 (shaft 9). The offset position of the center 28 is set so as to distance the in-chamber opening edge 24 gradually away from the outer circumference of the rotor 8 from the vicinity of the minor axis line 25 toward the major axis line 26.

[0030] The in-chamber opening edge 24 set as mentioned above faces to the outer circumference of the rotor 8, but the contact portion G is disposed between the in-chamber opening edge 24 and the outer circumference of the rotor 8. Therefore, the one of the side end edges of the vane 16 contacts with the end face 13a of the front side block 13 and the contact portion G. As a result, the side end edge of the vane 16 can be supported by the end face 13a. Namely, the contact portion G of the end face 13a contacts with the side end edge of the vane 16 to support the vane 16.

[0031] In the above-described embodiment, even if the vanes 16 don't contact with the oval inner wall 19 on an activation of the gas compressor 1, the vanes 16 can be supported by the contact portion G on the end face 13a of the front side block 13 or the end face 12a of the rear side block 12. Therefore, leaning of the vanes 16 can be restrained. Therefore, leaning of the vanes 16 is restrained, so that the vanes 16 and the suction hole 22 is not jammed with each other. As a result, ground damage or attrition of the front side block 13 or the rear side block 12, vibrations and noises can be restrained. Further, since it is not needed to make a reciprocating amount of the vanes 16 small, it is not needed to enlarge the cylinder chamber 15. Therefore, expansion in size or increase of weight of the gas compressor can be restrained.

Claims

1. A gas compressor comprising:

- a cylinder block;
- a rear side block and a front side block that are disposed on both sides of the cylinder block, respectively;
- a cylinder chamber that is formed in the cylinder block so as to be surrounded by the cylinder block, the rear side block and the front side block;
- an oval inner wall that is formed by an inner wall of the cylinder block and faces to the cylinder chamber;
- a rotor rotatably provided in the cylinder chamber;
- a plurality of vane slots that is formed on the rotor;
- a plurality of vanes that is inserted in the plurality of vane slots, respectively, so as to be able to reciprocate therewithin; and
- a suction hole that is provided at least one of the front side block and the rear side block and

through which refrigerant is suctioned into the cylinder chamber, wherein
an opening edge of the suction hole is composed of an in-chamber opening edge that locates between the oval inner wall and an outer circumference of the rotor and an in-block opening edge that faces to an sidewall of the cylinder block, and
the in-chamber opening edge locates on a side of the oval inner wall away from the outer circumference of the rotor.

2. The gas compressor according to claim 1, wherein a contact portion with which a side edge of the vane contacts is provided, on at least one of the front side block and the rear side block, between the in-chamber opening edge and the outer circumference of the rotor.
3. The gas compressor according to claim 1 or 2, wherein the in-chamber opening edge has an arch shape from a vicinity of a minor axis line of the cylinder chamber toward a major axis line thereof.
4. The gas compressor according to any one of claims 1 to 3, wherein the in-chamber opening edge has an arch shape, and a center of the arch shape is offset to a rotational center of the rotor so as to distance the in-chamber opening edge gradually away from the outer circumference of the rotor.

