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(54) **Air conditioner**

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EP-A1- 1 950 501 JP-A- 11 118 176

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Description

BACKGROUND

1. Field

[0001] Embodiments of the present invention relate to an air conditioner including a front panel divided into rotatable first and second panels.

2. Description of the Related Art

[0002] Generally, an air conditioner is an apparatus to cool or warm an indoor space using a refrigerant cycle consisting of a compressor, condenser, expander and heat exchanger, to provide a user with a more pleasant indoor environment.

[0003] A conventional air conditioner includes a cabinet having an open front side, and a front panel coupled to the front side of the cabinet. The front panel is moved forward by a drive unit provided at a rear thereof, thus allowing heat-exchanged air to be discharged between the forwardly moved front panel and both sides of the cabinet.

[0004] However, in the air conditioner having the above-described configuration, discharging the heat-exchanged between the front panel and both sides of the cabinet has a limit to control an air stream to be discharged or a discharge direction of air.

[0005] JP 1000 111 8176 A relates to an air conditioner with front suction ports and blowing out ports that are provided at the bottom or the top of the air conditioner casing. A blower is installed inside the air conditioner and forces air to be directed towards air discharging plates. JP 1000 111 8176 A thereby provides an air conditioner according to the preamble of claim 1. Further, as only a relatively small portion of the air conditioner is used for discharging conditioned air, a lot of energy is necessary for air conditioning the room. Another disadvantage is that the air to be discharged from the air conditioner is directed towards people's heads or feet straight from the air conditioner into the room, which could decrease the comfort of people standing in front of the air conditioner, even making them sick.

[0006] It is the object of the present invention to provide an air conditioner, which is able to direct discharged air in a controllable manner and especially adapt the volume and direction of discharged air by using simple technical features.

[0007] This object can be solved with the technical features of claim 1. Improved embodiments can be achieved with the technical features of the dependent claims.

SUMMARY

[0008] Therefore, it is an aspect of the present invention to provide an air conditioner to easily control an air stream to be discharged or a discharge direction of air.

[0009] Additional aspects of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0010] In accordance with one aspect of the present invention, an air conditioner includes a cabinet, a front panel provided at a front side of the cabinet and divided into a first panel and a second panel, and rotating units to rotate the first panel and second panel respectively. A center panel is provided behind the first panel and second panel and is exposed via rotation of the first panel and second panel. The first panel and second panel may be rotated respectively about one side thereof close to each other, and air in the cabinet may be discharged from opposite sides of the first panel and second panel when the first panel and second panel are rotated by the rotating units.

[0011] The rotating units may respectively rotate the first panel and second panel simultaneously or individually.

[0012] The rotating units may respectively control rotating angles of the first panel and second panel, thus changing an air stream to be discharged.

[0013] The cabinet may include a body and a front cover coupled to the body, and the center panel may be provided in the center of the front cover.

[0014] Each of the rotating units may include a drive motor, and a rotating member having one end connected to the drive motor and the other end connected to the front panel.

[0015] Each of the rotating units may further include a case mounted to the front cover, and a cover to cover an upper side of the case, and the drive motor and rotating member may be received in the case.

[0016] Brackets may extend from rear surfaces of the first panel and second panel, and each of the brackets may have a protrusion connected to the rotating member.

[0017] The cover may have a guide region through which the protrusion penetrates the cover to thereby be connected to the rotating member.

[0018] The guide region may include a first guide region to guide lateral movement of the first panel or second panel, and a second guide region to guide rotation of the first panel or second panel, the first guide region and second guide region being connected to each other.

[0019] The rotating member may have a connecting hole for connection of the protrusion, and the protrusion may be moved in the connecting hole when being moved along the first guide region for lateral movement of the first panel or second panel.

[0020] In accordance with another aspect of the present invention, an air conditioner includes a cabinet, a front panel provided at a front side of the cabinet and including at two panels, and rotating units to rotate the panels respectively.

[0021] The front panel is divided into a first panel and a second panel, and a display panel may be provided behind the first panel and second panel and may be ex-

posed when the first panel and second panel are rotated by the respective rotating units.

[0022] The first panel and second panel may be rotated respectively about one side thereof close to each other, and air in the cabinet may be discharged from opposite sides of the first panel and second panel when the first panel and second panel are rotated by the rotating units.

[0023] The rotating units may respectively control rotating angles of the first panel and second panel, thus changing an air stream to be discharged.

[0024] Each of the rotating units may include a case, a drive motor installed in the case, a rotating member having one end connected to the drive motor and the other end connected to the front panel, and a cover to cover the case.

[0025] The first panel and second panel may be moved laterally by a predetermined distance so as not to interfere with the display panel when being rotated by the rotating units.

[0026] The cover may include a first guide region to guide lateral movement of the front panel, and a second guide region to guide rotation of the front panel, the first guide region and second guide region being connected to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] These and/or other aspects of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view illustrating an air conditioner according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view illustrating a partial configuration of the air conditioner shown in FIG. 1;

FIG. 3 is an exploded perspective view illustrating a coupling relationship of a rotating unit and a front panel shown in FIG. 2; and

FIGS. 4 to 7 are cross sectional views illustrating an operation of the air conditioner shown in FIG. 1.

