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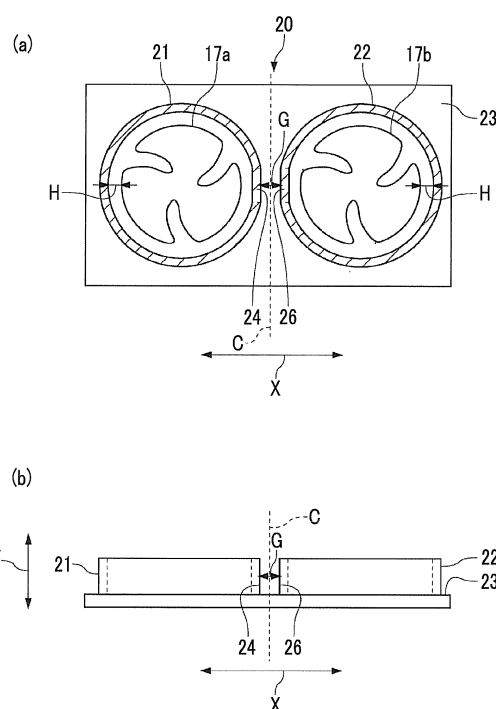
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(54) **BLOWER**

(57) Provided is a blower that enables displacement of mouths to be suppressed when a resin bellmouth having two mouths arranged side by side is subjected to an external force. This blower (16) is characterized by being equipped with a first fan (17a), a second fan (17b) that is disposed side by side to the first fan (17a), and a bellmouth (20) that has a first mouth (21) surrounding the first fan (17a) and a second mouth (22) surrounding the second fan (17b) and is made of a resin, wherein when the bellmouth (20) is displaced upon being subjected to an external force, a portion of the first mouth (21) comes into contact with a portion of the second mouth (22).

FIG. 2



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Description

Technical Field

[0001] The present invention relates to a blower and particularly, to a blower which is provided with a bellmouth made of resin.

Background Art

[0002] An air conditioner has an indoor unit which performs heat exchange with indoor air, and an outdoor unit which dissipates heat to the outside air or absorbs heat from the outside air and is provided with a blower. The blower is provided with a fan, and a bellmouth for surrounding the fan and blowing air. The bellmouth is installed with a constant clearance provided between itself and the fan. The smaller the clearance, the higher the blowing effect of the bellmouth becomes, and therefore, in general, the clearance is set to be small.

[0003] A projection opening (hereinafter referred to as a mouth) configuring the bellmouth is provided to correspond to the number of fans. For example, in an outdoor unit of PTL 1, two mouths are provided with a distance provided therebetween with respect to two fans arranged side by side in a vertical direction.

[0004] In a blower, a bellmouth made of metal or a bellmouth made of resin is used.

[0005] A bellmouth made of metal has high rigidity, and therefore, a concern that the bellmouth may be deformed by an external force such as a snow load or a wind load is low. However, there is a restriction in processing, and therefore, the degree of freedom of a shape is low.

[0006] On the other hand, a bellmouth made of resin can be formed by, for example, injection molding, and therefore, the degree of freedom of a shape becomes higher. However, rigidity is low, compared to a bellmouth made of metal, and therefore, there is a concern that the bellmouth may be bent and deformed by an external force.

Citation List

Patent Literature

[0007] [PTL 1] Japanese Unexamined Patent Application Publication No. 2011-231985

Summary of Invention

Technical Problem

[0008] A bellmouth made of resin, in which two mouths are arranged side by side and integrally formed, is fixed by fixing members at both right and left ends. If an external force is applied to the bellmouth, in a central portion, there is no support for an external force, and therefore, there is a concern that the central portion of the bellmouth

may be bent and dented. If the central portion of the bellmouth is dented, the mouths are displaced toward the center side, and therefore, a clearance (a first clearance) in an array direction of the mouths becomes greater and a clearance (a second clearance) in a direction perpendicular to the array direction becomes smaller. If the first clearance becomes greater, the blowing performance of the bellmouth is lowered, and thus the performance of an outdoor unit is lowered. On the other hand, if the second clearance becomes smaller, the fans and the bellmouth may interfere with each other, and thus there is a concern that breakage of the fans and/or the bellmouth may occur.

[0009] The present invention has been made based on such a problem and has an object to provide a blower in which when a bellmouth made of resin, in which two mouths are arranged side by side, is subjected to an external force, the displacement of the mouths is suppressed.

Solution to Problem

[0010] Under such an object, according to an aspect of the present invention, there is provided a blower including: a first fan; a second fan which is provided in parallel to the first fan; and a bellmouth which has a first mouth surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein if the bellmouth is displaced by being subjected to an external force, a portion of the first mouth and a portion of the second mouth come into contact with each other.