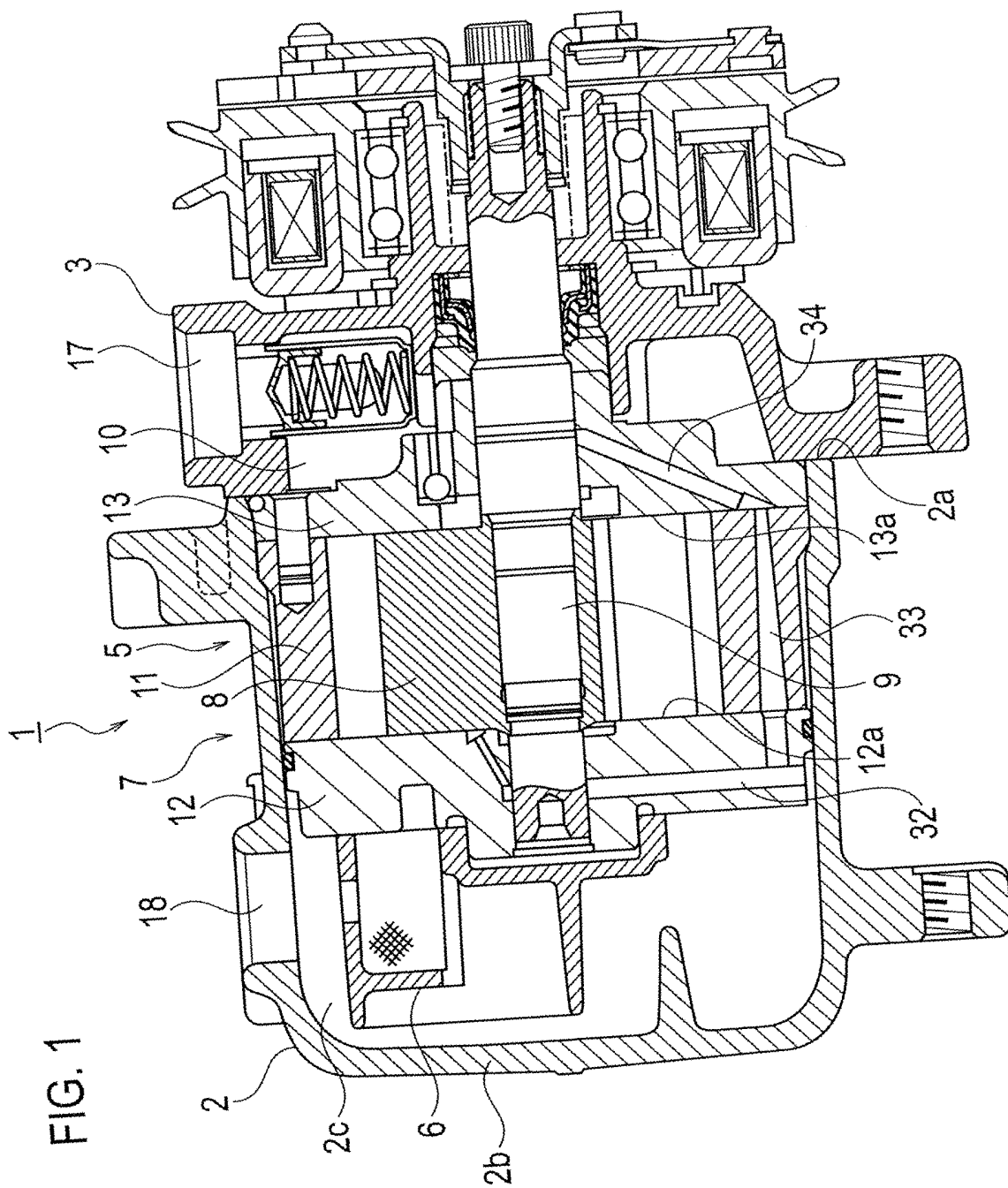


FIG. 2

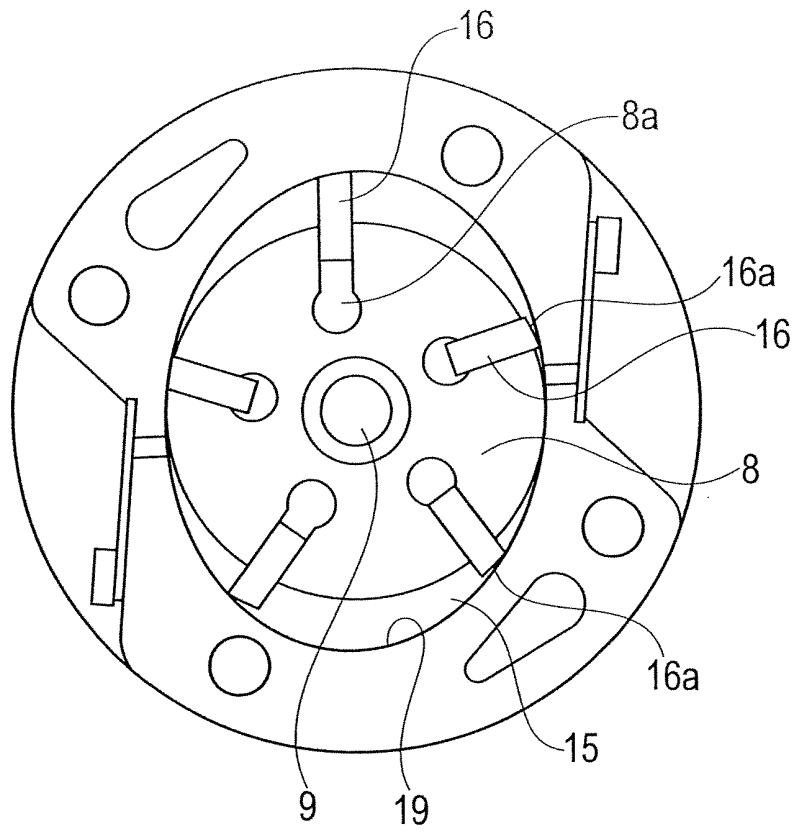