DETAILED DESCRIPTION

[0028] Reference will now be made in detail to an air conditioner according to the embodiment of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0029] The air conditioner according to the embodiment of the present invention, as shown in FIGS. 1 and 2, includes a cabinet 10 defining an external appearance of the air conditioner, and a front panel 20 to cover an

entire front side of the cabinet 10.

[0030] The cabinet 10 includes a body 11, and a front cover 16 provided in front of the body 11. The body 11 is formed with an air suction hole (not shown) in a lower position of a side surface or rear surface thereof, through which indoor air is suctioned into the body 11.

[0031] A blower 30 is installed in a lower region of the body 11 and serves to blow the air suctioned into the cabinet 10 through the air suction hole. Also, a heat exchanger 40 is installed in an upper region of the body 11 and serves to heat exchange the air blown by the blower 30.

[0032] The blower 30 includes a fan 31, a drive motor (not shown) to apply rotating force to the fan 31, and a fan duct 33 in which the fan 31 is received. The blower 30, as shown, is arranged orthogonal to a front side of the body 11, to suction air from both sides of the body 11.

[0033] The fan 31 is a conventional centrifugal fan and as described above, serves to suction indoor air into the cabinet 10 and then, discharge the air having passed through the heat exchanger 40 to the outside. The drive motor is coupled to the fan 31 and provides the fan 31 with rotating force. The fan duct 33, as described above, receives the fan 31 therein and serves to guide the air blown by the fan 31 toward the heat exchanger 40.

[0034] The heat exchanger 40 takes the form of a flat panel to allow the air blown by the blower 30 to be heat exchanged while passing through the heat exchanger 40. The heat exchanger 40 is obliquely installed to divide an upper interior space of the body 11.

[0035] The front cover 16 is provided at a front upper part of the body 11 and has air discharge holes 17 to discharge the heat-exchanged air from the body 11. In addition, the front cover 16 is centrally provided with a display panel 18 that displays general operations of the air conditioner.

[0036] The front panel 20 is provided to cover the entire front side of the cabinet 10. As shown, the front panel 20 includes a first panel 21 and a second panel 22, which are provided individually at left and right sides in front of the front cover 16. The first and second panels 21 and 22 close the front side of the cabinet 10 when the operation of the air conditioner is halted, thus serving to hide the display panel 18 provided at the front cover 16.

[0037] The air conditioner according to the present embodiment includes rotating units 50 to rotate the first and second panels 21 and 22 individually or simultaneously by predetermined angles. The rotating units 50 rotate the first and second panels 21 and 22 respectively about portions of the first and second panels 21 and 22 close to each other, thus serving to define discharge regions 15, through which the heat-exchanged air in the cabinet 10 is discharged from outer sides of the first and second panels 21 and 22.

[0038] In this case, the rotating units 50 may change a direction of air discharged through the discharge regions 15 based on rotating angles of the first and second panels 21 and 22, thereby controlling an air stream to be

discharged. In addition, the rotating units 50 may rotate the first and second panels 21 and 22 by different angles, to control a direction of the air discharged through the discharge regions 15.

[0039] The rotating units 50 are provided respectively at both sides of the display panel 18 of the front cover 16. More specifically, each of the rotating units 50, as shown in FIG. 3, includes a case 51, a drive motor 53 received in the case 51, a rotating member 55 coupled to a shaft of the drive motor 53, and a cover 57 to cover an open upper side of the case 51.

[0040] The case 51 is mounted to the front cover 16 and is located at either side of the display panel 18. As described above, the case 51 receives the drive motor 53 and rotating member 55. The drive motor 53 is installed in the case 51 to rotate the rotating member 55.

[0041] The rotating member 55 is rotated in the case 51 by the drive motor 53. The rotating member 55 may be curved to assure smooth rotation thereof in the case 51.

[0042] The rotating member 55 serves to rotate the first and second panels 21 and 22 by predetermined angles via rotation of the drive motor 53. For this, brackets 25 extend rearward from middle positions of rear surfaces of the first and second panels 21 and 22, and protrusions 26 are formed at lower surfaces of the brackets 25. Each of the protrusions 26 is connected to the rotating member 55, and the rotating member has a connecting hole 56 for connection of the protrusion 26. The connecting hole 56 has a predetermined length sufficient to allow the protrusion 26 connected into the connecting hole 56 to be moved by a predetermined distance.

[0043] The brackets 25 may be additionally provided at upper and lower ends of the rear surfaces of the first and second panels 21 and 22. The protrusions 26 of the additional brackets 25 may be guided by guide portions (not shown) formed at upper and lower ends of the body 11 during operation of the rotating units 50.

[0044] The cover 57 has a guide region 58, through which the protrusion 26 of the bracket 25 provided at the first or second panel 21 or 22 penetrates to thereby be connected to the rotating member 55.

[0045] The first and second panels 21 and 22 may interfere with the display panel 18 when being rotated by the rotating units 50. Therefore, in the present embodiment, the first and second panels 21 and 22 are first moved laterally by a predetermined distance and then, are rotated via operation of the rotating units 50.

[0046] In this case, the guide region 58 of the cover 57, as described above, guides the lateral movement and rotation of the first or second panel 21 or 22. The guide region 58 includes a first guide region 58a to guide lateral movement of the first or second panel 21 or 22, and a second guide region 58b to guide rotation of the first or second panel 21 or 22.

[0047] The first guide region 58b, as shown, is linearly formed and is inclined outwards and towards a front thereof. The second guide region 58b is connected to

the first guide region 58a and is curved outwards and towards a front thereof similar to the first guide region 58a.