[0011] A portion of the first mouth and a portion of the second mouth face each other, and when the bellmouth is displaced, these sites come into contact with each other, whereby forces which are applied to the sites can cancel each other out. In this way, it is possible to suppress the displacement of the first mouth and the second mouth. Then, the clearances (the first clearance and the second clearance described above) between the first fan and the first mouth and between the second fan and the second mouth can be maintained, and therefore, a decrease in the performance of the blower or breakage of the bellmouth and/or the fans can be prevented.

[0012] In the blower according to the present invention, it is preferable that the first mouth has a first flat portion, and the second mouth has a second flat portion, and if the bellmouth is displaced by being subjected to an external force, the first flat portion and the second flat portion come into contact with each other.

[0013] In this way, forces which are applied to the sites (the first flat portion and the second flat portion) which are in contact with each other can cancel each other out without causing a local force.

[0014] Further, according to another aspect of the present invention, there is provided a blower including: a first fan; a second fan which is provided in parallel to the first fan; and a bellmouth which has a first mouth

surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein the first mouth and the second mouth are integrally formed.

[0015] The first mouth and the second mouth are integrally formed, whereby forces which are applied to an integrated site (a connection portion) can cancel each other out. For this reason, the clearances (the first clearance and the second clearance described above) between the first fan and the first mouth and between the second fan and the second mouth are maintained, and therefore, a decrease in the performance of the blower or breakage of the bellmouth and/or the fans can be prevented.

[0016] In the blower according to the present invention, it is preferable that at least one of the first mouth and the second mouth has a rib formed therein in a circumferential direction.

[0017] By forming the rib at the mouth, it is possible to improve the rigidity of the mouth, and therefore, the deformation of the entire mouth can be suppressed. **Advantageous Effects of Invention**

[0018] According to the present invention, if the bellmouth made of resin is displaced by being subjected to an external force, a portion of the first mouth and a portion of the second mouth come into contact with each other, and therefore, it is possible to suppress the displacement of each mouth. Further, the first mouth and the second mouth are integrally formed, whereby the displacement of each mouth can be suppressed.

[0019] For this reason, the initial clearance between the bellmouth and the fan can be maintained, and thus a decrease in the performance of the blower, or breakage of the bellmouth and/or fans which can be caused by contact between the bellmouth and the fans can be avoided.

Brief Description of Drawings

[0020]

Fig. 1 is a schematic front view showing an outdoor unit of an air conditioner according to this embodiment.

Fig. 2(a) is a plan view showing a bellmouth according to a first embodiment, and Fig. 2(b) is a front view of the bellmouth shown in Fig. 2(a).

Fig. 3(a) is a plan view showing the bellmouth when it has been subjected to an external force, and Fig. 3(b) is a front view of the bellmouth shown in Fig. 3(a).

Fig. 4(a) is a plan view showing a bellmouth according to a second embodiment, and Fig. 4(b) is a front view of the bellmouth shown in Fig. 4(a).

Fig. 5(a) is a plan view showing a bellmouth according to a modification example, and Fig. 5(b) is a front view of the bellmouth shown in Fig. 5(a).

Description of Embodiments

[0021] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings.

[First Embodiment]

[0022] As shown in Fig. 1, an outdoor unit 1 of an air conditioner according to an embodiment of the present invention is provided with a housing 10 having an intake port 12 formed in a front face 10a, a heat exchanger 15 which is provided in the interior of the housing 10, and a blower 16 which discharges air which has passed through the heat exchanger 15.

[0023] The blower 16 is provided with a fan part 17 and a bellmouth 20. The fan part 17 has a first fan 17a, and a second fan 17b which is provided in parallel to the first fan 17a.

[0024] The present invention has features in the structure of the bellmouth 20.

[0025] The bellmouth 20 is provided so as to cover a top face 10b of the housing 10 of the outdoor unit 1. The bellmouth 20 is made of a resin material and formed by, for example, injection molding.

[0026] The bellmouth 20 is provided with a base portion 23, a first mouth 21, and a second mouth 22, as shown in Figs. 2(a) and 2(b). Hereinafter, there are cases where the first mouth 21 and the second mouth 22 are referred to simply as mouths 21 and 22.

[0027] The base portion 23 has a rectangular shape and is fixed to the housing 10 by fixing members.

[0028] The first mouth 21 and the second mouth 22 are formed so as to stand from the base portion 23 (Fig. 2(b)) and are arranged side by side with a gap G therebetween in a width direction X (Fig. 2(a)).

[0029] The first mouth 21 has a tubular shape and is provided so as to surround the first fan 17a. The first mouth 21 is provided with a clearance H provided between itself and the first fan 17a.

[0030] A flat portion (a first flat portion) 24 is formed at a portion of a side wall of the first mouth 21. The flat portion 24 has a rectangular cross section and a flat surface is formed therein in a vertical direction Y. The cross section of the first mouth 21 has an arc shape with the exception of the flat portion 24.

