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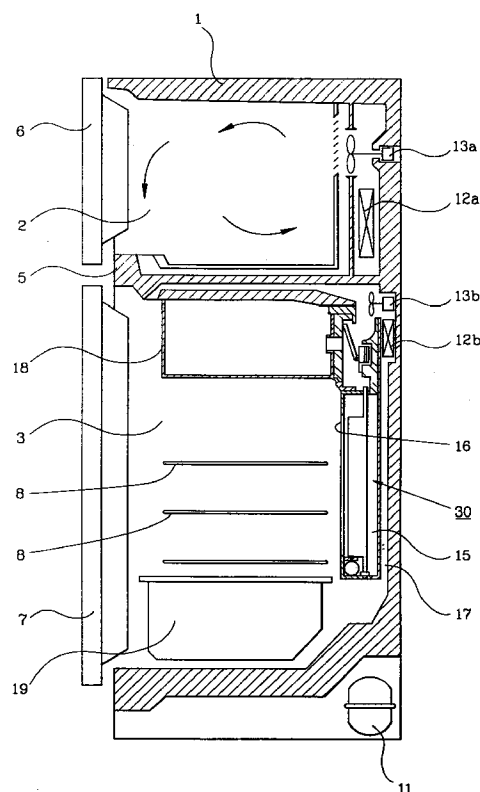
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(54) Refrigerator with cool air distributing device

(57) Disclosed is a refrigerator a device (30) for dispersing cool air. In a duct (15) of a cooling compartment (3) is installed a horizontal dispersing blade (43) of planar plate shape, which is rotatable around a vertical axis. The blade (43) disperses cool air horizontally. In the duct (15) are installed a cam (53) rotatable around a horizontal axis, and a motor (59) for rotating the cam (53). The rotation of the cam (53) is converted to the reciprocal rotation of the blade (43) by a transmission part (69). Thus, while the cam (53) is rotated by the motor (59), the cool air is dispersed horizontally in the compartment (3), and the temperature in the compartment (3) is maintained uniform. Further, if the cam (5) is stopped, the cool air can be concentrated on a specific area.

FIG. 5



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Description

[0001] The present invention relates to a refrigerator comprising a cooling compartment, an aperture opening into the compartment, a heat pump and cool air distributing means for supplying cool air generated by the heat pump to the compartment through the aperture.

[0002] Generally, a refrigerator has a cabinet in which there are a freezing compartment and a fresh food compartment. A partition wall separates these compartments. Doors are provided at the front of the freezing and cooling compartments. A cooling system supplies the freezing compartment and the fresh food compartment with cool air and comprises a compressor, a condenser and an evaporator. The cool air generated by the evaporator flows along a supply duct formed at the back of each compartment, and is then supplied into each cooling compartment through cool air discharge ports opening thereinto by a fan.

[0003] In such a conventional refrigerator, however, cool air tends to be supplied into a particular area of the cooling compartment and other areas tend to be less well served. Consequently, a uniform temperature is not maintained throughout the cooling compartment.

[0004] This problem has been addressed by providing cool air discharge ports in the side walls of the cooling compartment as well as in its rear wall. However, there may be still a dead-zone at an edge area which is not supplied with the cool air sufficiently. Furthermore, the ducting required to supply cool air from the sides of the cooling compartment reduces the space available for food and increases the cost of manufacture.

[0005] The problem of adequately distributing cool air in a refrigerator is worse for larger refrigerators.

[0006] Figures 1 through 3 are a side view, a partial enlarged sectional view, and an exploded perspective view of the main elements of a refrigerator having a device for dispersing cool air as disclosed in WO-A-95/27278.

[0007] Referring to Figures 1 to 3, a refrigerator comprises freezing and fresh food compartments 2, 3 in a cabinet 1, which are separated from each other by a partition 5. Respective doors 6, 7 are provided for closing the compartments 2, 3. A cooling system, comprising a compressor 11, a condenser (not shown), a freezing compartment evaporator 12a, and a fresh food compartment evaporator 12b, is installed in the cabinet 1. Cool air generated by the evaporators 12a, 12b is supplied to the corresponding compartments 2, 3 by a freezing compartment fan 13a and a fresh food compartment fan 13b respectively.