FIG. 3

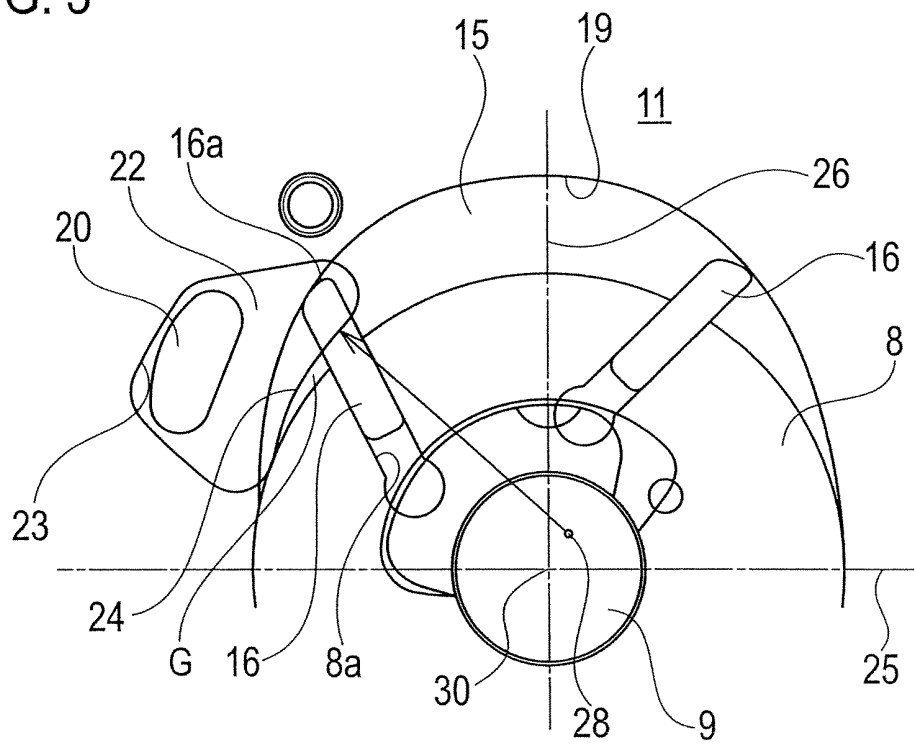
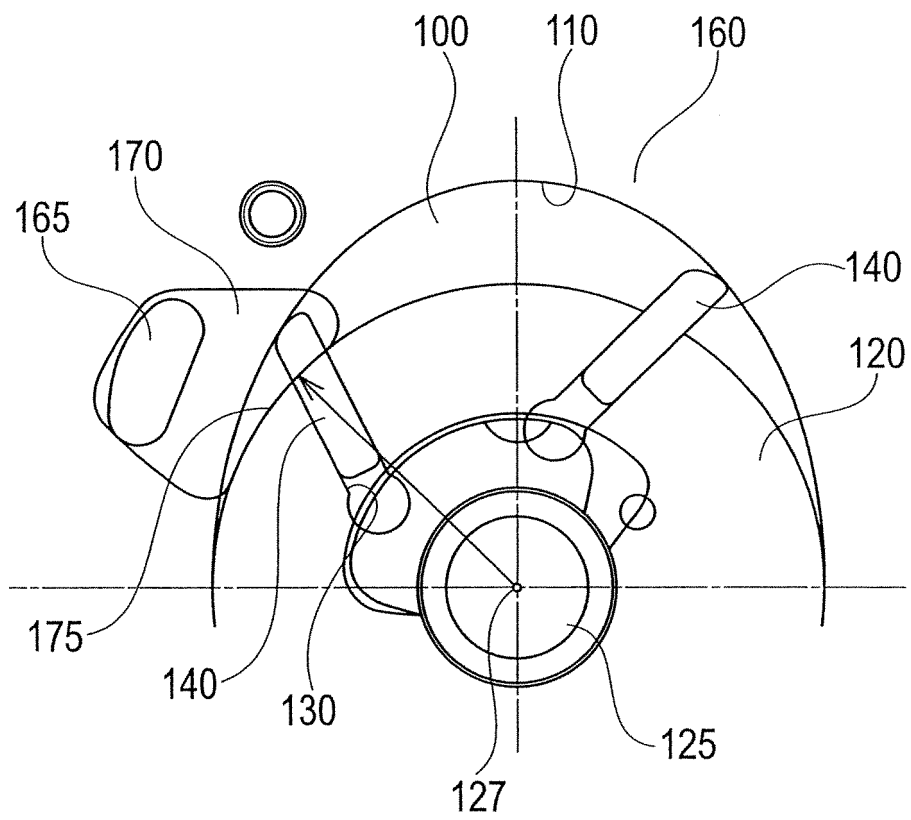


