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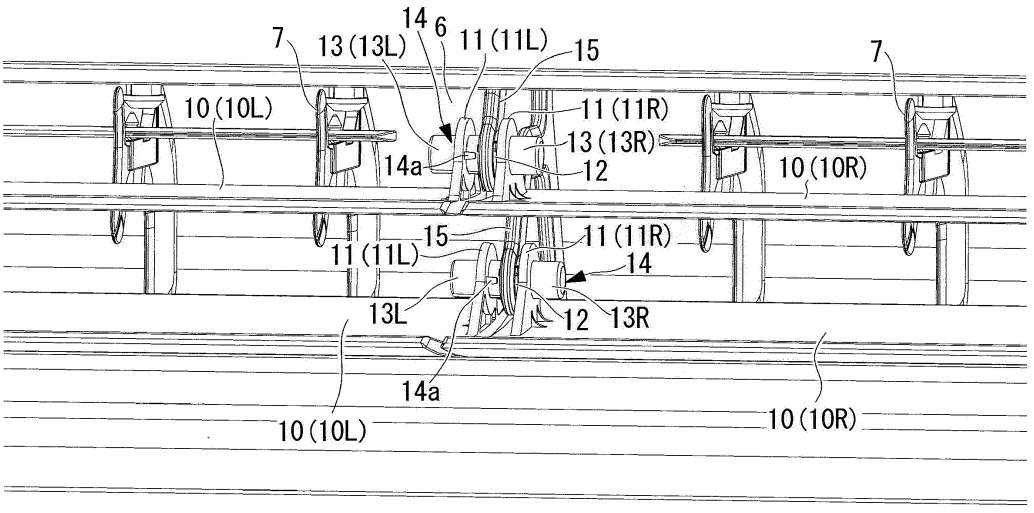
## (54) Air conditioning unit

(57) An air conditioning unit includes a horizontal flap (10) ; a shaft formation member (14) including shaft portions (13) on both sides; a first shaft support portion (11L) that rotatably supports the horizontal flap (10); a second shaft support portion (11R) that rotatably supports the horizontal flap (10); and a support member (15) that is provided with a support shaft hole. One of the shaft portions (13) is inserted into the support shaft hole and supported at the appropriate location on the case between the first shaft portion (11L) and the flange portion (12), and the horizontal flap (10) is rotatably supported by inserting each of the shaft portions (13) into the first rotation shaft hole and the second rotation shaft hole respectively.

FIG. 1

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## Description

### Background of the Invention

#### Technical Field

**[0001]** The present invention relates to an air conditioning unit that carries out air conditioning of a room, and in particular, relates to an air conditioner that is provided with horizontal flaps.

#### Description of the Related Art

**[0002]** Conventionally, the air blowing opening for temperature-adjusted air provided on an air conditioning unit (the indoor unit) is provided with horizontal flap that changes the vertical direction of the temperature-adjusted air that is blown into the room. In order to carry out air direction adjustment of the vertical blowing direction, the horizontal flap rotates centered on a horizontal axis using a motor as a drive source.
As disclosed, for example, in Japanese Unexamined Patent Application, Publication No. 2007-132578, such horizontal flap is separated into a plurality of parts in a horizontal direction.

**[0003]** The conventional example shown in FIG. 4A and FIG. 4B is a shaft portion structure of the end portion side on a horizontal flap 20, which is separated into a plurality of parts in the horizontal direction, at which a motor is not provided.
A shaft formation portion 21, which is substantially semicircular plate-shaped, that projects substantially vertically from the back surface of the horizontal flap 20 (the surface inside the air conditioning unit) is provided in proximity to both end portions of the horizontal flap20. A shaft portion 22 that projects horizontally outward is provided on the shaft formation portion 21. In this context, the term "horizontally outward" means a direction away from the direction toward the center of the horizontal flap 20, and toward both the direction of the horizontal flap 20 adjacent in a horizontal direction and the case support portion side of the air conditioning unit.

**[0004]** The shaft portion 22 described above is supported so as to be rotatable by the drive power of a motor (not illustrated) that is mounted at an end portion of the casing side by being inserted into a through hole 24a of a support member 24 via a collar 23. The support member 24 is a projecting stationary member that links to the case side of the air conditioning unit.