[0048] Now, operation and effects of the air conditioner having the above-described configuration will be described.

[0049] First, as shown in FIG. 4, the front panel 20 consisting of the first and second panels 21 and 22 is installed to cover the entire front side of the cabinet 10. The front panel 20 hides a center panel provided at the front cover 16, i.e. the display panel 18 when the air conditioner is halted.

[0050] As shown in FIG. 5, if the drive motors 53 are rotated, the rotating members 55 connected to the drive motors 53 are rotated. With rotation of the rotating members 55, the protrusions 26 connected to the rotating members 55 are guided along the first guide regions 58a so as to be linearly moved.

[0051] In the above-described operation, the linearly moved protrusions 26 move the first and second panels 21 and 22 outwards and towards a front thereof. In this case, the protrusions 26 are moved by a predetermined distance in the connecting holes 56 of the rotating members 55.

[0052] As shown in FIG. 6, the protrusions 26 are guided along the second guide regions 58b connected to the first guide regions 58a with a continuous further rotation of the drive motor 53. The protrusions 26 moved along the second guide regions 58b rotate the first and second panels 21 and 22 outwards and towards a front thereof.

[0053] With the above-described operation, the first and second panels 21 and 22 are rotated by the rotating units 50, allowing the heat-exchanged air to be discharged from the cabinet 10 through the discharge regions 15 defined at outer sides of the first and second panels 21 and 22.

[0054] In the present embodiment, the first and second panels 21 and 22 are rotated individually or simultaneously by the rotating units 50, and a direction of air streams discharged through the discharge regions 15 may be changed based on Further, in the present embodiment, as the first and second panels 21 and 22 are rotated by the rotating units 50, the display panel 18 provided at the front cover 16 is exposed. In this case, the first and second panels 21 and 22 do not interfere with the display panel 18 of the front cover 16 when being rotated by the rotating units 50 because the first and second panels 21 and 22 are first moved laterally by a predetermined distance as the protrusions 26 are moved along the first guide regions 58a and then, are rotated as the protrusions 26 are moved along the second guide regions 58b by operation of the rotating units 50.

[0055] As shown in FIG. 7, the rotating units 50 may rotate the first and second panels 21 and 22 by different angles, to change discharge directions of air. In this case, the air discharged through the discharge regions 15 may create a leftward air stream or rightward air stream based on the different rotation angles of the first and second

panels 21 and 22.

[0056] As is apparent from the above description, an air conditioner according to the embodiment of the present invention includes a front panel consisting of rotatable first and second panels, to control an air stream to be discharged and a discharge direction of air based on rotation angles of the first and second panels.

Claims

1. An air conditioner comprising:

a cabinet (10);
a front panel (20) provided at a front side of the cabinet (10) and including two panels; and wherein the front panel (20) is divided into a first panel (21) and a second panel (22);
characterized in that
the first panel (21) and the second panel (22) are adapted to direct discharged air, wherein rotating units (50) are provided to rotate the first panel (21) and the second panel (22) respectively, so as to define discharge regions (15) of the discharged air, wherein a center panel is provided behind the first panel (21) and second panel (22) and is exposed when the first panel (21) and second panel (22) are rotated by the respective rotating units (50).

2. The air conditioner according to claim 1, wherein the first panel (21) and second panel (22) are rotated respectively about one side thereof close to each other; and
air in the cabinet (10) is discharged from opposite sides of the first panel (21) and second panel (22) when the first panel (21) and second panel (22) are rotated by the rotating units (50).

3. The air conditioner according to one of the claims 1 or 2, wherein the rotating units (50) respectively rotate the first panel (21) and second panel (22) simultaneously or individually.

4. The air conditioner according to one of the claims 1 to 3, wherein the rotating units (50) respectively control rotating angles of the first panel (21) and second panel (22), thus changing an air stream to be discharged.

5. The air conditioner according to one of the claims 1 to 4, wherein the cabinet (10) includes a body (11) and a front cover (16) coupled to the body (11); and the center panel is provided in the center of the front cover (16).

6. The air conditioner according to claim 1, wherein the first panel (21) and second panel (22) are moved

laterally by a predetermined distance so as not to interfere with the center panel when being rotated by the rotating units (50).

7. The air conditioner according to one of the 1 to 6, wherein each of the rotating units (50) includes a drive motor (53), and a rotating member (55) having one end connected to the drive motor (53) and the other end connected to the front panel (20).

8. The air conditioner according to claim 7, wherein each of the rotating units (50) further includes a case (51) mounted to the front cover (16), and a cover (57) to cover an upper side of the case (51); and the drive motor (53) and rotating member (55) are received in the case (51).

9. The air conditioner according to claim 7 or 8, wherein brackets (25) extend from rear surfaces of the first panel (21) and second panel (22); and each of the brackets (25) has a protrusion (26) connected to the rotating member (55).

10. The air conditioner according to claim 8 wherein the cover (57) has a guide region (58) through which the protrusion (26) penetrates the cover (57) to thereby be connected to the rotating member (55).

11. The air conditioner according to claim 10, wherein the guide region (58) includes a first guide region (58a) to guide lateral movement of the first panel (21) or second panel (22), and a second guide region (58a) to guide rotation of the first panel (21) or second panel (22), the first guide region (58a) and second guide region (58b) being connected to each other.

