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(54) **OUTDOOR UNIT OF AIR CONDITIONING SYSTEM**

(57) The purpose of the present invention is to further increase the efficiency of heat exchange in an outdoor unit. An outdoor unit (1) comprising a cylindrical bell mouth (12) provided to a base plate (11) that constitutes part of a housing (10), a fan (20) provided inside the bell mouth (12), a motor (21) that is installed in a central part of the fan (20) and rotatably drives the fan (20), a motor

support member (30A) that is provided so as to straddle an opening part (13) of the bell mouth (12) to support the motor (21), and heat exchangers (15) provided in a pair of two so as to face each other across the opening part (13) of the bell mouth (20). At least one end part (30a) of the motor support member (30A) is disposed between end parts (15e, 15f) of the pair of heat exchangers (15).

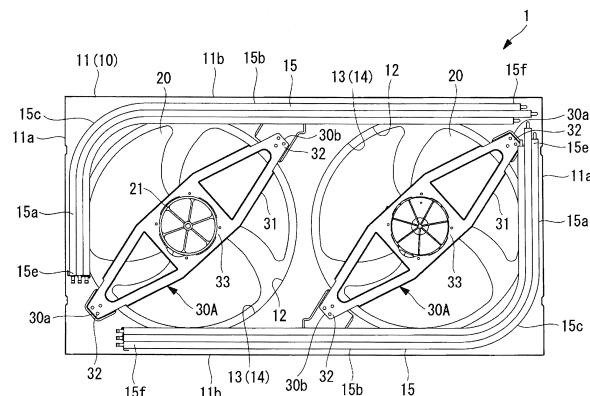


FIG. 3

Description

Technical Field

[0001] The present disclosure relates to an outdoor unit of an air conditioning system.

Background Art

[0002] An outdoor unit of an air conditioning system includes a fan and a heat exchanger in a housing. The outdoor unit performs heat exchange with a refrigerant in the heat exchanger by applying wind generated by rotating the fan to the heat exchanger.

[0003] As disclosed in Patent Documents 1 and 2, for example, in the outdoor unit, the fan is arranged inside an opening part formed in a fan cover constituting a part of the housing. A motor that drives the fan is attached to the fan cover via a motor support member. The motor support member is disposed so as to straddle the opening part in the radial direction, and both ends of the motor support member are fixed to the fan cover on the outer peripheral side of the opening part.

Citation List

Patent Documents

[0004]

Patent Document 1: JP-A-2001-050801

Patent Document 2: JP-UM-A-54-159349

Summary of Invention

Technical Problem

[0005] Incidentally, in an outdoor unit, in order to reduce an external dimension of the outdoor unit and increase a heat exchange efficiency in a heat exchanger, the heat exchanger may be brought closer to a fan or an opening part on an inner peripheral side, and a bell mouth.

[0006] However, in a configuration disclosed in Patent Documents 1 and 2, the heat exchanger has to be arranged on an outer peripheral side of an end part of a motor support member fixed to a fan cover on an outer peripheral side of the opening part. Therefore, in order to bring the heat exchanger closer to the fan or the opening part and the bell mouth, both end parts of the motor support member are hindered.

[0007] Furthermore, the outdoor unit includes a cylindrical bell mouth on an outer peripheral side of the fan. The gap between an inner peripheral surface of the bell mouth and an outer peripheral part of the fan may be made as small as possible in order to increase the heat exchange efficiency.

[0008] However, in the configuration disclosed in Pat-

ent Documents 1 and 2, the motor support member is fixed to the fan cover. The bell mouth is also fixed to the fan cover. That is, the motor support member and the bell mouth are indirectly connected via a fan cover. Therefore, the manufacturing error of the fan cover also contributes to the position accuracy of the motor support member and the bell mouth. As a result, there is a limit to increase the position accuracy of the motor support member and the bell mouth.

the present disclosure has been made in view of the above circumstances, and the purpose of the present disclosure is to provide an outdoor unit of an air conditioning system capable of further increasing a heat exchange efficiency in the outdoor unit.

Solution to Problem

[0009] An outdoor unit of an air conditioning system according to a first aspect of the present disclosure includes a cylindrical bell mouth disposed to a base plate that constitutes part of a housing, a fan disposed inside the bell mouth, a motor that is installed in a central part of the fan and rotatably drives the fan, a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor, and heat exchangers disposed in a pair of two so as to face each other across the opening part of the bell mouth, wherein at least one end part of the motor support member is arranged between end parts of the pair of two heat exchangers.

[0010] According to this configuration, in a case where the pair of two heat exchangers are disposed so as to face each other across the opening part of the bell mouth, in order to increase a heat exchange efficiency, when each heat exchanger is brought closer to the opening part, a gap between the heat exchanger and the opening part of the bell mouth becomes small. In contrast, in a case where at least one end part of the motor support member is arranged between the end parts of the pair of two heat exchangers, it is not necessary to arrange the end part of the motor support member between the opening part of the bell mouth and the heat exchanger. Therefore, the gap between the opening part of the bell mouth and the heat exchanger can be narrowed to arrange the motor support member, and the heat exchange efficiency in the heat exchanger can be increased.

[0011] In the outdoor unit of the air conditioning system of the above-described first aspect, the motor support member is further preferably joined directly to the bell mouth.

[0012] According to this configuration, the position accuracy of the motor support member and the bell mouth can be increased by directly joining the motor support member to the bell mouth. As a result, the gap between the fan driven by the motor supported by the motor support member and the bell mouth can be narrowed. Therefore, air can flow efficiently by the fan and heat exchange efficiency in the heat exchanger can be increased.

[0013] In the outdoor unit of the air conditioning system

of the above-described first aspect, the motor support member is more preferably integrally formed with a motor base member that fixes the motor.

[0014] According to this configuration, by integrally forming the motor base member to the motor support member, man hour of assembly can be suppressed compared to a case where the motor base member is a separate component from the motor support member.

[0015] In the outdoor unit of the air conditioning system according to the above-described first aspect, the outdoor unit further preferably includes a reinforcing member that is disposed on an outer peripheral side of the bell mouth and configured to reinforce the base plate.