[0031] The second mouth 22 has a shape axisymmetric to the first mouth 21 with a reference line C as the axis of symmetry and is provided so as to surround the second fan 17b.

[0032] Further, the second mouth 22 has a flat portion (a second flat portion) 26 formed at a site facing the flat portion 24 of the first mouth 21. Further, the second mouth 22 is provided with a clearance H provided between itself and the second fan 17b.

[0033] The gap G is set such that the flat portion 24 and the flat portion 26 come into contact with each other when the first mouth 21 and the second mouth 22 are

displaced by being subjected to an external force. For this reason, when the maximum displacement amounts in a direction in which the first mouth 21 and the second mouth 22 approach each other when being subjected to an external force are respectively set to be L1 and L2, the gap G necessarily satisfies the relationship of $G < L1 + L2$.

[0034] Further, in this embodiment, the mouths 21 and 22 are formed of the same resin, and therefore, the gap G satisfies the relationship of $G < 2 \times L1$ or $G < 2 \times L2$.

[Operation and Effects]

[0035] Hereinafter, the operation and effects of the bellmouth 20 according to this embodiment will be described.

[0036] If the first mouth 21 is subjected to an external force, the flat portion 24 is displaced in a direction coming close to the second mouth 22. On the other hand, if the second mouth 22 is subjected to an external force, the flat portion 26 is displaced in a direction coming close to the first mouth 21.

[0037] If the flat portions 24 and 26 are displaced from each other, the flat portion 24 comes into contact with the flat portion 26 at a predetermined position, as shown in Figs. 3 (a) and 3(b). If the flat portions 24 and 26 come into contact with each other, the flat portion 24 receives a force in the opposite direction to the force when the flat portion 24 itself attempts to be displaced, from the flat portion 26. On the other hand, the flat portion 26 receives a force in the opposite direction to the force when the flat portion 26 itself attempts to be displaced, from the flat portion 24.

[0038] Then, the forces which are applied to the flat portions 24 and 26 cancel each other out, whereby the mouths 21 and 22 are not displaced. Further, the flat portions 24 and 26 come into contact with each other at planes, and therefore, it is possible to avoid a local force being applied.

[0039] For this reason, the clearance H between the first fan 17a and the first mouth 21 and the clearance H between the second fan 17b and the second mouth 22 are substantially maintained. If the clearances H are maintained, a decrease in the performance of the blower 16, or breakage of the bellmouth 20 and/or the fans 17a and 17b due to contact between the bellmouth 20 and the fans 17a and 17b can be prevented.

[0040] Further, in the related art, a bellmouth made of resin is mainly used in a blower having a one-fan specification in which a fan is one, because there is a concern that the bellmouth made of resin may be displaced if it is subjected to an external force. However, the bellmouth 20 made of resin according to this embodiment can be used in a blower having a two-fan specification in which two fans are provided, because even if the two mouths 21 and 22 are provided therein, displacement of them due to an external force can be suppressed.

[0041] Further, the bellmouth 20 of this embodiment is

made of a resin material, and therefore, the bellmouth 20 can be formed by injection molding. For this reason, compared to a bellmouth made of metal, it is possible to freely change the heights of the mouths 21 and 22. By increasing the heights of the mouths 21 and 22, it is possible to improve the effect of blowing air which is discharged.

[Second Embodiment]

[0042] In the first embodiment, the bellmouth 20 in which the mouths 21 and 22 are provided with the gap G provided therebetween has been described. In this embodiment, a bellmouth 50 in which a first mouth 51 and a second mouth 52 are integrally formed is described. In addition, the same portions as those in the first embodiment are denoted by the same reference numerals and description thereof is omitted.

[0043] The first mouth 51 and the second mouth 52 are integrally formed so as to stand from the base portion 23 and are arranged side by side in the width direction X, as shown in Figs. 4(a) and 4(b).

[0044] The first mouth 51 has a tubular shape and is provided so as to surround the first fan 17a.

[0045] The first mouth 51 is provided with the clearance H provided between itself and the first fan 17a.

[0046] The second mouth 52 has a shape axisymmetric to the first mouth 51 with the reference line C as the axis of symmetry and is provided so as to surround the second fan 17b. The second mouth 52 is provided with the clearance H provided between itself and the second fan 17b.

[0047] In addition, a site at which the first mouth 51 and the second mouth 52 are integrated is, for convenience, referred to as a connection portion.

[Operation and Effects]

[0048] The first mouth 51 and the second mouth 52 according to this embodiment are formed in an integrated fashion.

[0049] If the first mouth 51 is subjected to an external force, a force (F1) is applied from the first mouth 51 side to the connection portion. Similarly, if the second mouth 52 is subjected to an external force, a force (F2) is applied from the second mouth 52 side to the connection portion.

[0050] The force F1 and the force F2 are in the opposite directions, and therefore, the forces which are applied to the connection portion cancel each other out. For this reason, the displacement of the mouths 51 and 52 is suppressed.