12. The air conditioner according to claim 11, wherein the rotating member (55) has a connecting hole (56) for connection of the protrusion (26); and the protrusion (26) is moved in the connecting hole (56) when being moved along the first guide region (58a) for lateral movement of the first panel (21) or second panel (22).

Patentansprüche

1. Klimaanlage mit:

einem Gehäuse (10);
einem Frontpaneel (20), das an einer Vorderseite des Gehäuses (10) vorgesehen ist und mindestens zwei Elemente enthält; und wobei das Frontpaneel (20) in ein erstes Element (21) und ein zweite Element (22) unterteilt ist;
dadurch gekennzeichnet, dass
das erste Element (21) und das zweite Element (22) so ausgebildet sind, dass sie abgeführte

- Luft lenken, wobei Dreheinheiten (50) vorgesehen sind, um das erste Element (21) und das zweite Element (22) entsprechend so zu drehen, dass Ableitgebiete (15) der abgeleiteten Luft gebildet werden, wobei eine zentrale Platte hinter dem ersten Element (21) und dem zweiten Element (22) vorgesehen und zugänglich ist, wenn das erste Element (21) und das zweite Element (22) durch die jeweiligen Dreheinheiten (50) gedreht werden.
2. Klimaanlage nach Anspruch 1, wobei das erste Element (21) und das zweite Element (22) entsprechend um eine Seite in unmittelbarer Nähe zueinander gedreht werden; und Luft in dem Gehäuse (10) aus gegenüberliegenden Seiten des ersten Elements (21) und des zweiten Elements (22) abgeleitet wird, wenn das erste Element (21) und das zweite Element (22) durch die Dreheinheiten (50) gedreht werden.
3. Klimaanlage nach Anspruch 1 oder 2, wobei die Dreheinheiten (50) entsprechend das erste Element (21) und das zweite Element (22) zusammen oder einzeln drehen.
4. Klimaanlage nach einem der Ansprüche 1 bis 3, wobei die Dreheinheiten (50) Drehwinkel des ersten Elements (21) und des zweiten Elements (22) steuern, wodurch ein abzuleitender Luftstrom verändert wird.
5. Klimaanlage nach einem der Ansprüche 1 bis 4, wobei das Gehäuse (10) einen Körper (11) und eine mit dem Körper (11) gekoppelte Frontabdeckung (16) aufweist; und die zentrale Platte in der Mitte der Frontabdeckung (16) vorgesehen ist.
6. Klimaanlage nach Anspruch 1, wobei das erste Element (21) und das zweite Element (22) seitlich entsprechend einer vorbestimmten Strecke so verschoben sind, dass sie die zentrale Platte bei Drehung durch die Dreheinheiten (50) nicht behindern.
7. Klimaanlage nach einem der Ansprüche 1 bis 6, wobei die Dreheinheiten (50) jeweils einen Antriebsmotor (53) und ein Drehelement (55) aufweisen, wovon ein Ende mit dem Antriebsmotor (53) und das andere Ende mit dem Frontpaneel (20) verbunden ist.
8. Klimaanlage nach Anspruch 7, wobei die Dreheinheiten (50) ferner jeweils einen Kasten (51), der an der Frontabdeckung (16) montiert ist, und eine Abdeckung (57) aufweisen, um eine Oberseite des Kastens (51) abzudecken; und der Antriebsmotor (53) und das Drehelement (55) in dem Kasten (51) untergebracht sind.
9. Klimaanlage nach Anspruch 7 oder 8, wobei Halterungen (25) sich von hinteren Flächen des ersten Elements (21) und des zweiten Elements (22) aus erstrecken; und die Halterungen (25) jeweils einen Vorsprung (26) aufweisen, der mit dem Drehelement (55) verbunden ist.
10. Klimaanlage nach Anspruch 8, wobei die Abdeckung (57) ein Führungsgebiet (58) aufweist, durch das der Vorsprung (26) die Abdeckung (57) durchdringt, um mit dem Drehelement (55) in Kontakt zu treten.
11. Klimaanlage nach Anspruch 10, wobei das Führungsgebiet (58) ein erstes Führungsgebiet (58a) zur Führung einer lateralen Bewegung des ersten Elements (21) oder des zweiten Elements (22) und ein zweites Führungsgebiet (58b) aufweist, um die Drehung des ersten Elements (21) oder des zweiten Elements (22) zu führen, wobei das erste Führungsgebiet (58a) und das zweite Führungsgebiet (58b) miteinander verbunden sind.
12. Klimaanlage nach Anspruch 11, wobei das Drehelement (55) eine Verbindungsbohrung (56) zur Anbindung des Vorsprungs (26) aufweist; und der Vorsprung (26) in der Verbindungsbohrung (56) bewegt wird, wenn er zur lateralen Bewegung des ersten Elements (21) oder des zweiten Elements (22) entlang des ersten Führungsgebiets (58a) bewegt wird.

Revendications

1. Climatiseur comprenant:

une enceinte (10);
un panneau avant (20) prévu sur un côté avant de l'armoire (10) et comprenant deux panneaux; et dans lequel le panneau avant (20) est divisé en un premier panneau (21) et un second panneau (22);

caractérisé en ce que

le premier panneau (21) et le second panneau (22) sont conçus pour diriger l'air évacué, dans lequel des unités rotatives (50) sont prévues pour faire tourner le premier panneau (21) et le second panneau (22), respectivement, de manière à définir des zones de décharge (15) de l'air évacué, dans lequel un panneau central est prévu derrière le premier panneau (21) et un second panneau (22) et est exposé lorsque le premier panneau (21) et second panneau (22) sont entraînés en rotation par les unités rotatives respectives (50).