[0016] According to this configuration, the base plate is reinforced by the reinforcing member, so that the base plate can be suppressed from resonating at the time of rotation of the fan.

[0017] In the outdoor unit of the air conditioning system of the above-described first aspect, it is further preferably that a plurality of sets of the bell mouths, the fans, the motors, and the motor support members are disposed in the same base plate, the reinforcing member is arranged between the bell mouths adjacent to each other.

[0018] According to this configuration, when a plurality of sets of bell mouths are disposed, the strength of the base plate is reduced particularly between the opening parts of the bell mouth. Thus, by arranging the reinforcing member between the bell mouths adjacent to each other, the base plate of this part can be efficiently reinforced. Therefore, the base plate can be suppressed from resonating at the time of rotation of the fan.

[0019] An outdoor unit of an air conditioning system according to a second aspect of the present disclosure includes a cylindrical bell mouth disposed to a base plate that constitutes part of a housing, a fan disposed inside the bell mouth, a motor that is installed in a central part of the fan and rotatably drives the fan, and a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor, wherein the motor support member is directly joined to the bell mouth.

[0020] According to this configuration, the position accuracy of the motor support member and the bell mouth can be increased by directly joining the motor support member to the bell mouth. As a result, the gap between the fan driven by the motor supported by the motor support member and the bell mouth can be narrowed. Therefore, air can flow efficiently by the fan and heat exchange efficiency in the heat exchanger can be increased.

[0021] An outdoor unit of an air conditioning system according to a third aspect of the present disclosure includes a cylindrical bell mouth disposed to a base plate that constitutes part of a housing, a fan disposed inside the bell mouth, a motor that is installed in a central part of the fan and rotatably drives the fan, a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor, and a reinforcing member that is disposed on an outer peripheral side of the bell mouth and configured to reinforce the base plate,

wherein a plurality of sets of the bell mouths, the fans, the motors, and the motor support members are disposed in the same base plate, the reinforcing member is arranged between the bell mouths adjacent to each other.

[0022] According to this configuration, when a plurality of sets of bell mouths are disposed, the strength of the base plate is reduced particularly between the opening parts of the bell mouth. Thus, by arranging the reinforcing member between the bell mouths adjacent to each other, the base plate of this part can be efficiently reinforced. Therefore, the base plate can be suppressed from resonating at the time of rotation of the fan.

Advantageous Effect of Invention

[0023] According to the outdoor unit of the air conditioning system according to the present disclosure, the heat exchange efficiency in the outdoor unit can be further increased.

Brief Description of Drawings

[0024]

FIG. 1 is a perspective view illustrating a part of an embodiment of an outdoor unit of an air conditioning system of the present disclosure.

FIG. 2 is a perspective view of a motor support member disposed in a bell mouth of the outdoor unit, viewed from the inside of the housing.

FIG. 3 is a diagram of the motor support member as viewed from the inside of the housing.

FIG. 4 is a cross-sectional view illustrating a structure that the motor support member and the bell mouth are directly joined.

FIG. 5 is a cross-sectional view illustrating another example of a structure that the motor support member and the bell mouth are directly joined.

FIG. 6 is a diagram illustrating a first modified example of an embodiment of an outdoor unit of the air conditioning system of the present disclosure, and is a perspective view of a motor support member disposed in a bell mouth of the outdoor unit as viewed from the inside of the housing.

FIG. 7 is a diagram illustrating a second modified example of an embodiment of the outdoor unit of the air conditioning system of the present disclosure, and is a perspective view of a reinforcing member that is disposed on a base plate of the outdoor unit as viewed from the inside of the housing.

FIG. 8 is a diagram illustrating a third modified example of an embodiment of the outdoor unit of the air conditioning system of the present disclosure, and is a diagram of the motor support member of the outdoor unit as viewed from the inside of the housing.

Description of Embodiments

[0025] Hereinafter, an embodiment of an outdoor unit of an air conditioning system according to the present invention will be described with reference to the drawings.

[0026] As illustrated in FIG. 1, the outdoor unit 1 of the air conditioning system includes a housing 10, a bell mouth 12, a fan 20, a motor 21 (see FIG. 2 and FIG. 3), and a heat exchanger 15.

[0027] In FIG. 2, the motor support member 30A on the right side is different from the motor support member 30A on the left side, and a state that the motor 21 is not mounted is illustrated.

[0028] The housing 10 has a rectangular parallelepiped shape, and a base plate 11 formed from a metal plate is disposed on one surface of the housing 10.

[0029] The bell mouth 12 is fixed to the base plate 11 of the housing 10. The bell mouth 12 is cylindrical, and a flange part 12a that protrudes outward at the base end part of the bell mouth 12 is integrally formed. The bell mouth 12 is fixed to the base plate 11 in a state that the flange part 12a abutting against the base plate 11. A through hole 14 (see FIG. 2 and FIG. 3) that communicates with the opening part 13 inside the bell mouth 12 is formed in the base plate 11.

[0030] In this embodiment, the base plate 11 has a rectangular shape, and two of the bell mouths 12 are arranged side by side at gaps along the long side direction of the base plate 11.

[0031] The fan 20 is installed inside the opening part 13 of each bell mouth 12. The fan 20 integrally includes a boss 22 formed at a central part of the fan 20 and a plurality of blades 23 disposed in the circumferential direction on the outer peripheral side of the boss 22.

[0032] As illustrated in FIG. 2, the motor 21 is arranged inside the housing 10 with respect to the fan 20. The motor 21 is arranged coaxially with the boss 22 of the fan 20, and the drive shaft 21s is coupled to the boss 22. The motor 21 rotationally drives the fan 20 by causing the drive shaft to rotate by a current supplied from the outside.

[0033] The motor 21 is fixed to the bell mouth 12 by a motor support member 30A, which will be described in detail below. Note that in FIG. 2, the motor support member 30A on the right side is different from the motor support member 30A on the left side, and a state that the motor 21 is not mounted is illustrated.

[0034] As illustrated in FIG. 3, the heat exchanger 15 is disposed in a pair of two so as to face each other across the opening parts 13 and 13 of the bell mouths 12 and 12. The refrigerant circulated between the heat exchanger 15 and the indoor unit constituting the air conditioning system flows in the heat exchanger 15.