[0008] A partially cylindrical duct plate 9 is attached to an inner wall plate 23 forming the rear inner wall surface of the fresh food compartment 3. The duct plate 9 has cool air discharge ports 16, opening into the fresh food compartment 3, formed in it. A supply duct 15 and a return duct 17, separated from each other by a seal plate 25, are provided between the duct plate 9 and the

rear wall 4 of the cabinet 1. A duct member 21, for guiding downwards cool air blown by the fresh food compartment fan 13b, is installed in the supply duct 15. Cool air generated by the fresh food compartment evaporator 12b is blown by the fresh food compartment fan 13b and then supplied to the fresh food compartment 3 via the supply duct 15 and the cool air discharge ports 16.

[0009] A cool air dispersing device 130 is installed in the supply duct 15. The cool air dispersing device 130 comprises a rotational shaft 131 having a vertical axis, cool air dispersing blades 132 assembled with the rotational shaft 131 in correspondence with respective cool air discharge ports 16, and a driving motor 135 for rotating the rotational shaft 131. Each of the cool air dispersing blades 132 comprises three discs 136, 137, 138 disposed in parallel with each other along the shaft 131, and first and second blade parts 133, 134 disposed between pairs of the discs 136, 137, 138. Each of the blade parts 133, 134 is curved so that its cross-section is loosely S-shaped. The blade parts 133, 134 are bent in opposite directions to each other.

[0010] In a refrigerator having the above-described constitution, when the driving motor 131 rotates the rotational shaft 131 at a low speed, cool air flowing along the supply duct 15 changes its direction along the curved surfaces of the cool air dispersing blades 132, and is directed into the fresh food compartment 3 so as to disperse horizontally. When concentrated cooling in a specific area is needed, the driving motor 135 stops the rotational shaft 131 so that the cool air dispersing blades 132 direct cool air to the specific area. However, since the blade parts 133, 134 of the cool air dispersing device 130 are S-shaped, the left or right sides of the fresh food compartment 3 may not be supplied with the cool air sufficiently and the smooth flow of cool air may be impeded by a vortices in the cool air formed about the cool air discharge ports 16.

[0011] A refrigerator according to the present invention is characterised in that the cool air distributing means comprises a vertical blade and drive means for reciprocating the blade about a vertical axis, the drive means comprising a cam member, rotatable about a horizontal axis and having a groove in the form of an oblique loop, and a cam follower member received in the groove and drivingly coupled to the blade.

[0012] Option features of the present invention are set out in claims 2 to 16 appended hereto. The fact that two features may be mentioned for the first time in the same claim must not be construed as meaning that the presence of one of the features inevitably requires the presence of the other.

[0013] Embodiments of the present invention will now be described, by way of example, with reference to Figures 4 to 22 of the accompanying drawings, in which:-

Figure 1 is a side sectional view of a conventional refrigerator having cool air dispersing blades;

Figure 2 is a partial enlarged sectional view of Fig-

ure 1;

Figure 3 is an enlarged exploded perspective view of main elements of Figure 2;

Figure 4 is a front view of a refrigerator according to the first embodiment of the present invention;

Figure 5 is a side sectional view of Figure 4;

Figure 6 is an enlarged exploded perspective view of a cool air dispersing device shown in Figures 4 and 5;

Figure 7 is a perspective view of the assembled state of Figure 6;

Figures 8 and 9 are partial enlarged views of Figure 7;

Figure 10 is an exploded perspective view of a cool air dispersing device according to the second embodiment of the present invention;

Figure 11 is a perspective view of the assembled state of Figure 10;

Figure 12 is an exploded perspective view of a cool air dispersing device according to the third embodiment of the present invention;

Figures 13 and 14 are partial enlarged views of the assembled state of Figure 12;

Figure 15 is an exploded perspective view of a cool air dispersing device according to the fourth embodiment of the present invention;

Figure 16 is a perspective view of the assembled state of Figure 15;

Figure 17 is an exploded perspective view of a cool air dispersing device according to the fifth embodiment of the present invention;

Figure 18 is a perspective view of the assembled state of Figure 17;

Figure 19 is an exploded perspective view of a cool air dispersing device according to the sixth embodiment of the present invention;

Figure 20 is a perspective view of the assembled state of Figure 19; and

Figures 21 and 22 are exploded transverse sectional views of Figure 20.