**[0005]** In a shaft portion structure configured in this manner, the collar 23, which is a resin component having a lubricating property, is interposed in the portion serving as a sliding portion during the rotation of the horizontal flap 20. In this case, generally, an ABS resin is used in the horizontal flap 20, in which the shaft formation portion 21 and the shaft portion 22 are integrated, and the support member 2 4, and a polyacetal (POM) resin is used in the collar 23.
Note that in such a conventional structure, dedicated structural components (the collar 23 and the support member 24) are necessary in the adjacent horizontal flap 20.

**[0006]** According to the shaft portion structure of the horizontal flap 20 described above, when the horizontal flap 20 is formed by being separated into the left and right portions, the collar 23 and the support member 24 must be provided in the same number as the separated horizontal flap 20, and thus, there is a problem in that the number of components increases. Furthermore, in the case in which the structural components of the shaft portion structure are shared, an extremely difficult fitting and adjustment is required in which tapered forms are fit in two stages, such as fitting the shaft portion 22 and the collar 23 and then fitting the collar 23 and the through hole 24a.

**[0007]** Furthermore, because the shaft portion structure having many components attached narrows the flow path of the air blowing opening, this causes an increase in the air path resistance.

### Summary of the Invention

**[0008]** In consideration of the above circumstances, it is an object of the present invention to provide, in an air conditioning unit that is provided with a horizontal flap that include a plurality of parts in a horizontal direction, a shaft portion structure for the horizontal flap that can simplify the structure of the air blowing opening by decreasing the number of components.

**[0009]** The present invention uses the following devices to solve the above problems.
The air conditioning unit according to the present invention includes a horizontal flap, which includes a plurality of parts in a horizontal direction, that is arranged in an air blowing opening for temperature-adjusted air and that changes the blowing direction of the temperature-adjusted air vertically; a shaft formation member , which is made of a self-lubricating resin, including shaft portions on both sides in an axial direction with a flange portion interposed therebetween; a first shaft support portion that rotatably supports the horizontal flap and that projects vertically from a position in proximity to the back surface end portion of one of the parts (10L, 10R) of the horizontal flap, and that is provided with a first rotation shaft hole in the horizontal direction; a second shaft support portion that rotatably supports the horizontal flap and that projects vertically from a position in proximity to the back surface end portions of the other of the parts of the horizontal flap, and that is provided with a second rotation shaft hole in the horizontal direction; and a support member that extends to link to an appropriate location on a case and that is provided with a support shaft hole. One of the shaft portions is inserted into the support shaft hole and supported at the appropriate location on the case between the first shaft support portion and the flange portion, and the horizontal flap is rotatably supported by

inserting each of the shaft portions into the first rotation shaft hole and the second rotation shaft hole respectively.

**[0010]** Such an air conditioning unit provides a shaft formationmember, which is made of a self-lubricating resin, including shaft portions on both sides in an axial direction with a flange portion interposed therebetween; a first shaft support portion that rotatably supports the horizontal flap and that projects vertically from a position in proximity to the back surface end portions of one of the parts of the horizontal flap, and that is provided with a first rotation shaft hole in the horizontal direction; a second shaft support portion that rotatably supports the horizontal flap and that projects vertically from a position in proximity to the back surface end portions of the other of the parts of the horizontal flap, and that is provided with a second rotation shaft hole in the horizontal direction; and a support member that extends to link at a suitable location on the case and is provided with a support shaft hole. One of the shaft portions is inserted into the support shaft hole and supported at the appropriate location on the case between the first shaft support portion and the flange portion, and the horizontal flap is rotatably supported by inserting each of the shaft portions into the first rotation shaft hole and the second rotation shaft hole respectively. Thus, the separated horizontal flap can be rotationally supported by one shaft formation member.

**[0011]** That is, in the horizontal flap that includes a plurality of parts in the horizontal direction, the parts included in the horizontal flap share one shaft portion, and at the same time, a collar is unnecessary because the shaft portion itself is a resin having a high self-lubricating property. Thus, the structure of the air blowing opening can be simplified due to the reduction in the number of components.

The shaft formation member in this case is preferably provided with an elastically deformable locking catch that projects from the shaft portion surface in order to prevent misalignment in an axial direction after passing through the stationary shaft hole during insertion.

Brief Description of the Drawings

**[0012]**

FIG. 1 is an enlarged perspective view of the primary components according to an embodiment of the air conditioning unit of the present invention showing the shaft portion peripheral structure of the horizontal flap.

FIG. 2 is an exploded perspective view that shows the shaft portion structure of the horizontal flap.

FIG. 3 is a perspective view of the external appearance showing the air conditioner unit (the indoor unit).