[0035] Each heat exchanger 15 is substantially L-shaped and includes a first straight line part 15a that extends along the short side 11a of the base plate 11, a second straight line part 15b that extends along a long

side 11b orthogonal to the short side 11a of the base plate 11, and a curved part 15c formed between the first straight line part 15a and the second straight line part 15b and that extends along the outer perimeter part of the opening part 13 of one of the bell mouths 12.

[0036] The motor support member 30A is disposed so as to straddle the opening part 13 of the bell mouth 12. The motor support member 30A includes an arm part 31 and a fixing bracket 32 and 32. Note that in FIG. 3, the motor support member 30A on the right side is different from the motor support member 30A on the left side, and a state that the motor 21 is not mounted is illustrated.

[0037] The arm part 31 extends so as to straddle the opening part 13 in a radial direction. A motor base member 33 that fixes the motor 21 is integrally formed in the central part of the arm part 31.

[0038] The fixing bracket 32 and 32 is disposed on both end parts of the arm part 31.

[0039] As illustrated in FIG. 4, each fixing bracket 32 is arranged so as to face the flange part 12a of the bell mouth 12 across the base plate 11. The fixing bracket 32 of the motor support member 30A and the flange part 12a of the bell mouth 12 are coupled by passing the stud bolt 35 disposed on the fixing bracket 32 side through the base plate 11 and the flange part 12a, and screwing the nut 36 to the tip part of the stud bolt 35.

[0040] Such a motor support member 30A can be formed, for example, by bending a metal plate.

[0041] Here, instead of the configuration illustrated in FIG. 4, as illustrated in FIG. 5, a bolt 37 may be inserted through the base plate 11 from the flange part 12a side of the bell mouth 12, and the tip part 37a of the bolt 37 is screwed into the fixing bracket 32 of the motor support member 30A.

[0042] As illustrated in FIG. 3, one end 30a of the motor support member 30A is arranged between the end parts 15e and 15f of the pair of two heat exchangers 15 and 15. The motor support member 30A straddles the opening part 13 in the radial direction, and the other end part 30b is arranged in the vicinity of the intermediate part of the second straight line part 15b of the heat exchanger 15.

[0043] According to the configuration described above, a pair of two heat exchangers 15 and 15 are disposed so as to face each other across the opening part 13 of the bell mouth 12 and in order to increase the heat exchange efficiency, when each heat exchanger 15 is brought closer to the opening part 13, the gap between the heat exchanger 15, particularly the curved part 15c, and the opening part 13 becomes small. In contrast, since one end part 30a of the motor support member 30A is arranged between the end parts 15e and 15f of the pair of two heat exchangers 15, it is not necessary to arrange the one end 30a of the motor support member 30A in the gap between the curved part 15c of the heat exchanger 15 and the opening part 13. Accordingly, the gap between the opening part 13 of the bell mouth 12 and the curved part 15c of the heat exchanger 15 can be narrowed to

arrange the motor support member 30A. As a result, the heat exchange efficiency in the heat exchanger 15 can be increased.

[0044] Further, by directly joining the motor support member 30A to the bell mouth 12, the position accuracy of the motor support member 30A and the bell mouth 12 can be improved. As a result, the gap between the fan 20 driven by the motor 21 supported by the motor support member 30A and the bell mouth 12 can be narrowed. Therefore, air can flow efficiently by the fan 20 and heat exchange efficiency in the heat exchanger 15 can be increased.

[0045] Further, by integrally forming the motor base member 33 with the motor support member 30A, compared to a case where the motor base member 33 is a separate component from the motor support member 30A, the man hour of assembly can be reduced.

First Modified Example of Embodiment

[0046] Note that in the embodiment described above, the motor base member 33 is integrally formed with the motor support member 30A, but the present disclosure is not limited to this. For example, as illustrated in FIG. 6, the motor support member 30B may be configured to include a pair of two pipe members 38 and 38 that straddles the opening part 13, and the plate-shaped motor base member 39 may be welded to these pipe members 38 and 38. Note that in FIG. 6, the motor support member 30B on the right side is different from the motor support member 30B on the left side, and state that the motor 21 is not mounted is illustrated.

Second Modified Example of Embodiment

[0047] Further, as illustrated in FIG. 7, a reinforcing member 40A that reinforces the base plate 11 may be provided on the outer peripheral side of the bell mouth 12. Note that, in FIG. 7, the motor 21 mounted on the motor support member 30A is omitted.

[0048] As described in the above embodiment, when a plurality of sets of the bell mouth 12, the fan 20, the motor 21, and the motor support member 30A are disposed in the same base plate 11, the strength of the base plate 11 is reduced particularly between the opening parts 13 and 13 of the adjacent bell mouths 12 and 12. As a result, the base plate 11 sometimes resonates when the fan 20 rotates.

[0049] Therefore, the reinforcing member 40A is arranged between the bell mouths 12 and 12 adjacent to each other.

[0050] The reinforcing member 40A integrally includes a main part 41 that extends in the direction of the short side 11a of the base plate 11, an extension part 42 extending on one side in the direction of the long side 11b at one end part of the main part 41, and an extension part 43 extending on the other side in the direction of the long side at the other end part of the main part 41. The

reinforcing member 40A is formed in a rib-like shape that rises inside the housing 10 orthogonal to the base plate 11. The main part 41 and the extension part 42 and 43 of the reinforcing member 40A are fixed to the base plate 11.

[0051] According to such a configuration, by reinforcing the base plate 11 by the reinforcing member 40A, the base plate 11 can be suppressed from resonating at the time of rotation of the fan 20.

[0052] Since the strength is reduced, in particular, between the opening parts 13 and 13 of the adjacent bell mouths 12 and 12, by arranging the reinforcing member 40A between the bell mouths 12 and 12 adjacent to each other, the base plate 11 in this part can be efficiently reinforced. Therefore, the base plate 11 can be effectively suppressed from resonating at the time of rotation of the fan 20.

Third Modified Example of Embodiment

[0053] In the embodiment described above, although a plurality of sets of the bell mouth 12, the fan 20, the motor 21, and the motor support members 30A and 30B are disposed in the same base plate 11, however, as illustrated in FIG. 8, the bell mouth 12, the fan 20, the motor 21, and the motor support member 30A may be provided in a single set.