[0014] Hereinafter, the present invention will be described in detail with reference to the accompanying drawings. Parts identical to those in the conventional refrigerator shown in Figures 1 through 3 will be referred to with the same reference numerals, and the description thereof will be omitted.

[0015] Figure 4 is a front view of a refrigerator according to the first embodiment of the present invention, and Figure 5 is a side sectional view of Figure 4. The refrigerator has, as the conventional refrigerator which has been illustrated with reference to Figures 1 through 3, a cabinet 1 forming freezing compartment 2 and a fresh food compartment 3 which are partitioned by a partitioning wall 5 and are disposed upper and lower parts thereof, respectively. On the front openings of the freezing compartment 2 and the fresh food compartment 3, doors 6 and 7 for opening/closing them are installed

respectively. In the fresh food compartment 3, shelves 8 for placing food thereon is installed, which divide the fresh food compartment 3 into three stratified area, i. e., an upper area, a middle area, and a lower area. A special fresh chamber 18 for storing food which requires a specific temperature range is formed at the upper part of the fresh food compartment 3, and a vegetable chamber 19 for storing vegetables is formed at the lower part of the fresh food compartment 3.

[0016] In the cabinet 1 is installed a cooling system comprising a compressor 11, a condenser (not shown), a freezing compartment evaporator 12a, and a fresh food compartment evaporator 12b. The cool air generated by the evaporators 12a and 12b is supplied into the corresponding cooling compartments 2 and 3 by the freezing compartment fan 13a and the fresh food compartment fan 13b.

[0017] A supply duct 15 and a return duct 17 are provided in the rear of the fresh food compartment 3. The cool air generated by the fresh food compartment evaporator 12b is blown by the fresh food compartment fan 13b so as to be supplied into the fresh food compartment 3 via the supply duct 15 and the cool air discharge ports 16. A device 30 for dispersing cool air is installed in the supply duct 15.

[0018] A pair of temperature sensors 9a and 9b are installed in the fresh food compartment 3. The temperature sensors 9a and 9b comprise a first temperature sensor 9a installed at the upper left area of the fresh food compartment 3, and a second temperature sensor 9b installed at the lower right area of the fresh food compartment 3.

[0019] Figures 6 through 9 show the cool air dispersing device 30 according to the first embodiment of the present invention. The cool air dispersing device 30 comprises a rotational shaft 45 disposed vertically in the supply duct 15 formed by a duct plate 27, a horizontal dispersing blade 43 installed on the rotational shaft 45, a cam 51 disposed at the lower area of the supply duct 15, a driving motor 59 for rotating the cam 51, and a transmission part 61 driven by the cam 51.

[0020] The upper and lower ends of the rotational shaft 45 are inserted respectively into supporting holes 32 and 29 which are respectively provided on the upper and lower parts of the duct plate 27. Thus, the rotational shaft 45 is rotatably supported by the supporting holes 32 and 29, and thereby the horizontal dispersing blade 43 is rotatable around the rotational shaft 45. The horizontal dispersing blade 43 controls the horizontal discharge direction of cool air discharged through the discharge port 16 formed on the duct plate 27.

[0021] The horizontal dispersing blade 43 has the shape of a rectangular plate. On the lower edge of the horizontal dispersing blade 43 is formed an operation groove 49. The operation groove 49 is formed horizontally along the plane of the horizontal dispersing blade 43. The operation groove 49 interacts with an operation bar 69 which will be described later.

[0022] The cam 51 has a cylindrical cam body 53, and the cam body 53 is installed with a cam shaft 56. Both ends of the cam shaft 56 are supported by cam brackets 33 and 35 formed at the lower part of the duct plate 27. Thus, the cam body 53 is disposed horizontally so as to be capable of rotating around the cam shaft 56. Furthermore, a cam groove 55 is formed on the circumference of the cam body 53. The cam groove 55 has a cam profile which is a closed loop reciprocating along the cam shaft 56.

[0023] The driving motor 59 is fixed by a motor bracket 37 provided at the lower part of the duct plate 27. The cam shaft 56 is coupled with the driving shaft of the driving motor 59, so the cam 51 is rotated by the driving motor 59. The driving motor 59 is a stepping motor which is capable of controlling the angular position thereof.