FIG. 4 is a drawing that shows an example of a conventional structure of a shaft portion structure for horizontal flaps, where (a) is an exploded perspective new and (b) is a cross-sectional view of the assembled state.

Detailed Description of the Preferred Embodiments

**[0013]** An embodiment of an air conditioning unit according to the present invention will be explained below with reference to the drawings.

FIG. 3 is a perspective view illustrating a wall-suspended air conditioner unit 1 as the air conditioning unit (indoor unit) according to one embodiment of the present invention.

The air conditioning unit 1 is provided with a base main body 2, a front cover 3 that is installed on the base main body 2 such that the front portion of the base main body 2 is covered at the top and bottom, the left and right, and the front surface of the base main body 2, and lateral rectangular case 5 that is formed from front panel 4 that is installed on the front surface of the front cover 3.

**[0014]** The entire front surface and top surface of the front cover 3 that forms the case 5 are a lattice frame (not illustrated). The lattice frame forms the air intake opening that takes in the indoor air that is to be air-conditioned and is formed so as to also serve as a filter guide. On the upper surface of the front cover 3, an intake grille (not illustrated) is arranged, and at the front section of the lower surface, an air blowing opening 6 for blowing temperature-adjusted air into a room opens over substantially the entire width.

**[0015]** A plurality of louvers 7 that change the horizontal direction of the air and two horizontal flaps 10, an upper flap and a lower flap separated into left and right portions, that change the vertical direction of the air and can close the air blowing opening 6 for the temperature-adjusted air are provided in this air blowing opening 6. These louvers 7 and horizontal flaps 10 use a motor (not illustrated) as a power source and are formed so as to rotate independently.

Note that although there are two illustrated horizontal flaps 2, an upper flap and a lower flap, separated into left and right parts (for a total of four parts), the horizontal flaps 10 may be separated into three parts.

**[0016]** As described above, a shaft portion structure that rotatably supports the horizontal flaps 10 is configured as shown in FIG. 1 and FIG. 2 in an air conditioning unit 1 provided with horizontal flaps 10, separated into a plurality of parts in the horizontal direction, that are arranged in the air blowing opening 6 for temperature-adjusted air and that change the blowing direction in a vertical direction.

**[0017]** The shaft portion structure of the horizontal flap 10 is equipped with shaft support portions 11 that project on the back surface of the horizontal flap 10, a shaft formation member 14 that includes shaft portions 13 at the ends in an axial direction with a flange portion 12 interposed therebetween, and a support member 15 that extends to link to an appropriate location on the case 5.

The shaft portion structure in this case is not a linking portion with drive motors (not illustrated) that are ar-

ranged in the vicinity of the left and right end portions of the case 5, but relates to the end portion sides at which separated the horizontal flap 10, which is separated into a plurality along the horizontal direction, are adjacent. In the following explanation, with respect to adjacent left and right pairs of horizontal flap 10, shaft support portions 11, and shaft portions 13, the left side is distinguished as the horizontal flap 10L, the shaft support portion 11L, and the shaft portion 13L, and the right side is distinguished as the horizontal flap 10R, the shaft support portion 11R and the shaft portion 13R.

**[0018]** The shaft support portion 11 is a substantially semi-circular plate-shaped member that projects in a perpendicular direction from a position in proximity to the end portion on the back surface of each of the flaps 10. This shaft support portion 11 is a resin molded component (for example, made of an ABS resin or the like) that is integrally formed with the flap 10, and a rotation shaft hole 11a that passes through in a horizontal direction is provided in order to insert and fit the shaft portion 13 of the shaft formation member 14.

The horizontal direction in this case is the direction in which the horizontal flap 10 extends, and the direction that is perpendicular to this extended direction is the vertical direction.

**[0019]** The shaft formation member 14 is an integrally molded component made of a self-lubricating resin such as polyacetal (POM) and the like. Thus, the shaft portions 13 inserted into the rotation shaft holes 11a can slide smoothly with respect to a resin sliding surface made of a different type of resin due to being self-lubricating.

The flange portion 12 of the shaft formation member 14 is a member that separates the shaft portions 13 into left shaft portion 13L and right shaft portion 13R so as to conform to the shaft support portions 11L and 11R of the horizontal flaps 10L and 10R, which are separated into left and right portions, and serves as a partition for preventing mutual movement therebetween.

**[0020]** In the illustrated configuration example, a locking catch 14a is provided on the front surface of the shaft portion 13L on the left side of the shaft formation member 14. This locking catch 14a is a portion that prevents misalignment of the support member 15 in the axial direction after the shaft portion 13L has passed through the stationary shaft hole 15a during the insertion, and can flexibly deform from a state projecting from the surface of the shaft portion 13L toward the inside, in the direction of the shaft center.