[0054] In this case, the heat exchanger 15 is disposed in a pair of two so as to face each other across the opening part 13 of the bell mouth 12. Each heat exchanger 15 is substantially L-shaped and includes a first straight line part 15g that extends along one side 11g of the base plate 11, a second straight line part 15h that extends along another side 11h orthogonal to the one side 11g of the base plate 11, and a curved part 15c formed between the first straight line part 15g and the second straight line part 15h and that extends along the outer perimeter part of the opening part 13 of one of the bell mouth 12. Then, one end part 30a and the other end part 30b of the motor support member 30A are arranged between the end parts 15e and 15f of the pair of two heat exchangers 15 and 15.

[0055] As a result, similar to the embodiment described above, the gap between the opening part 13 of the bell mouth 12 and the curved part 15c of the heat exchanger 15 can be narrowed. As a result, the heat exchange efficiency in the heat exchanger 15 can be increased.

[0056] In addition, in the configuration illustrated in FIG. 8, when the reinforcing member 40B is disposed, an L-shaped reinforcing member 40B may be disposed in the vicinity of the part where the end parts 15e and 15f of the heat exchangers 15 and 15 face each other.

Reference Signs List

[0057]

1 Outdoor Unit

10 Housing
 11 Base Plate
 12 Bell Mouth
 13 Opening Part
 15 Heat Exchanger
 15c Curved Part
 15e, 15f End Part
 20 Fan
 21 Motor
 30A, 30B Motor Support Member
 30a One End Part
 30b Other End Part
 33, 39 Motor Base Member
 40A, 40B Reinforcing Member

ber is arranged between the bell mouths adjacent to each other.

6. An outdoor unit of an air conditioning system, comprising:

a cylindrical bell mouth disposed to a base plate that constitutes part of a housing; a fan disposed inside the bell mouth;
 a motor that is installed in a central part of the fan and rotatably drives the fan; and
 a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor, wherein
 the motor support member is directly joined to the bell mouth.

Claims

1. An outdoor unit of an air conditioning system, comprising:

a cylindrical bell mouth disposed to a base plate that constitutes part of a housing;
 a fan disposed inside the bell mouth;
 a motor that is installed in a central part of the fan and rotatably drives the fan;
 a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor; and
 heat exchangers disposed in a pair of two so as to face each other across the opening part of the bell mouth, wherein
 at least one end part of the motor support member is arranged between end parts of the pair of two heat exchangers.

7. An outdoor unit of an air conditioning system, comprising:

a cylindrical bell mouth disposed to a base plate that constitutes part of a housing; a fan disposed inside the bell mouth;
 a motor that is installed in a central part of the fan and rotatably drives the fan; a motor support member disposed so as to straddle an opening part of the bell mouth to support the motor; and
 a reinforcing member that is disposed on an outer peripheral side of the bell mouth and configured to reinforce the base plate, wherein
 a plurality of sets of the bell mouths, the fans, the motors, and the motor support members are disposed in the same base plate, the reinforcing member is arranged between the bell mouths adjacent to each other.

2. The outdoor unit of the air conditioning system according to claim 1, wherein
 the motor support member is directly joined to the bell mouth.

3. The outdoor unit of the air conditioning system according to claim 1 or 2, wherein
 the motor support member is integrally formed with a motor base member that fixes the motor.

4. The outdoor unit of the air conditioning system according to any one of claims 1 to 3, further comprising:
 a reinforcing member that is disposed on an outer peripheral side of the bell mouth and configured to reinforce the base plate.

5. The outdoor unit of the air conditioning system according to claim 4, wherein
 a plurality of sets of the bell mouths, the fans, the motors, and the motor support members are disposed in the same base plate, the reinforcing mem-