2. Climatiseur selon la revendication 1, dans lequel le premier panneau (21) et un second

panneau (22) sont entraînés en rotation respectivement autour d'un côté de celui-ci à proximité l'un de l'autre; et

l'air dans l'enceinte (10) est déchargé à partir des côtés opposés du premier panneau (21) et du second panneau (22) lorsque le premier panneau (21) et le second panneau (22) sont entraînés en rotation par les unités rotatives (50).

3. Climatiseur selon l'une des revendications 1 ou 2, dans lequel des unités rotatives (50) font tourner respectivement le premier panneau (21) et le second panneau (22) simultanément ou individuellement. 10
4. Climatiseur selon l'une des revendications 1 à 3, dans lequel unités rotatives (50) commandent respectivement les angles de rotation du premier panneau (21) et du second panneau (22), changeant ainsi un courant d'air à évacuer. 15
5. Climatiseur selon l'une des revendications 1 à 4, dans lequel l'enceinte (10) comprend un corps (11) et un capot avant (16) couplé au corps (11); et le panneau central est prévu au centre du capot avant (16). 20
6. Climatiseur selon la revendication 1, dans lequel le premier panneau (21) et le second panneau (22) sont déplacés latéralement d'une distance prédéterminée de façon à ne pas interférer avec le panneau central lorsqu'il est mis en rotation par les unités rotatives (50). 25
7. Climatiseur selon l'une des revendications 2 à 6, dans lequel chacune des unités rotatives (50) comprend un moteur d'entraînement (53), et un élément rotatif (55) ayant une extrémité reliée au moteur d'entraînement (53) et l'autre extrémité reliée au panneau avant (20). 30
8. Climatiseur selon la revendication 7, dans lequel chacune des unités rotatives (50) comprend en outre un boîtier (51) monté sur le capot avant (16), et un capot (57) pour recouvrir une face supérieure du boîtier (51); et le moteur d'entraînement (53) et l'élément rotatif (55) sont logés dans le boîtier (51). 35
9. Climatiseur selon la revendication 7 ou la revendication 8, dans lequel les supports (25) s'étendent à partir des surfaces arrière du premier panneau (21) et du second panneau (22); et chacun des supports (25) présente une protubérance (26) reliée à l'élément rotatif (55). 40
10. Climatiseur selon la revendication 8, dans lequel le capot (57) présente une zone de gui-

dage (58) à travers laquelle pénètre la protubérance (26) dans le capot (57) pour se connecter à l'élément rotatif (55).

- 5 11. Climatiseur selon la revendication 10, dans lequel la zone de guidage (58) comprend une première zone de guidage (58a) pour guider le mouvement latéral du premier panneau (21) ou du second panneau (22) et une seconde zone de guidage (58a) pour guider la rotation du premier panneau (21) ou du second panneau (22), la première zone de guidage (58a) et la seconde région de guidage (58b) étant reliée l'une à l'autre. 10
12. Climatiseur selon la revendication 11, dans lequel l'élément rotatif (55) comporte un trou de raccordement (56) pour assurer le raccordement de la protubérance (26); et la protubérance (26) se déplace dans le trou de raccordement (56) lorsqu'elle est déplacée le long de la première zone de guidage (58a) pour assurer le déplacement latéral du premier panneau (21) ou du second panneau (22). 15