[0051] If the displacement of the mouths 51 and 52 is suppressed, the set clearances H can be maintained. For this reason, a decrease in the performance of the blower 16, or breakage of the bellmouth 50 and/or the fans 17a and 17b due to contact between the mouths 51 and 52 and the fans 17a and 17b can be prevented.

[0052] Further, the bellmouth 50 according to this em-

bodiment can also be applied to the blower 16 having a two-fan specification, similar to the first embodiment. Further, the bellmouth 50 is formed by injection molding, whereby it is possible to adjust the heights of the mouths 51 and 52, and therefore, it is possible to improve the effect of blowing air which is discharged.

[Modification Example]

[0053] In the above embodiments, the bellmouth 20 (50) in which the displacement of the mouths 21 and 22 (51 and 52) can be suppressed have been described. In a modification example, means for further suppressing the displacement of the mouths will be hereinafter described by taking the bellmouth 50 described in the second embodiment as an example.

[0054] As shown in Figs. 5(a) and 5(b), ribs 31 and 32 are respectively provided in circumferential directions of the outer peripheral walls of the mouths 51 and 52. The ribs 31 and 32 are made of a resin materials and formed integrally with the mouths 51 and 52.

[Operation and Effects]

[0055] The rigidity of the mouths 51 and 52 is increased by providing the ribs 31 and 32, and therefore, it becomes difficult for the entirety of the mouths 51 and 52 to be displaced with respect to an external force. Then, the entirety of the mouths 51 and 52 can maintain the original shape, and therefore, it is possible to maintain the blowing effect of the bellmouth 50.

[0056] In addition, the rib is not limited to a case of being provided at both the mouths 51 and 52 and may be provided at either of them.

[0057] Further, the ribs can also be provided at the mouths 21 and 22 of the first embodiment and can exhibit the same effects as the above-described effects.

[0058] The embodiments have been described above. However, in addition to these, as long as it does not depart from the gist of the present invention, it is possible to select the configurations mentioned in the above embodiments or appropriately change them to other configurations.

[0059] For example, in the first embodiment, the mouths 21 and 22 having the flat portions 24 and 26 have been described. However, even in a bellmouth without the flat portions 24 and 26, the outer peripheral wall of the first mouth 21 and the outer peripheral wall of the second mouth 22 come into contact with each other, thereby suppressing displacement from each other, and therefore, a decrease in the performance of the blower 16 or breakage of the bellmouth and/or the fans can be prevented.

[0060] Further, in the modification example, the ribs 31 and 32 are provided at the outer peripheral walls of the mouths. However, the ribs 31 and 32 can also be provided at the inner peripheral walls. Even in a case where the ribs 31 and 32 are provided at the inner peripheral

walls, it is possible to improve the rigidity of the mouths.

Reference Signs List

[0061]

5	1:	outdoor unit
	10:	housing
	10a:	front face
	10b:	top face
	12:	intake port
10	15:	heat exchanger
	16:	blower
	17:	fan part
	17a:	first fan
	17b:	second fan
15	20:	bellmouth
	21:	first mouth
	22:	second mouth
	23:	base portion
	24:	flat portion (first flat portion)
20	26:	flat portion (second flat portion)
	31, 32:	rib
	50:	bellmouth
	51:	first mouth
	52:	second mouth
25	C:	reference line
	G:	gap
	H:	clearance
	X:	width direction
	Y:	vertical direction
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Claims

1. A blower comprising:

- 35 a first fan;
a second fan which is provided in parallel to the first fan; and
a bellmouth which has a first mouth surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein if the bellmouth is displaced by being subjected to an external force, a portion of the first mouth and a portion of the second mouth come into contact with each other.

2. The blower according to Claim 1, wherein the first mouth has a first flat portion, and the second mouth has a second flat portion, and if the bellmouth is displaced by being subjected to an external force, the first flat portion and the second flat portion come into contact with each other.

3. A blower comprising:

- 55 a first fan;
a second fan which is provided in parallel to the first fan; and

a bellmouth which has a first mouth surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein the first mouth and the second mouth are integrally formed.

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4. The blower according to any one of Claims 1 to 3, wherein at least one of the first mouth and the second mouth has a rib formed therein in a circumferential direction.

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5. An outdoor unit of an air conditioner comprising: the blower according to any one of Claims 1 to 4.

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Amended claims under Art. 19.1 PCT

1. A blower comprising:

a first fan;
a second fan which is provided in parallel to the first fan; and
a bellmouth which has a first mouth surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein if the bellmouth is displaced by being subjected to an external force, a portion of the first mouth and a portion of the second mouth come into contact with each other.

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2. The blower according to Claim 1, wherein the first mouth has a first flat portion, and the second mouth has a second flat portion, and if the bellmouth is displaced by being subjected to an external force, the first flat portion and the second flat portion come into contact with each other.