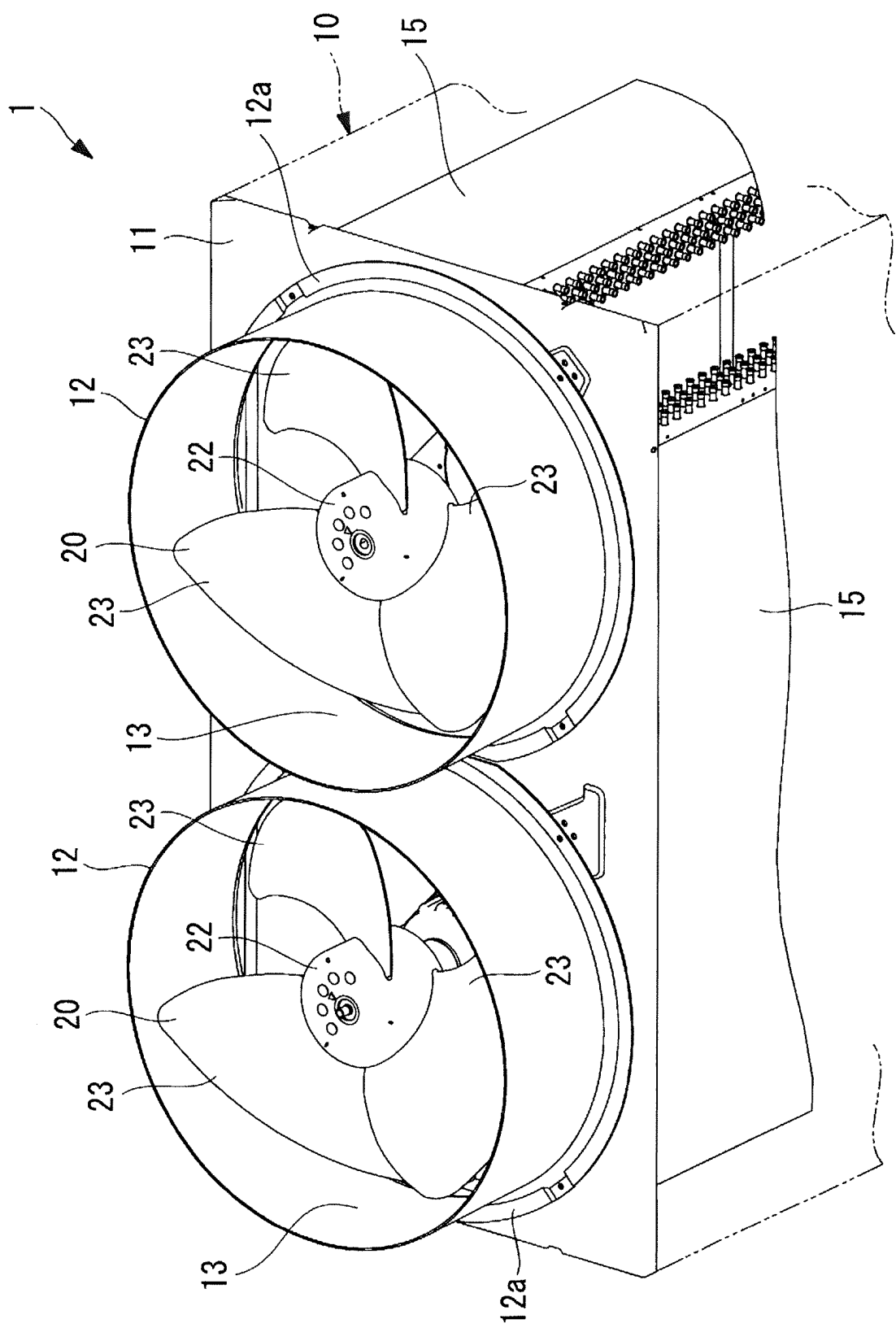


FIG. 1