[0024] The transmission part 61 is attached to the lower rear surface of the duct plate 27. The transmission part 61 is comprised of a guide member 63, and an operation bar 69 installed on the guide member 63. The guide member 63 has guide grooves 65 formed at the upper and lower surfaces thereof respectively, and another guide groove 67 is formed at the side surface of the guide member 63. The guide grooves 65 and 67 are formed horizontally so that they are parallel with the cam shaft 56.

[0025] The operation bar 69 passes through the guide member 63 via the guide grooves 65 formed on the upper and lower surfaces of the guide member 63, and is disposed vertically so that it is parallel with the rotational shaft 45. The operation bar 69 is capable of sliding along the guide grooves 65. The operation bar 69 is formed with a guide rib 68 protruding sideward from the middle part thereof. The guide rib 68 is accommodated in the guide groove 67, and the sliding of the operation bar 69 is guided by the guide rib 68 and the guide groove 67. The upper end of the operation bar 69 is inserted into the operation groove 49 of the horizontal dispersing blade 43, and the lower end thereof is inserted into the cam groove 55 of the cam 51.

[0026] Figures 8 and 9 show the discharge states of cool air guided by the cool air dispersing device 30 according to the first embodiment of the present invention. While the cam 51 is being rotated by the driving motor 59, the operation bar 69 slides reciprocally in horizontal direction along the guide grooves 65 and 67. The sliding of the operation bar 69 is converted to the rotational movement of the horizontal dispersing blade 43 by the operation groove 49. Therefore, while the cam 51 is rotating continuously, the horizontal dispersing blade 43 reciprocates between the states that it is rotated left as shown in Figure 8 and rotated right as shown in Figure 9.

[0027] When the horizontal dispersing blade 43 is rotated left as shown in Figure 8, the cool air in the supply duct 15 is discharged to the left area in the fresh food compartment 3. Similarly, when the horizontal dis-

persing blade 43 is rotated right as shown in Figure 9, the cool air in the supply duct 15 is discharged to the right area in the fresh food compartment 3. Therefore, while the horizontal dispersing blade 43 is rotating reciprocally within a predetermined angle, the cool air is dispersed horizontally, whereby the uniform distribution of cool air in the fresh food compartment 3 is realized. Furthermore, since the horizontal dispersing blade 43 has a shape of a planar plate, there occurs no vortex of cool air during the cool air dispersing operation of the horizontal dispersing blade 43.

[0028] Meanwhile, if the concentrative supply of cool air on a specific area such as an upper area or a lower area is required, the concentrative cooling can be realized by stopping the driving motor 59 when the horizontal dispersing blade 43 is directed to the corresponding area. In such a situation, a control part (not shown) drives the driving motor 59 on the basis of the temperature in the fresh food compartment 3 sensed by the temperature sensors 9a and 9b. In other words, if a rise in temperature of a specific area in the fresh food compartment 3 is sensed by the temperature sensors 9a and 9b, the control part stops the cam 51 so that the cool air is guided toward the specific area of which temperature has risen. Therefore, the specific area is cooled in a concentrative manner, and the uniform distribution of cool air in the fresh food compartment 3 can be achieved in a short period of time.

[0029] Figures 10 and 12 show a cool air dispersing device 40 according to the second embodiment of the present invention. In the present embodiment, parts identical to those in the above-described first embodiment are referred to with the same reference numerals. Furthermore, in the description of the following embodiments, parts substantially identical to those in the antecedent embodiments will be referred to with the same reference numerals. In the present embodiment, the construction of the driving motor 59, the cam 51, horizontal dispersing blade 43 and the transmission part 61 is the same as that of the above-described first embodiment.

[0030] In the present embodiment, a pair of discharge ports 16a and 16b are formed on the upper and lower areas of the duct plate 27. Further, a pair of horizontal dispersing blades 43a and 43b are installed on the upper and the lower parts of the rotational shaft 45. The pair of horizontal dispersing blades 43a and 43b correspond to the pair of discharge ports 16a and 16b, respectively. The operation groove 49 is formed on the lower edge of the upper horizontal dispersing blade 43a.

[0031] Meanwhile, the transmission part 61, the cam 51, and the driving motor 59 are disposed between the pair of discharge ports 16a and 16b. As in the above-described first embodiment, both ends of the operation bar 69 are inserted into the cam groove 55 and the operation groove 49, respectively.