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3. A blower comprising:

a first fan;
a second fan which is provided in parallel to the first fan; and
a bellmouth which has a first mouth surrounding the first fan, and a second mouth surrounding the second fan, and is made of a resin material, wherein the first mouth and the second mouth are integrally formed so as to stand from a base portion and share a connection portion which connects the first mouth and the second mouth to each other, and protrusion heights of the connection portion, the first mouth, and the second mouth are approximately the same.

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4. The blower according to any one of Claims 1 to 3, wherein at least one of the first mouth and the second mouth has a rib formed therein in a circumferential direction.

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FIG. 1

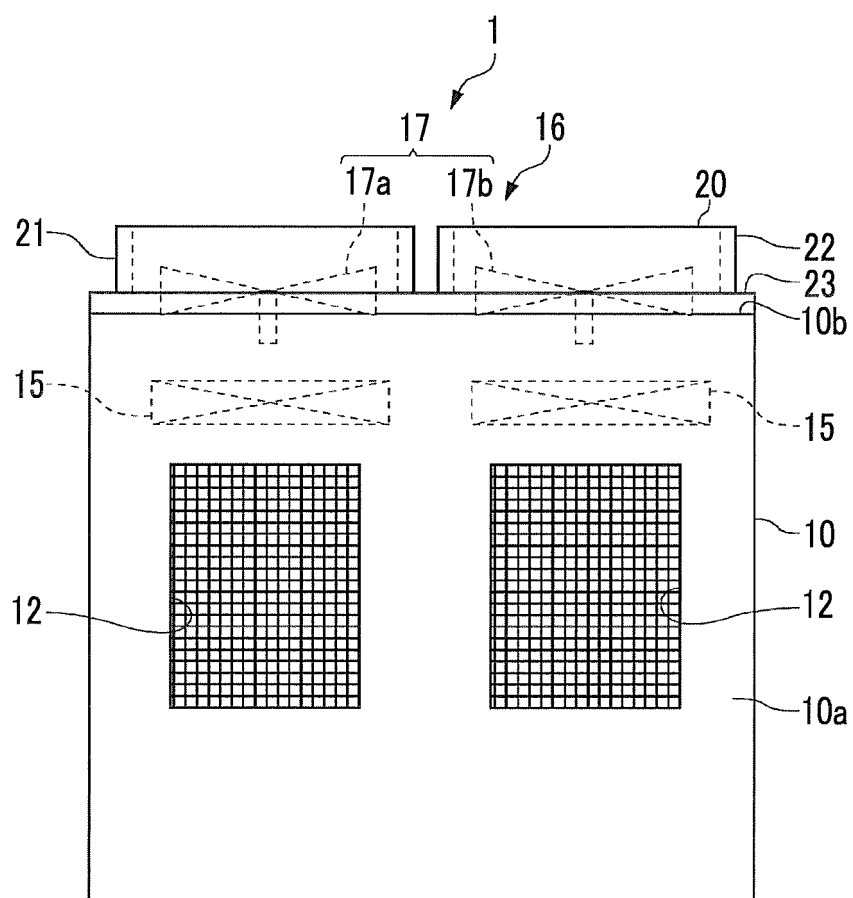


FIG. 2

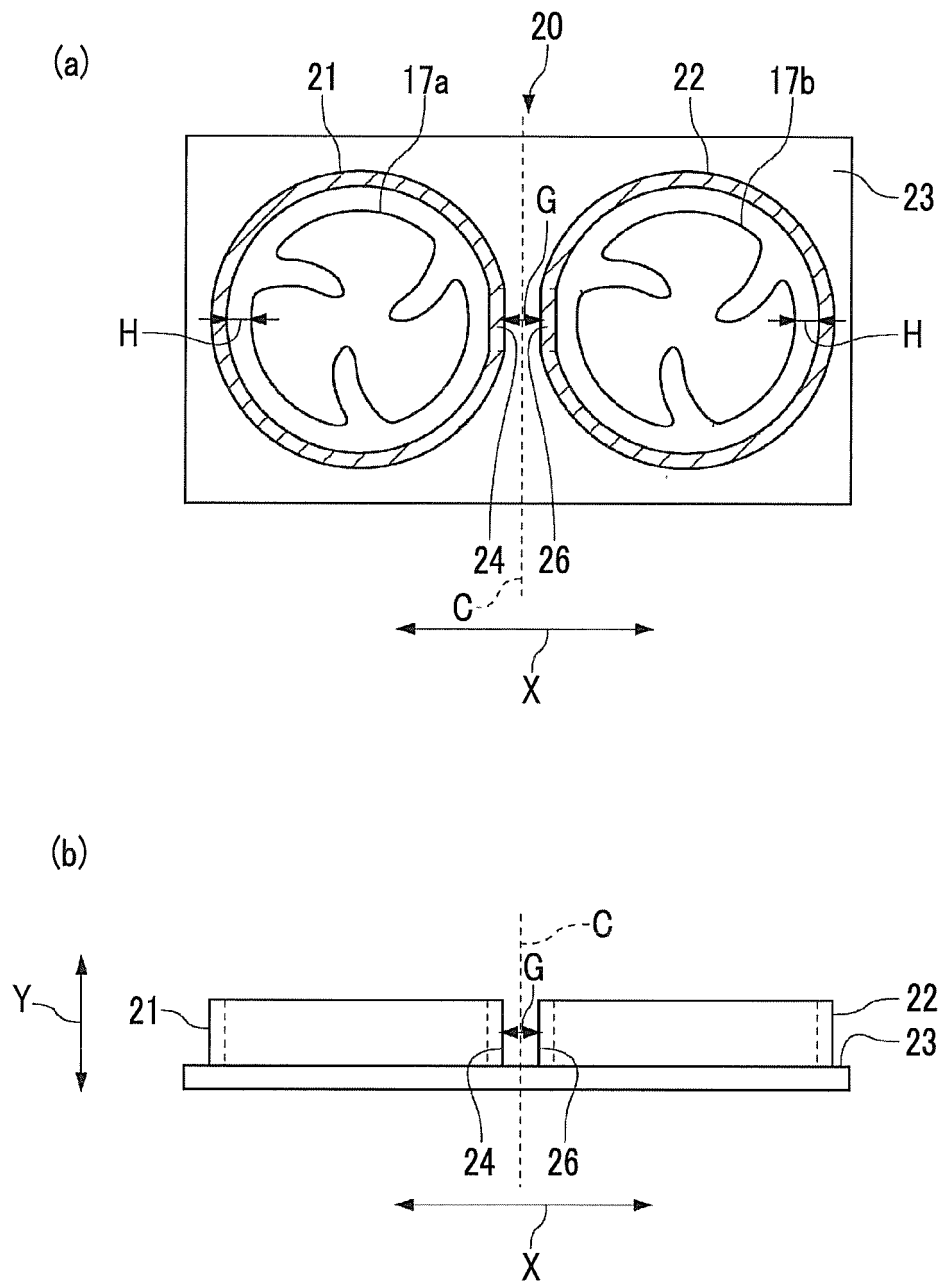


FIG. 3

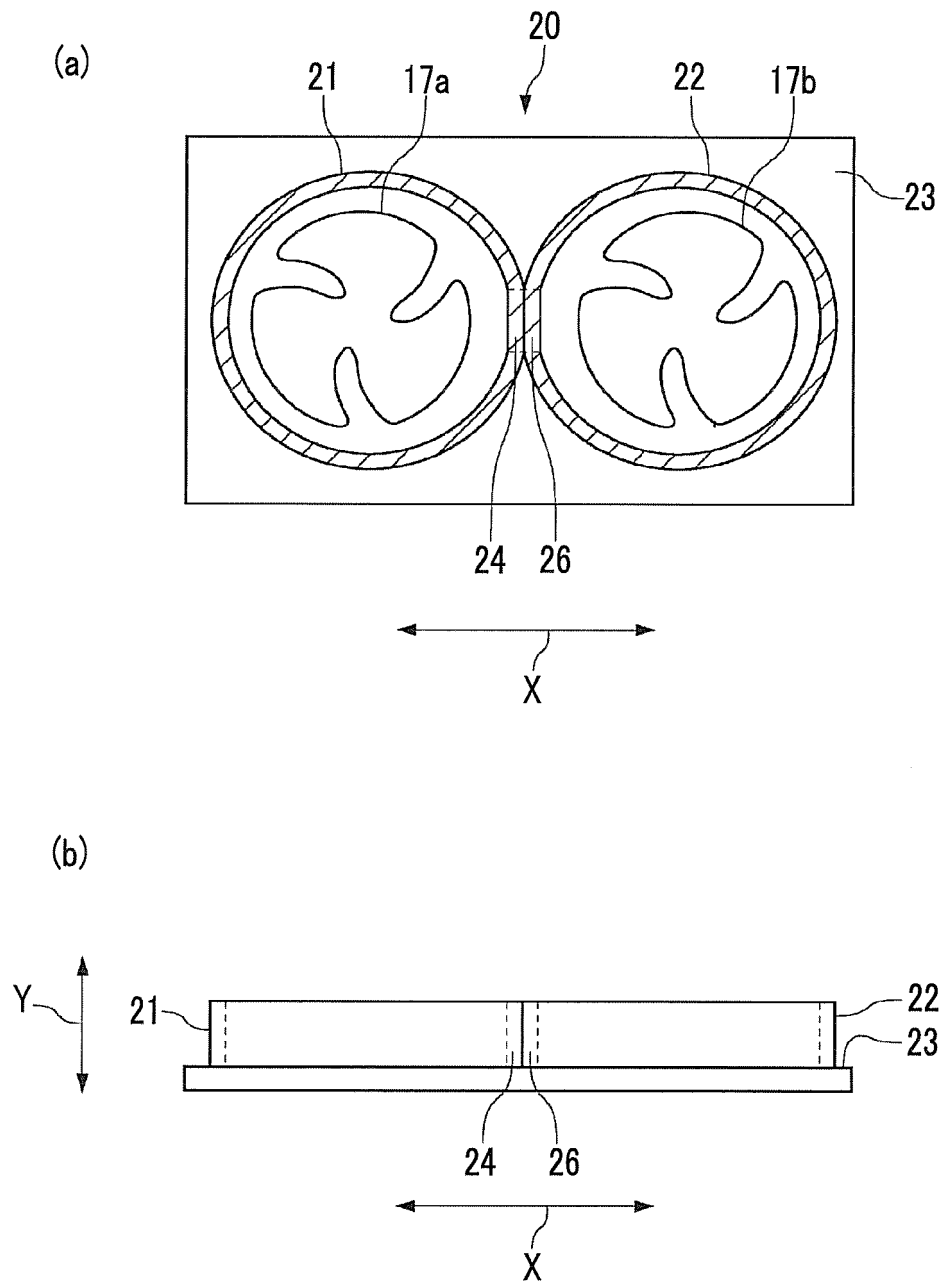


FIG. 4

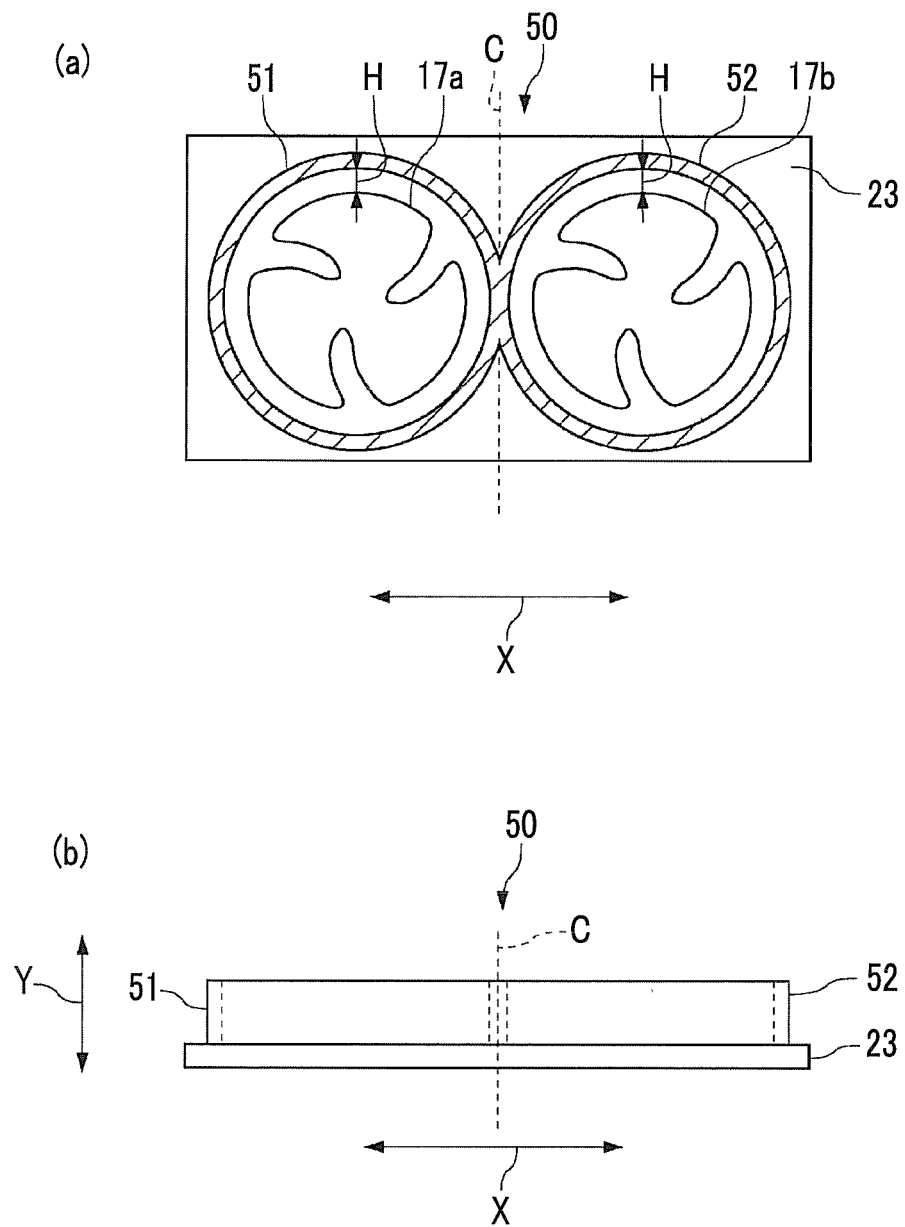
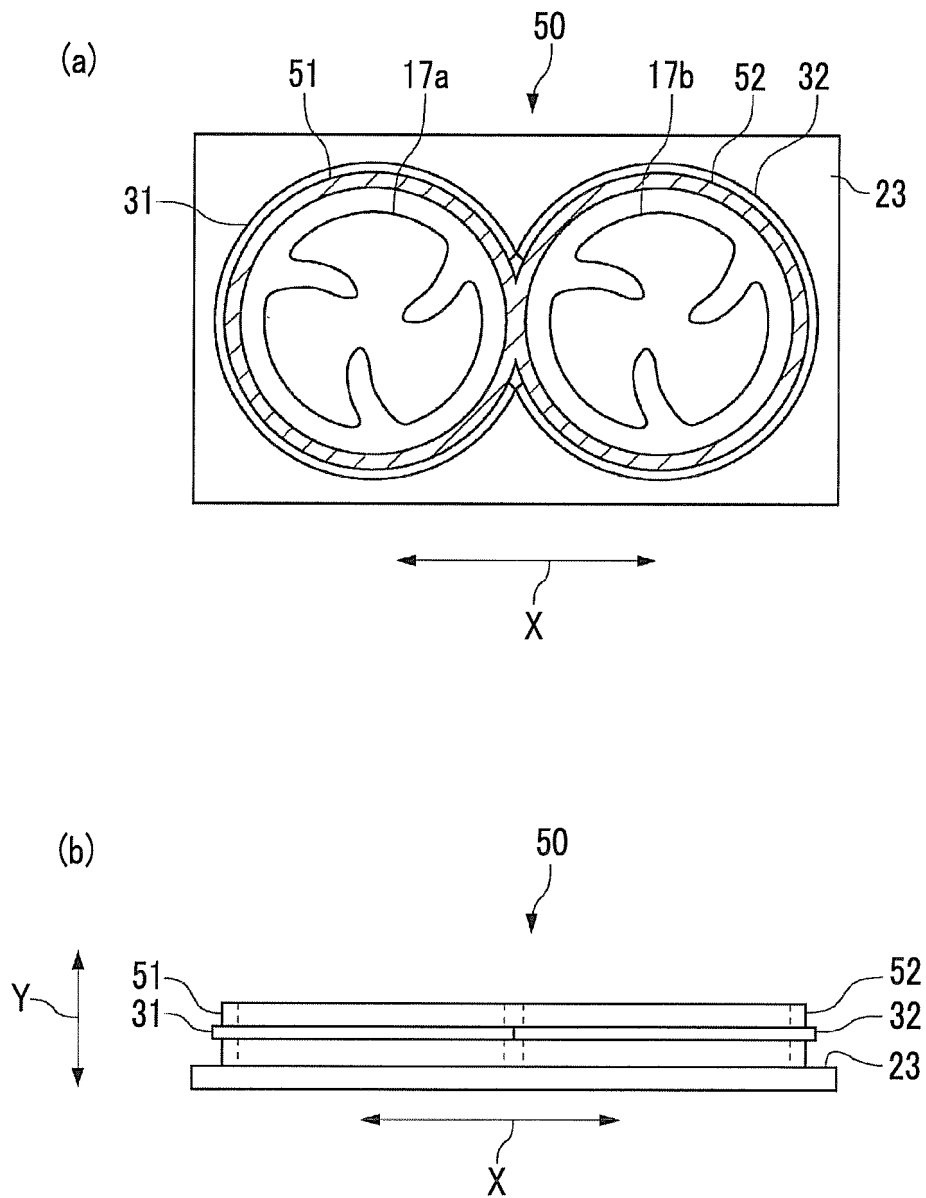


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/003196

A. CLASSIFICATION OF SUBJECT MATTER

F04D29/54(2006.01)i, F04D25/08(2006.01)i, F04D25/16(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)

F04D29/54, F04D25/08, F04D25/16, F24F1/00, F24F5/00

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 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

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 A	JP 54-128148 A (Tokyo Shibaura Electric Co., Ltd.), 04 October 1979 (04.10.1979), page 2, upper left column, line 6 to lower right column, line 18; fig. 1 to 4 (Family: none)	1, 3 4, 5 2
X Y	JP 7-305868 A (Mitsubishi Heavy Industries, Ltd.), 21 November 1995 (21.11.1995), paragraphs [0012] to [0018]; fig. 1 to 3 (Family: none)	1, 3 4, 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
12 August, 2014 (12.08.14)Date of mailing of the international search report
16 September, 2014 (16.09.14)Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/003196

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 46315/1980 (Laid-open No. 147398/1981) (Tokyo Shibaura Electric Co., Ltd.), 06 November 1981 (06.11.1981), page 5, lines 15 to 17; fig. 2 (Family: none)	4, 5
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Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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