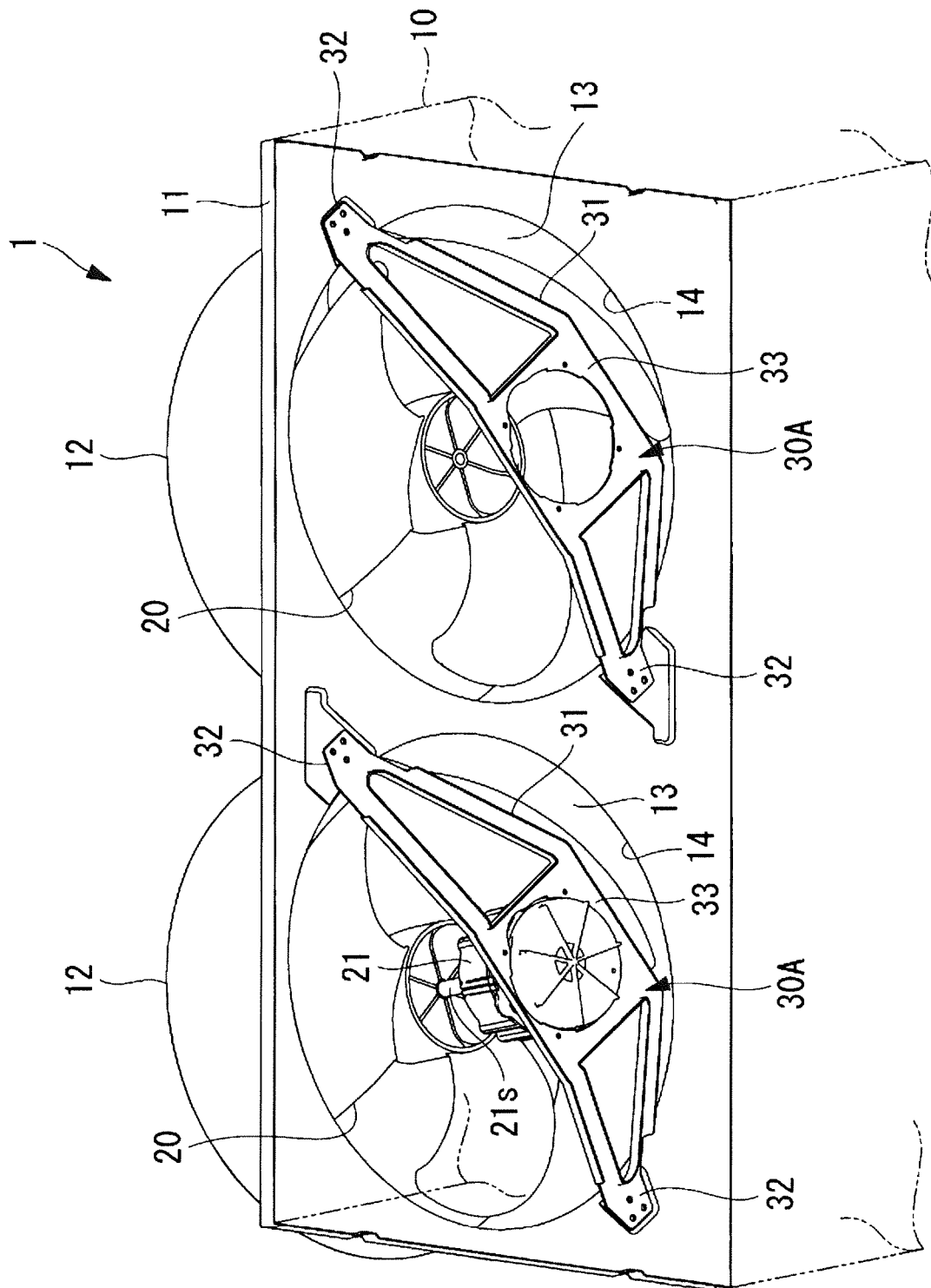
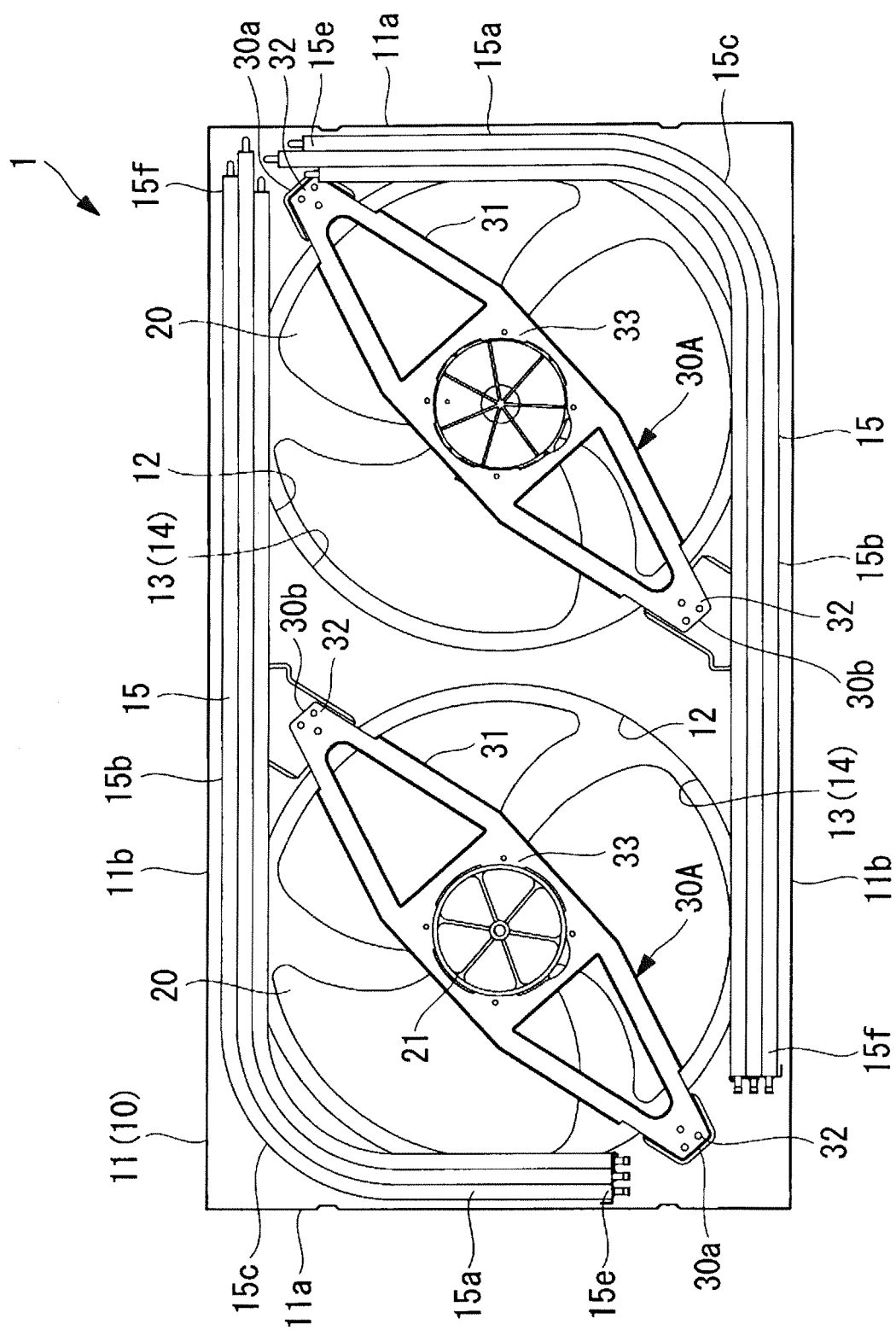