Note that reference numeral 14b in the figure is a notched portion in the flange portion 12, and is necessary for integrally forming the locking catch 14a, and thus, is not required by the production method for the shaft formation member 14.

**[0021]** The shaft support member 15 is an arm-shaped resin molded member (for example, made of an ABS resin or the like) that extends to link to a suitable location on the case 5, and in proximity to the distal end portion thereof, a support shaft hole 15a that passes through in a horizontal direction is provided. The shaft portion 13L of the above-described shaft formation member 14 is inserted and fit into this support shaft hole 15a.

While inserting the shaft portion 13L, first, when the locking catch 14a elastically deforms and the shaft portion 13L passes through the support shaft hole 15a, the locking catch 14a is restored and protrudes from the shaft surface. As a result, misalignment of the support member 15 in the axial direction is prevented by engagement with the protruding locking catch 14a, and it is held at a predetermined insertion position.

**[0022]** In addition, in the shaft portion structure that rotatably supports the horizontal flap 10, by inserting the shaft portion 13L into the stationary shaft hole 15a, the gap of the shaft portion forming member 14 between the shaft support portion 11L and the flange portion 12 is maintained at an appropriate location on the case 5 by the support member 15.

Note that in the illustrated configuration example, the shaft portion 13L is inserted into the stationary shaft hole 15a, but the gap of the shaft formation member 14 between the shaft support portion 11R and the flange portion 12 may be maintained on the case 5 by inserting the shaft portion 13R.

**[0023]** In addition, in the adjacent portion of the horizontal flaps 10L and 10R into which the horizontal flaps 10 is separated in a horizontal direction, by inserting respective shaft portions 13L and 13R into the rotation shaft hole 11a of the shaft support portions 11L and 11R that face each other, the horizontal flaps 10L and 10R are supported so as to be rotatable.

In this case, the assembly sequence for the horizontal flaps 10, the shaft formation member 14, and the support member 15 is not particularly limited.

**[0024]** The air conditioning unit 1 configured in this manner can rotatably support two adjacent horizontal flaps 10L and 10R by using one shaft formation member 14.

That is, adjacent horizontal flaps 10L and 10R, into which the horizontal flap 10 is separated in a horizontal direction, share one shaft formation member 14, and the shaft portions 13L and 13R of the shaft formation member 14 are used as rotation shafts.

**[0025]** Furthermore, because the shaft portion 13 is formed by a resin having a high self-lubricating property, a sliding surface is formed by a resin material that is different from the resin of the rotating shaft hole 11a and the stationary shaft hole 15a. Thus, , specifically providing and interposing the collar 23 made of a different resinmaterial, as is the case in the conventional structure shown in FIG. 4, becomes unnecessary, and the structure of the air blowing opening 6 can be simplified by reducing the number of components.

Excluding the horizontal flaps 10L and 10R, in the case of the conventional structure shown in FIG. 4, the specific number of components is a total of 4 because two sets of collars 23 and support members 24 are necessary. Therefore, the number of components in the present em-

bodiment, which requires two components, that is, the shaft formation member 14 and the support member 15, is reduced by half.

**[0026]** That is, in the air conditioning unit 1 of the present embodiment, the shaft formation structure that rotatably supports the horizontal flaps 10L and 10R is formed by using a shaft formation member 14 in which the shaft portions 13L and 13R for the horizontal flaps 10L and 10R have a high self-lubricating property, and this shaft formation member 14 is used as a shared component by left and right adjacent horizontal flaps 10L and 10R. Therefore, the number of components can be reduced by eliminating the collar 23. By reducing the number of such components, the structure of the air blowing opening 6 can be simplified.

In addition, the shaft portion structure of the horizontal flaps 10, in which the structure of the air blowing opening 6 can be simplified, can reduce the blow resistance by increasing the flow path area of the air blowing opening 6. Such a reduction of the blow resistance is effective in reducing the power consumption and reducing the operating noise of the air feeding fan.

**[0027]** In addition, the insertion relationship of the shaft portions 13L and 13R simply involves inserting the shaft portions 13L and 13R into the rotation shaft hole 11a, and thus, the fitting and adjustment between components are simple in comparison to the conventional fitting and adjustment, which has two stages.

Note that the present invention is not limited by the above embodiments, and modifications and changes within a range that does not depart from the spirit of the invention can be made.