FIG. 1

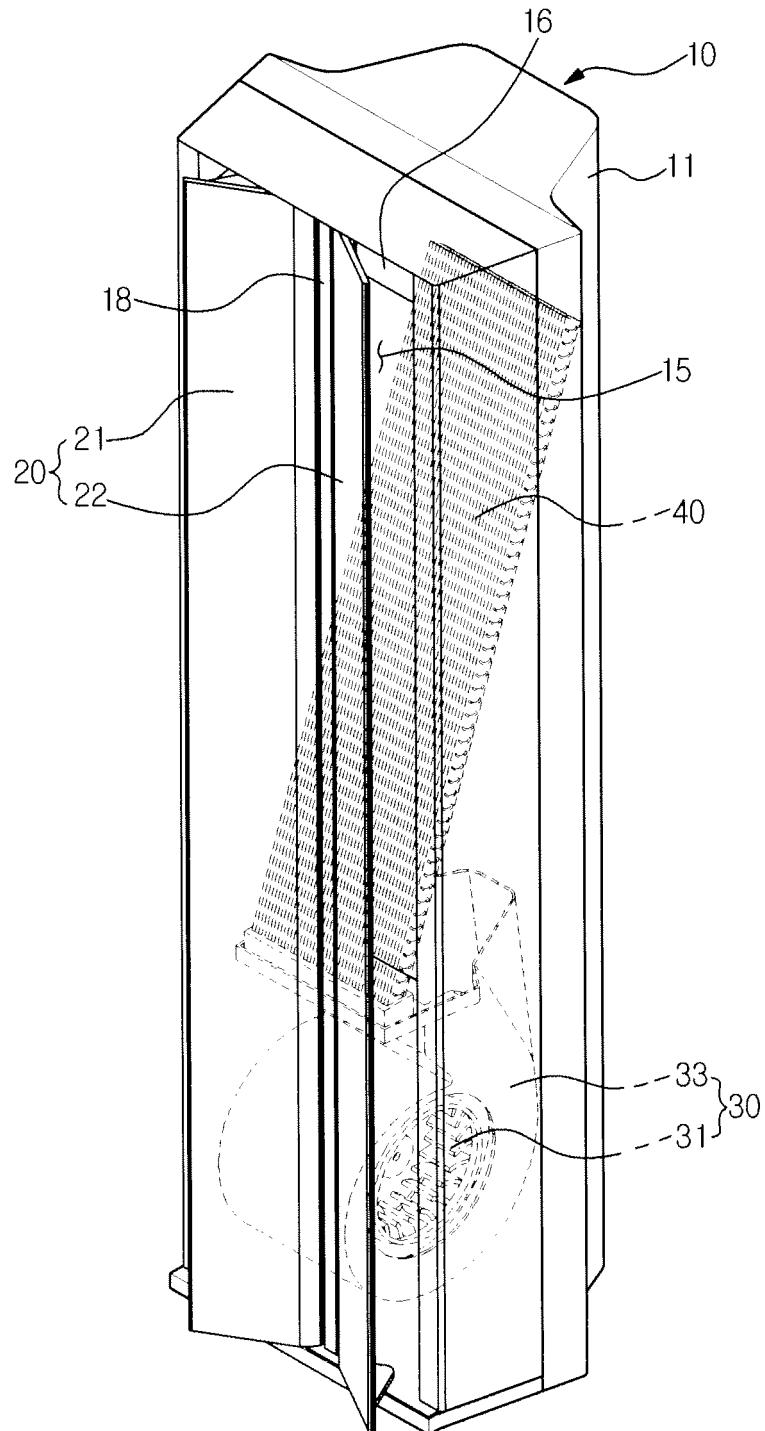


FIG. 2

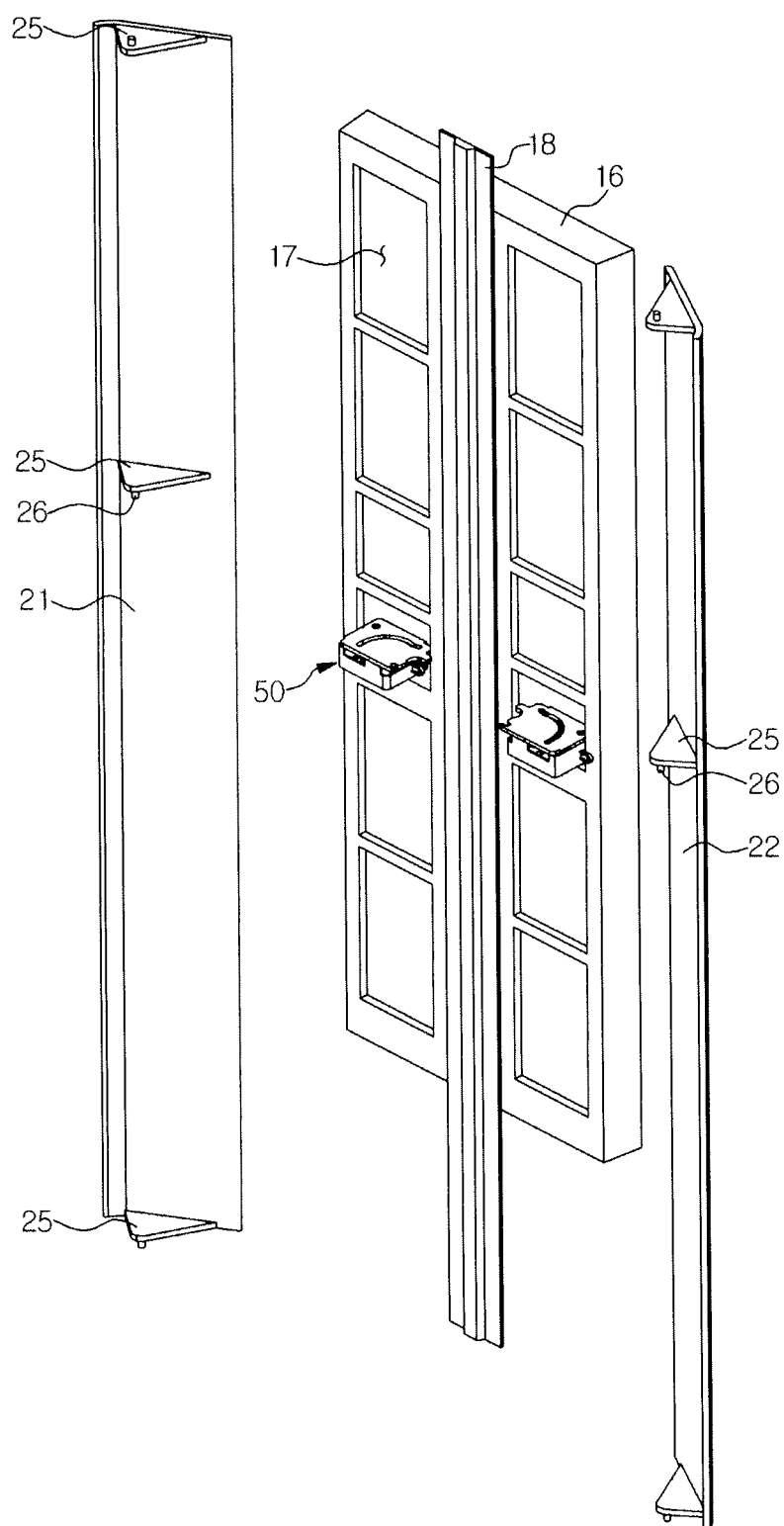


FIG. 3

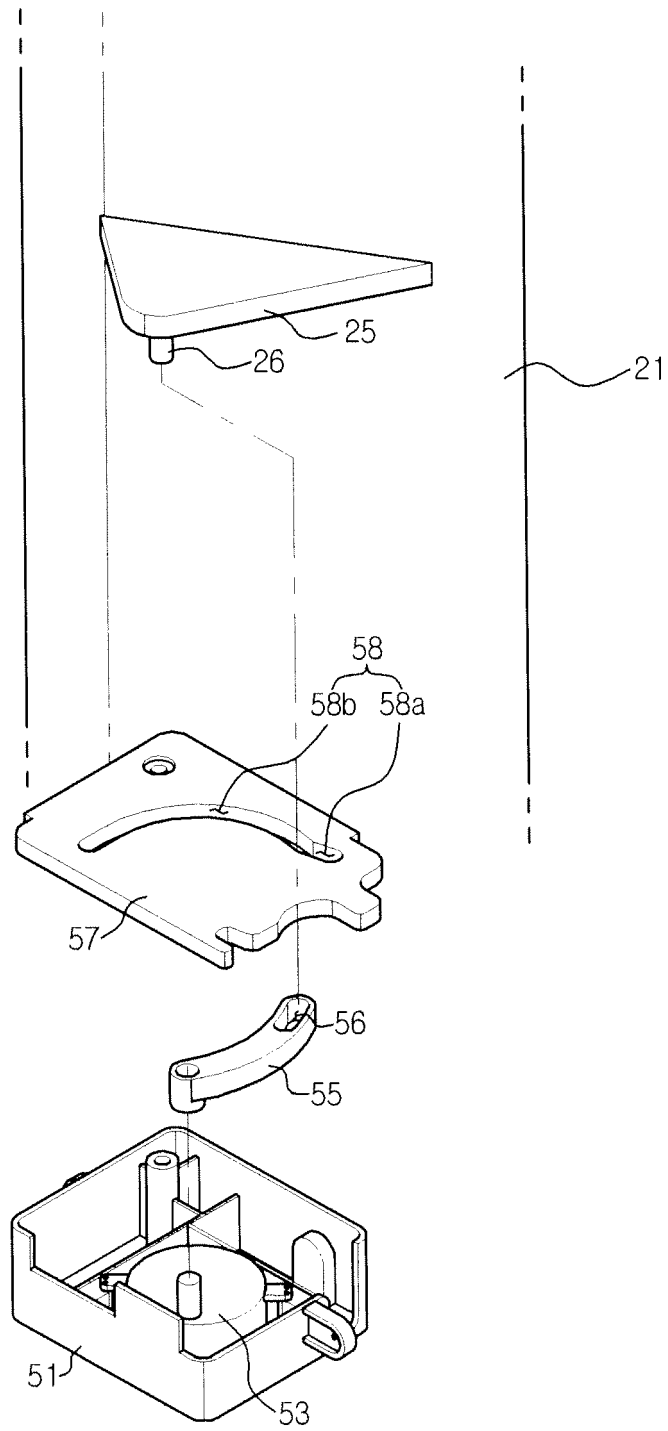