FIG. 2



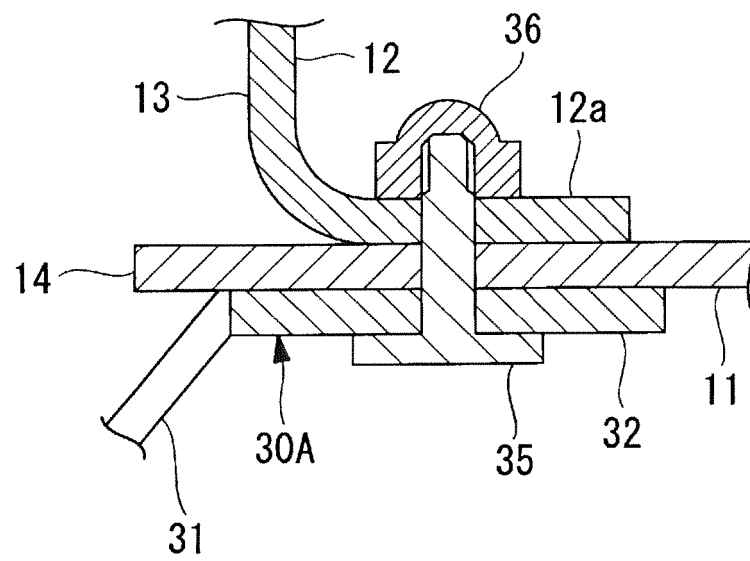


FIG. 4

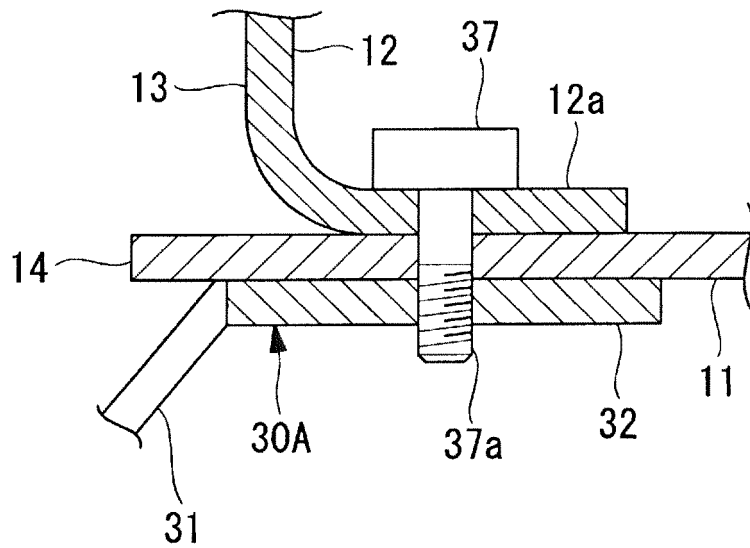
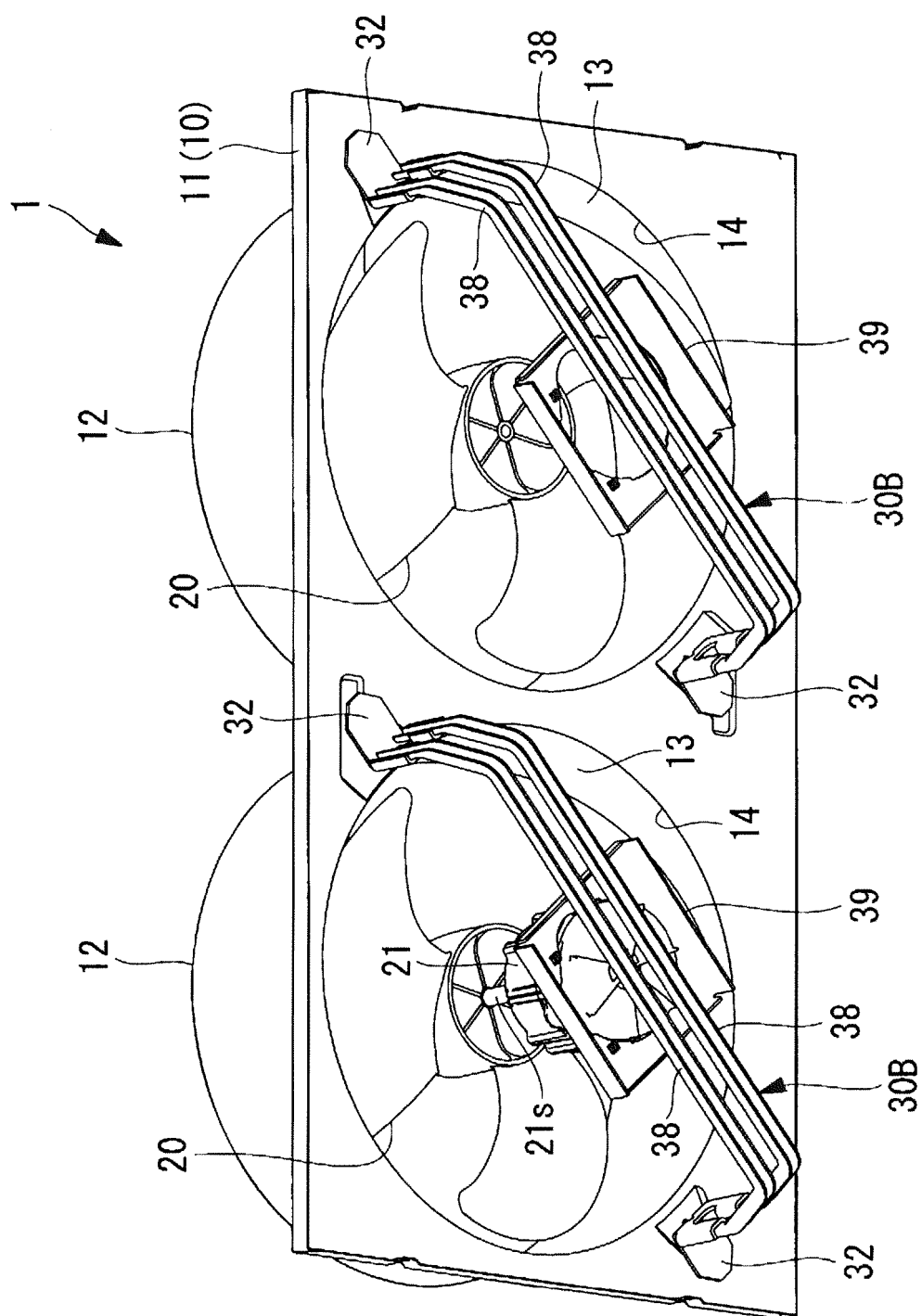


FIG. 5



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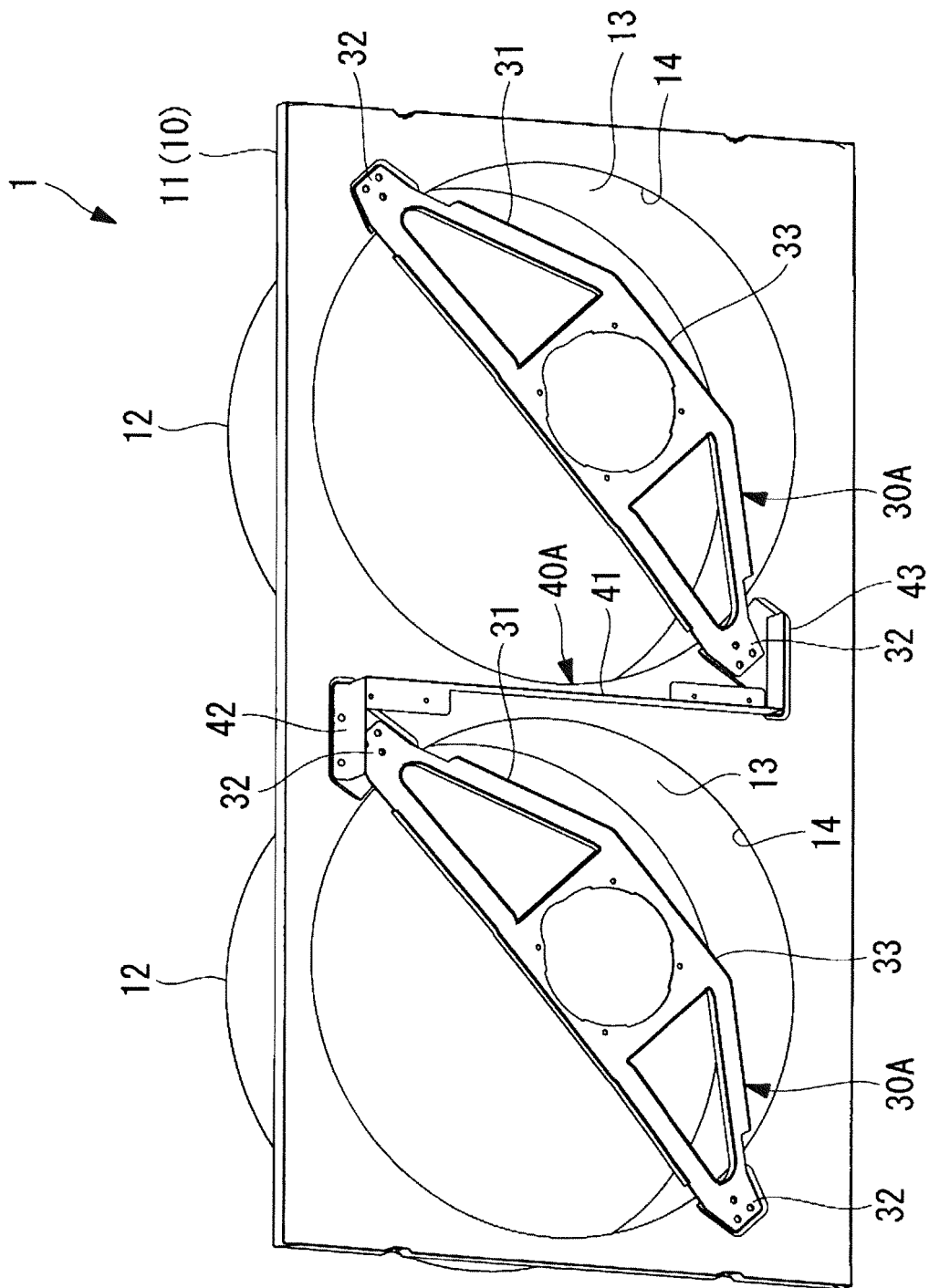