## Claims

**1.** An air conditioning unit, comprising
a horizontal flap (10), which includes a plurality of parts (10L,10R) in a horizontal direction, that is arranged in an air blowing opening (6) for temperature-adjusted air and that changes the blowing direction of the temperature-adjusted air vertically;
a shaft formation member (14), which is made of a self-lubricating resin, including shaft portions (13L, 13R) on both sides in an axial direction with a flange portion (12) interposed therebetween;
a first shaft support portion (11L) that rotatably supports the horizontal flap (10) and that projects vertically from a position in proximity to the back surface end portions of one of the parts (10L,10R) of the horizontal flap (10), and that is provided with a first rotation shaft hole (11a) in the horizontal direction;
a second shaft support portion (11R) that rotatably supports the horizontal flap (10) and that projects vertically from a position in proximity to the back surface end portions of the other of the parts (10L, 10R) of the horizontal flap (10), and that is provided with a second rotation shaft hole (11a) in the horizontal direction; and
a support member (15) that extends to link to an appropriate location on a case and that is provided with a support shaft hole (15a);
wherein one of the shaft portions (13L,13R) is inserted into the support shaft hole (15a) and supported at the appropriate location on the case between the first shaft support portion (11L) and the flange portion (12), and the horizontal flap (10) is rotatably supported by inserting each of the shaft portions (13L, 13R) into the first rotation shaft hole (11a) and the second rotation shaft hole (11a) respectively.

**2.** The air conditioning unit according to claim 1, wherein a locking catch (14a) is provided on the shaft formation member (14), and misalignment of the support member (15) in an axial direction is prevented by the locking catch (14a).