[0032] The operation of the cool air dispersing device

40 according to the present embodiment is the same with that of the above-described first embodiment. That is, as the driving motor 59 rotates the cam 51, the horizontal dispersing blades 43 rotate reciprocally within a predetermined angle. Thus, the cool air is dispersed horizontally. According to the present embodiment, since the cool air is discharged through the discharge ports 16a and 16b which respectively correspond to the upper and lower areas in the fresh food compartment 3, the cool air can be supplied respectively to the stratified areas in the fresh food compartment 3.

[0033] Furthermore, in the present embodiment, a pair of discharge ports 16a and 16b and a pair of horizontal dispersing blades 43 are provided, however, the number of them can be changed in consideration of the number of the stratified areas in the fresh food compartment 3 which are partitioned vertically from each other. For example, if there are three stratified areas, three discharge ports and three horizontal dispersing blades are preferably provided.

[0034] Figures 12 through 14 show a cool air dispersing device 50 according to the third embodiment of the present invention.

[0035] In the present embodiment, the construction of the driving motor 59 and the cam 51 is the same as that of the above-described first embodiment. Further, in the present embodiment, as in the above-described second embodiment, a pair of discharge ports 16a and 16b are formed on the upper and lower areas of the duct plate 27, respectively. Similarly, a pair of horizontal dispersing blades 43a and 43b are provided. The pair of horizontal dispersing blades 43a and 43b respectively correspond to the pair of discharge ports 16a and 16b.

[0036] In the present embodiment, however, a pair of rotational shafts 45a and 45b corresponding to the pair of horizontal dispersing blades 43a and 43b are provided. The pair of rotational shafts 45a and 45b are coaxially disposed. The upper end of the upper rotational shaft 45a is inserted into the supporting hole 32 provided on the upper part of the duct plate 27, and the lower end of the lower rotational shaft 45b is inserted into the supporting hole 29 provided on the lower part of the duct plate 27.

[0037] On the upper end of the lower rotational shaft 45b is formed an assembly protrusion 47, and on the lower end of the upper rotational shaft 45a is formed an assembly hole 46 into which the assembly protrusion 47 is inserted. The upper and lower rotational shafts 45a and 45b are assembled with each other through the assembly protrusion 47 and the assembly hole 46. Therefore, the rotational shafts 45a and 45b can be rotated independently of each other. Further, operation grooves 49a and 49b are respectively formed on the lower edge of the upper horizontal dispersing blade 43a and the upper edge of the lower horizontal dispersing blade 43b.

[0038] In the present embodiment, a pair of transmission parts 61a and 61b are provided which correspond

to the pair of horizontal dispersing blades 43a and 43b, respectively. The construction of respective transmission parts 61a and 61b are the same as that of the above-described first and second embodiments. Further, the transmission parts 61a and 61b, the cam 51, and the driving motor 59 are disposed between the pair of discharge ports 16a and 16b. In such a situation, the pair of transmission parts 61a and 61b are disposed below and over the cam 51, respectively.

[0039] The lower and upper ends of the operation bar 69 of the upper transmission part 61a are respectively inserted into the cam groove 55 and the operation groove 49a, and the upper and lower ends of the operation bar 69 of the lower transmission part 61b are respectively inserted into the cam groove 55 and the operation groove 49b.

[0040] While the cam 51 is rotated by the driving motor 59, the horizontal dispersing blades 43a and 43b rotate reciprocally within a predetermined angle by the transmission parts 61a and 61b, respectively. In such a situation, since two transmission parts 61a and 61b are driven by a single cam 51, the horizontal dispersing blades 43a and 43b are rotated oppositely to each other. More specifically, as shown in Figure 13, the upper horizontal dispersing blade 43a is rotated left while the lower horizontal dispersing blade 43b is rotated right, and as shown in Figure 14, the upper horizontal dispersing blade 43a is rotated right while the lower horizontal dispersing blade 43b is rotated left. Therefore, the effect for dispersing cool air into the fresh food compartment 3 more increases.

[0041] Figures 15 and 16 show a cool air dispersing device 60 according to the fourth embodiment of the present invention. In the present embodiment, the construction of the driving motor 59, the cam 51, and the transmission part 61 is the same as that of the above-described second embodiment.