FIG. 7

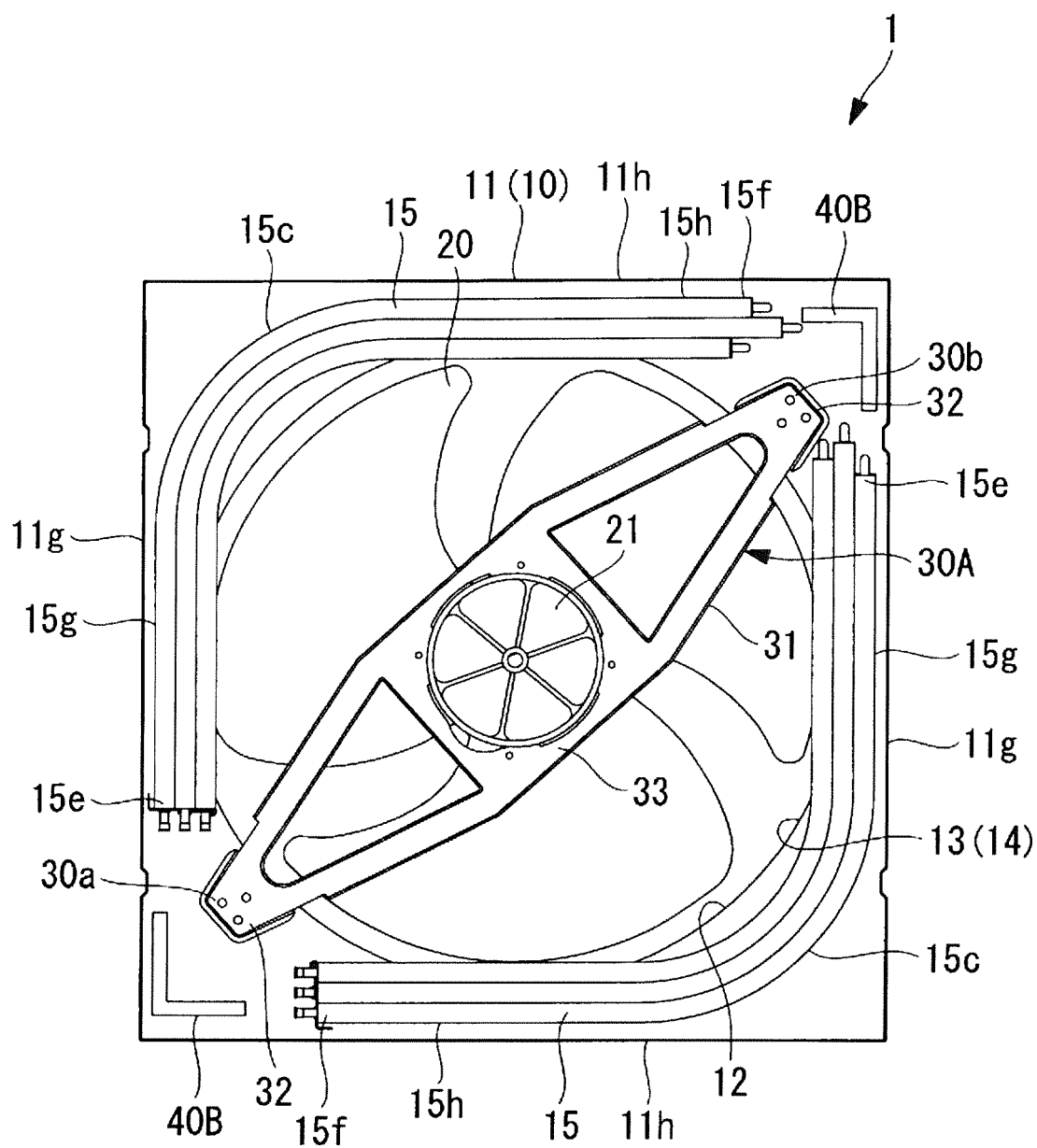


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/014520

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F24F1/46(2011.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. F24F1/46

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

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	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 8862/1989 (Laid-open No. 100137/1990) (MITSUBISHI ELECTRIC CORP.) 09 August 1990, page 1, line 19 to page 3, line 15, fig. 2 (Family: none)	1
Y		2-7
Y	JP 2013-2643 A (MITSUBISHI ELECTRIC CORP.) 07 January 2013, paragraphs [0010]-[0015], fig. 1-4 & EP 2535660 A2, paragraphs [0027]-[0038] & CN 102829515 A	2-6
Y	JP 5-157289 A (MITSUBISHI ELECTRIC CORP.) 22 June 1993, paragraphs [0007]-[0009], fig. 1-4 (Family: none)	4-5, 7

☐ 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
22 June 2018 (22.06.2018)Date of mailing of the international search report
03 July 2018 (03.07.2018)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- JP 54159349 A [0004]