FIG. 1

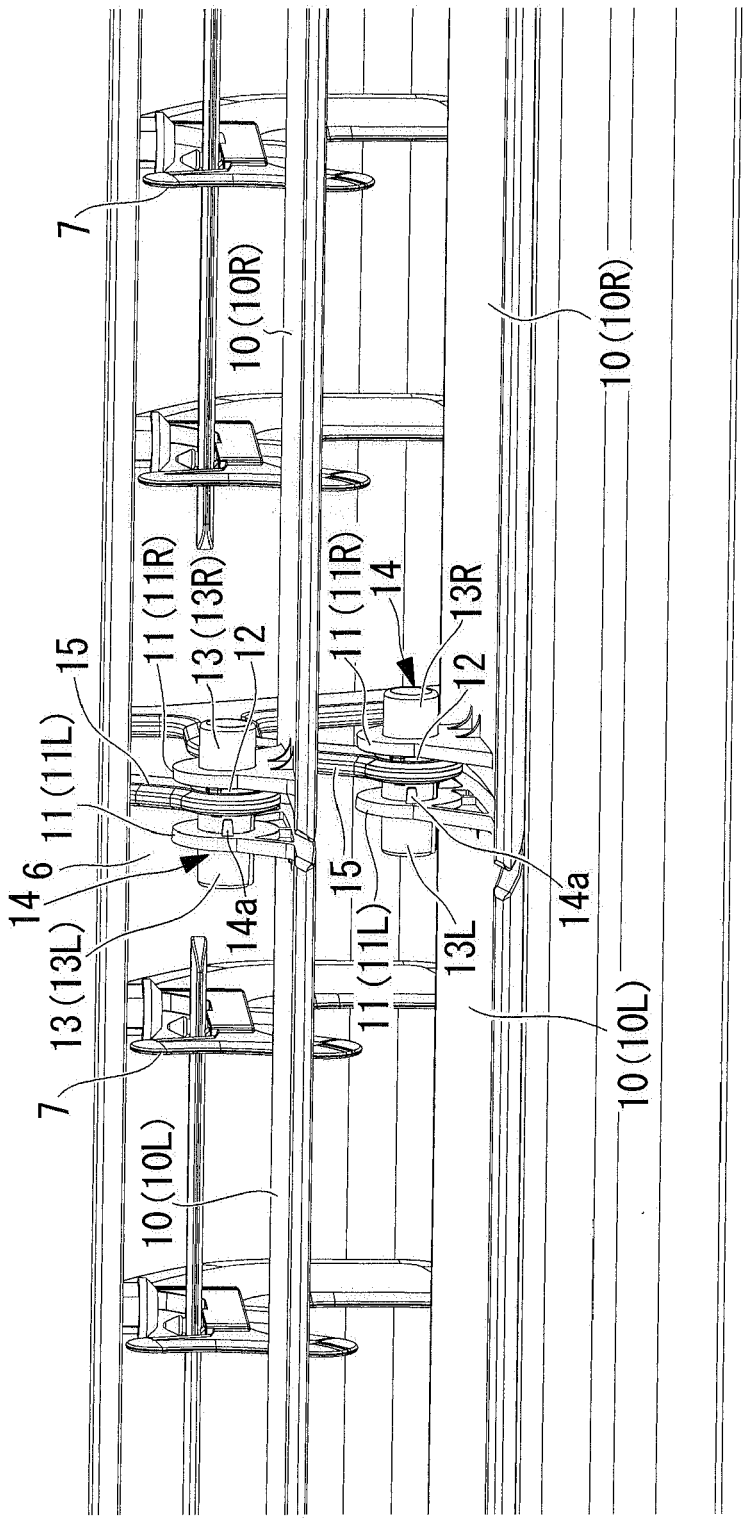

7
10(10R)
11(11R)
13(13R)
12
15
11(11L)
14
6
13(13L)
14a
7
10(10L)
11(11R)
14
13R
12
15
11(11L)
13L
14a
10(10R)
10(10L)