FIG. 4

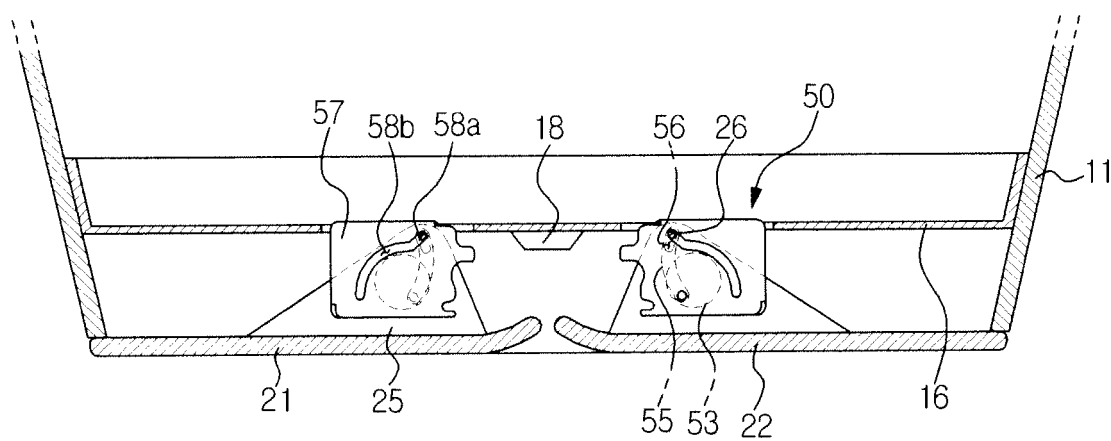


FIG. 5

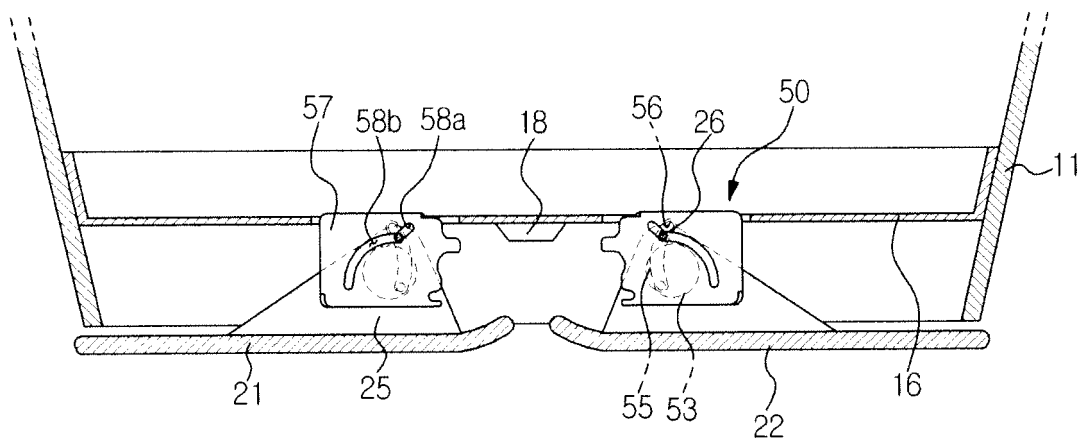


FIG. 6

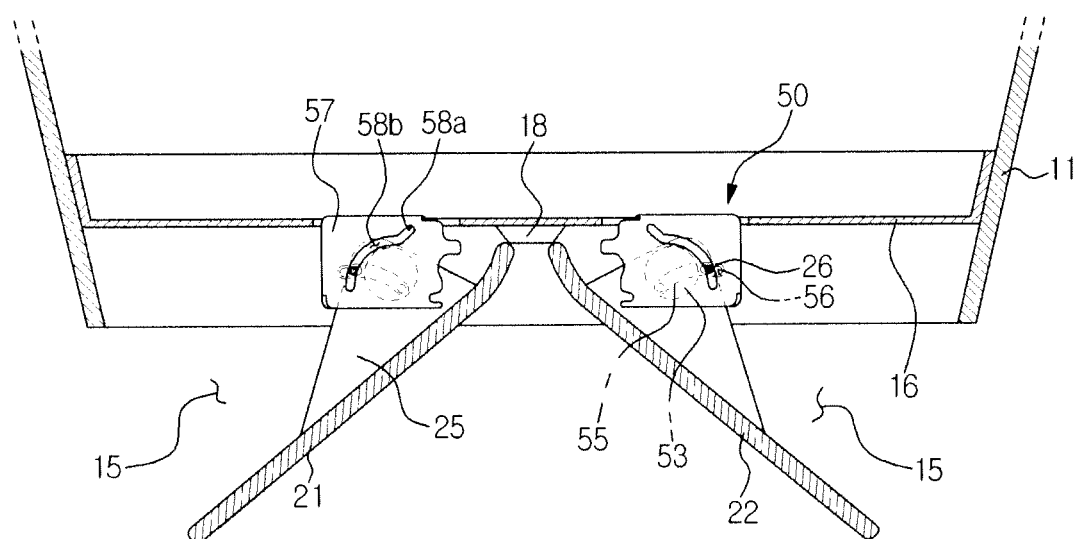