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/068650

A. CLASSIFICATION OF SUBJECT MATTER <i>F04C18/344</i> (2006.01) i, <i>F04C29/12</i> (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) <i>F04C18/344</i> , <i>F04C29/12</i> 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 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004-076735 A (Denso Corp.), 11 March 2004 (11.03.2004), claim 1; paragraphs [0020] to [0023]; fig. 1, 3 & US 7014439 B2	1-4
A	JP 2005-002826 A (Matsushita Electric Industrial Co., Ltd.), 06 January 2005 (06.01.2005), paragraphs [0008] to [0012]; fig. 1 to 3 (Family: none)	1-4
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 07 January, 2010 (07.01.10)		Date of mailing of the international search report 19 January, 2010 (19.01.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/068650

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 011425/1981 (Laid-open No. 123992/1982) (Nippondenso Co., Ltd.), 02 August 1982 (02.08.1982), fig. 1 (Family: none)	1-4

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/068650

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: claim 1, claim 2, claim 3 citing claim 2, and claim 4 directly or indirectly citing claim 2

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/068650

Continuation of Box No.III of continuation of first sheet (2)

(Invention 1) Inventions in claims 1 and 2

A gas compressor comprising: a cylinder block; a rear side block and a front side block which are arranged on both sides of the cylinder block; a cylinder chamber formed in the cylinder block so as to be surrounded by the cylinder block, the rear side block, and the front side block; an elliptic inner wall formed by the inner wall of the cylinder block, the inner wall facing the cylinder chamber; a rotor rotatably mounted in the cylinder chamber; vane grooves formed in the rotor; vanes projectably inserted in the vane grooves, respectively; and a suction hole provided in either the front side block and/or the rear side block and sucking a refrigerant into the cylinder chamber, wherein the opening edge of the suction hole consists of an in-chamber opening edge located on the inner side of the elliptic inner wall at a position between the elliptic inner wall and the outer periphery of the rotor, and also of an in-block opening edge facing the side wall of the cylinder block, the in-chamber opening edge being located on the elliptic inner wall side from the outer periphery of the rotor, and contact sections with which side edges of the vanes are in contact are provided to either the front side block and/or the rear side block so as to be located between the in-chamber opening edge and the outer periphery of the rotor.

(Invention 2) The invention in claim 3 directly citing claim 1

A gas compressor comprising: a cylinder block; a rear side block and a front side block which are arranged on both sides of the cylinder block; a cylinder chamber formed in the cylinder block so as to be surrounded by the cylinder block, the rear side block, and the front side block; an elliptic inner wall formed by the inner wall of the cylinder block, the inner wall facing the cylinder chamber; a rotor rotatably mounted in the cylinder chamber; vane grooves formed in the rotor; vanes projectably inserted in the vane grooves, respectively; and a suction hole provided in either the front side block and/or the rear side block and sucking a refrigerant into the cylinder chamber, wherein the opening edge of the suction hole consists of an in-chamber opening edge located on the inner side of the elliptic inner wall at a position between the elliptic inner wall and the outer periphery of the rotor, and also of an in-block opening edge facing the side wall of the cylinder block, the in-chamber opening edge being located on the elliptic inner wall side from the outer periphery of the rotor, the in-chamber opening edge having an arcuate shape extending from the vicinity of a small-diameter section of the cylinder chamber toward a large-diameter section thereof.

(Invention 3) The invention in claim 4 directly citing claim 1

A gas compressor comprising: a cylinder block; a rear side block and a front side block which are arranged on both sides of the cylinder block; a cylinder chamber formed in the cylinder block so as to be surrounded by the cylinder block, the rear side block, and the front side block; an elliptic inner wall formed by the inner wall of the cylinder block, the inner wall facing the cylinder chamber; a rotor rotatably mounted in the cylinder chamber; vane grooves formed in the rotor; vanes projectably inserted in the vane grooves, respectively; and a suction hole provided in either the front side block and/or the rear side block and sucking a refrigerant into the cylinder chamber, wherein the opening edge of the suction hole consists of an in-chamber opening edge located on the inner side of the elliptic inner wall at a position between the elliptic inner wall and the outer periphery of the rotor,

(continued to next sheet)

INTERNATIONAL SEARCH REPORT

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and also of an in-block opening edge facing the side wall of the cylinder block, the in-chamber opening edge being located on the elliptic inner wall side from the outer periphery of the rotor, the in-chamber opening edge having an arcuate shape with the center of the arcuate shape offset relative to the rotation center of the rotor in such a manner that the in-chamber opening edge is gradually separated from the outer periphery of the rotor.

(Note that the invention of claim 1 having no special technical feature is classified into invention 1)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP H6288372 B [0002]
- JP 2005002826 A [0002]