FIG. 2

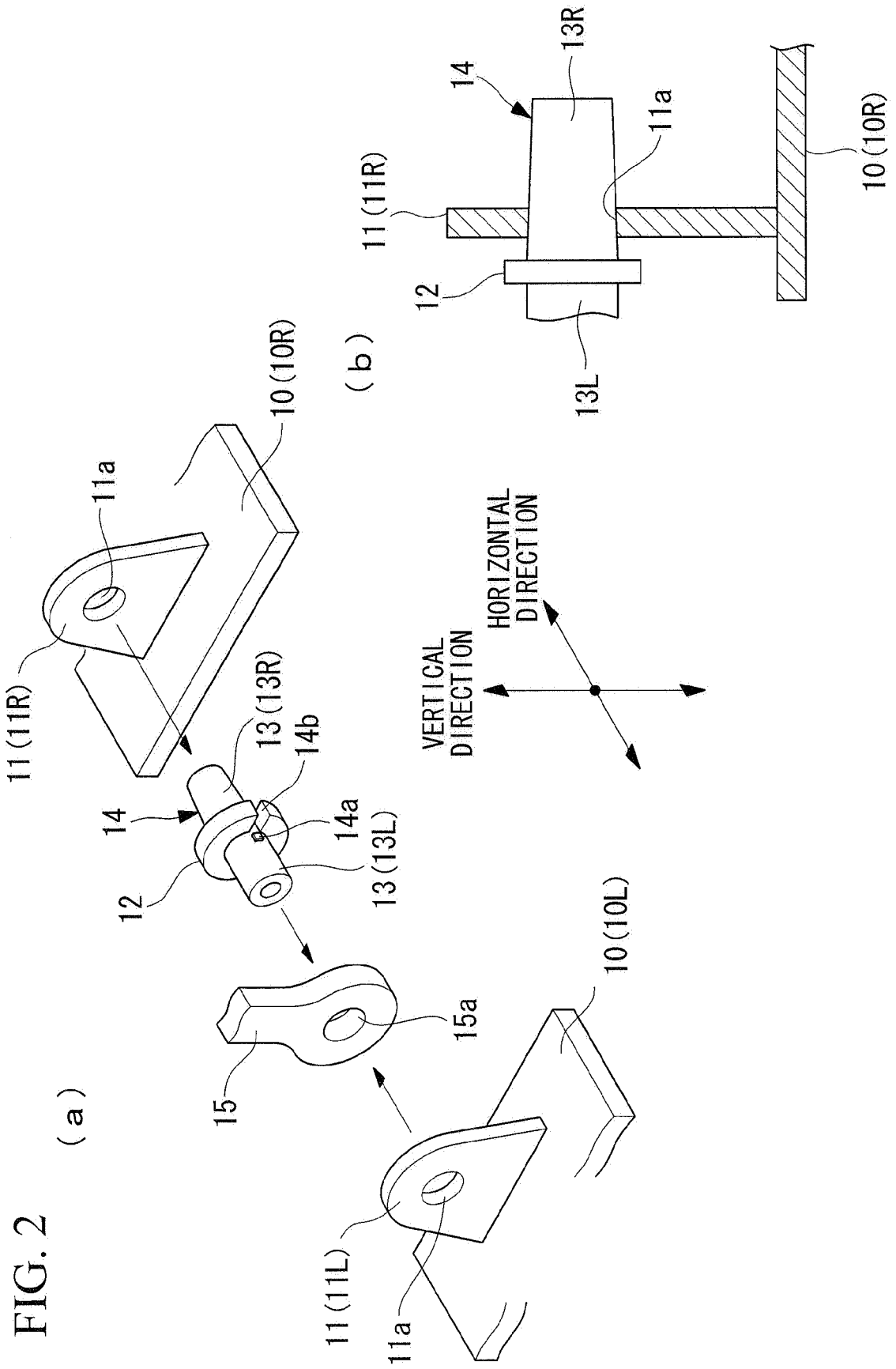

(a)
11 (11L)
11a
10 (10L)
15
15a
12
14
13 (13L)
14a
13 (13R)
14b
11 (11R)
11a
10 (10R)
VERTICAL DIRECTION
HORIZONTAL DIRECTION
(b)
11 (11R)
12
13L
14
13R
11a
10 (10R)

FIG. 3

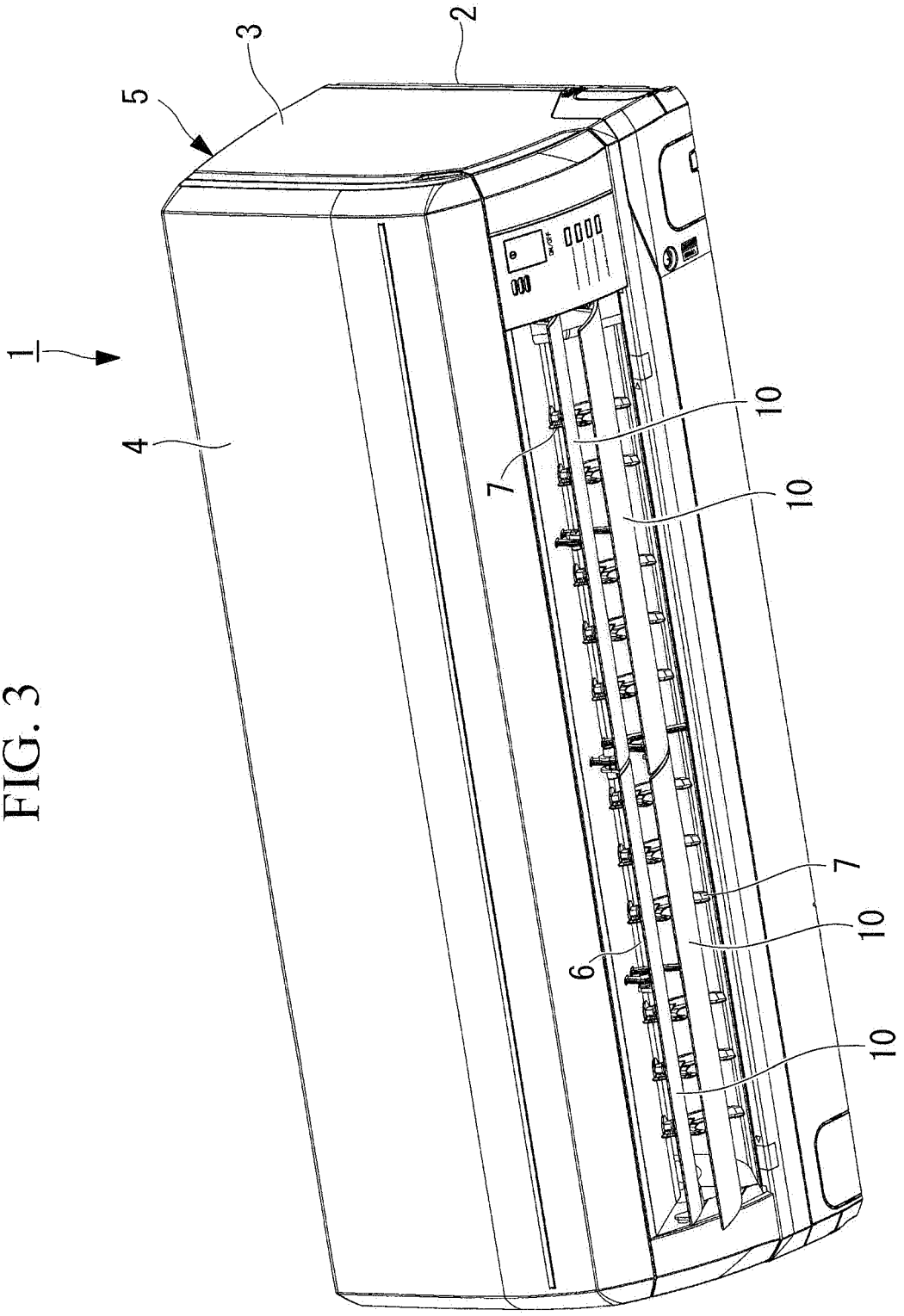