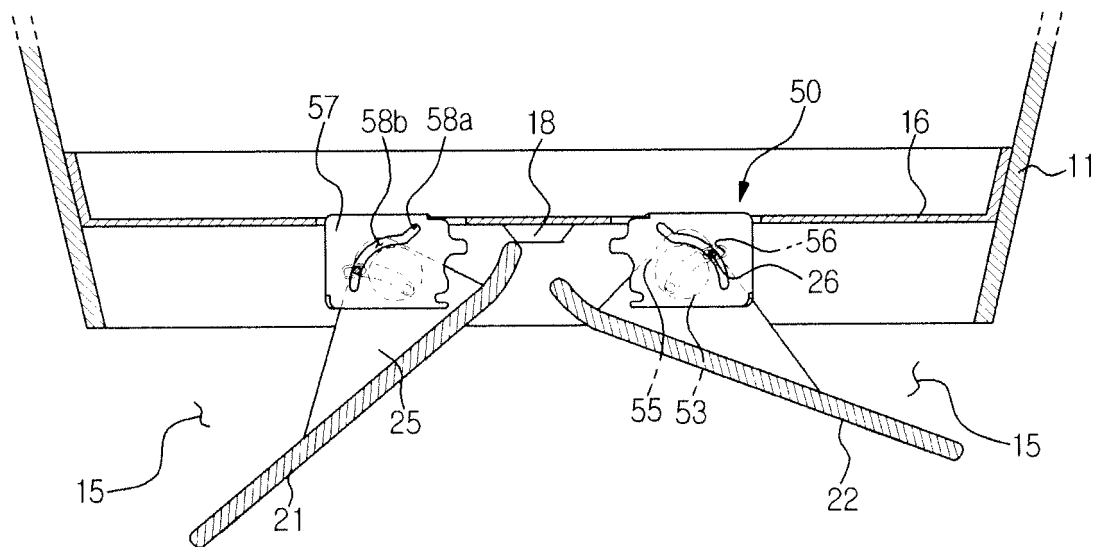


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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