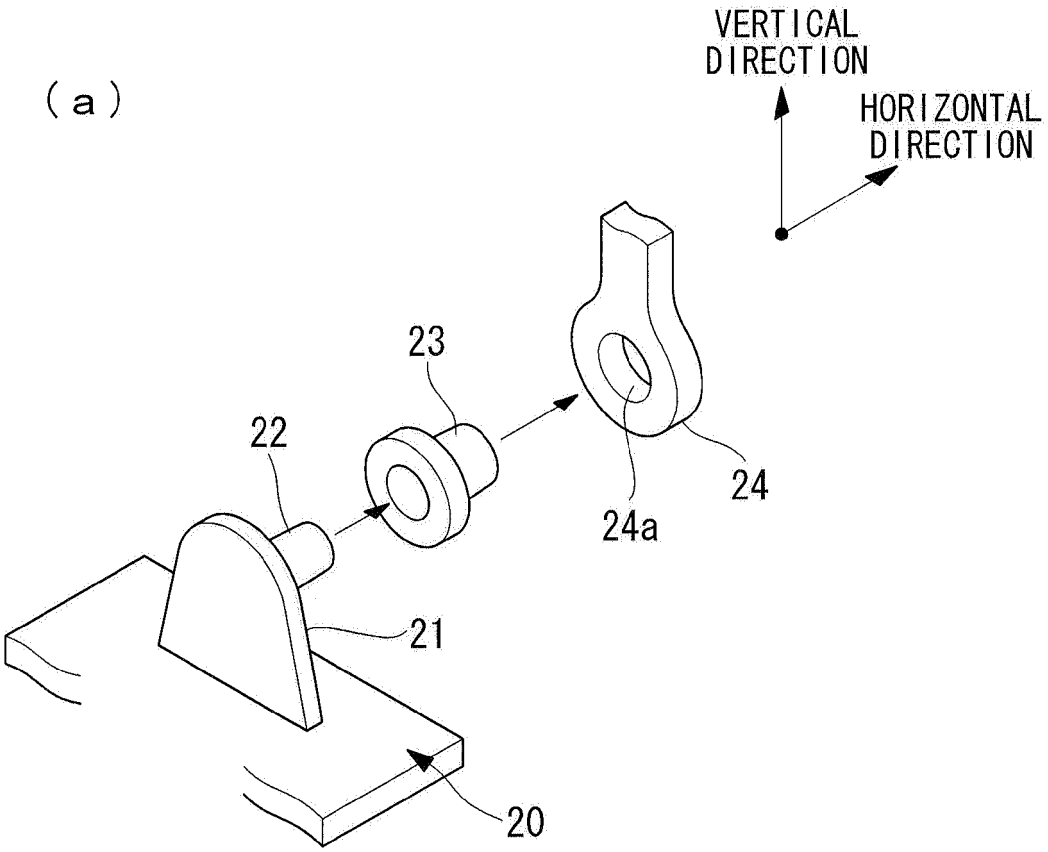


FIG. 4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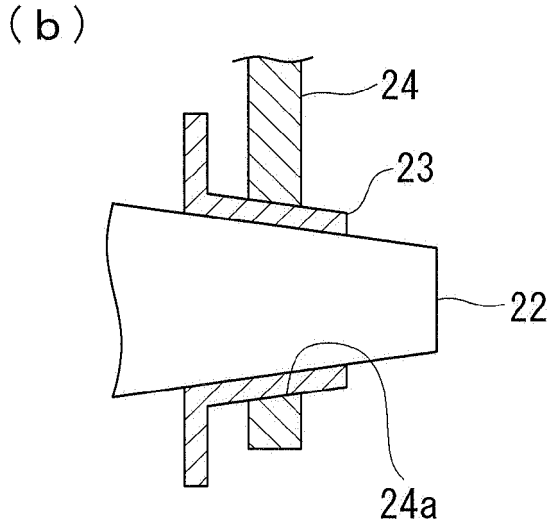
VERTICAL DIRECTION
HORIZONTAL DIRECTION
23
22
24
24a
21
20


(b)
24
23
22
24a

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- JP 2007132578 A **[0002]**