[0042] In the present embodiment, a plurality of vertical dispersing blades 71 of planar plate shape are further provided in the supply duct 15. The vertical dispersing blades 71 are disposed parallel with each other. Each of the vertical dispersing blades 71 has horizontal shafts 72 at both sides thereof. A plurality of shaft holes 34 are formed on the side flanges 33a and 33b of the duct plate 27, and the horizontal shafts 72 of the vertical dispersing blades 71 are inserted into the shaft holes 34. Accordingly, the vertical dispersing blades 71 are supported so as to be capable of rotating around the horizontal shafts 72. The vertical dispersing blades 71 control the vertical discharge direction of cool air discharged through the discharge ports 16a and 16b according to the rotational position thereof.

[0043] Each of the vertical dispersing blades 71 has a hinge part 73. The hinge part 73 are disposed at a position spaced from the horizontal shaft 72 at a predetermined distance.

[0044] In the rear of the duct plate 27 is installed a link member 81 having the shape of a long rod and being

disposed vertically. The link member 81 has a plurality of hinge assembly parts 82 disposed along the longitudinal direction thereof. The hinge assembly parts 82 are assembled with the hinge parts 73 of respective vertical dispersing blades 71. Therefore, the vertical dispersing blades 71 are assembled with the link member 81 while they are maintained parallel with each other.

[0045] As the link member 81 is moved up and down, the vertical dispersing blades 71 rotate reciprocally around the horizontal shaft 72 in vertical direction. On a middle part of the link member 81 is formed an elevating/de-elevating protrusion 83 interacting with an elevation/de-elevation member 86 which will be described later.

[0046] An elevation/de-elevation guide part 95 for elevating/de-elevating the link member 81 is attached to the rear surface of the duct plate 27. The elevation/de-elevation guide part 95 is positioned under the transmission part 61. The elevation/de-elevation guide part 95 has a construction similar to the transmission part 61. That is, the elevation/de-elevation part 95 has a guide member 96, and guide grooves 98 and 97 respectively formed at the upper and side surfaces of the guide member 96.

[0047] The lower end of the operation bar 69 of the transmission part 61 is accommodated in the guide groove 98 formed at the upper surface of the guide member 96. Therefore, the sliding of the operation bar 69 is guided by the guide groove 98. Further, on the lower part of the operation bar 69 is formed an operating protrusion 69a passing through the guide groove 97. The operating protrusion 69a interacts with the elevation/de-elevation member 86.

[0048] The elevation/de-elevation member 86 has a pair of arms having a predetermined angle with respect to each other, whereby it is V-shaped substantially. On an end of the elevation/de-elevation member 86 is formed a pivoting hole 84 assembled with a pivoting shaft 99 protruding backward from the rear surface of the duct plate 27. The elevation/de-elevation member 86 is capable of rotating around the pivoting shaft 99. The arms of the elevation/de-elevation member 86 are formed with slots 81 and 82, respectively. The operating protrusion 69a of the operation bar 69 is inserted into the upper slot 81, and the elevating/de-elevating protrusion 83 of the link member 81 is inserted into the lower slot 82.

[0049] As the operation bar 69 moves reciprocally along the guide groove 97, the elevation/de-elevation member 86 pivots reciprocally about the pivoting shaft 99 in vertical direction, whereby the link member 81 is elevated/de-elevated reciprocally. Therefore, the vertical dispersing blades 71 reciprocally rotate within a predetermined angle, and the cool air in the supply duct 15 is dispersed into the fresh food compartment 3.

[0050] According to the present embodiment, while the cam 51 is rotated by the driving motor 59, the horizontal dispersing blade 43 is rotated reciprocally in hor-

izontal direction by the transmission part 61, and simultaneously the vertical dispersing blades 71 are rotated reciprocally in vertical direction by the elevation/de-elevation guide part 95, the elevation/de-elevation member 86, and the link member 81. Accordingly, the cool air is dispersed horizontally and vertically.

[0051] Figures 17 and 18 show a cool air dispersing device 70 according to the fifth embodiment of the present invention.

[0052] In the present embodiment, the construction of the horizontal dispersing blades 43a and 43b, the rotational shafts 45a and 45b, the driving motor 59, the cam 51, and the transmission parts 61a and 61b is the same as that of the above-described third embodiment. That is, a pair of horizontal dispersing blades 43a and 43b are installed respectively on a pair of rotational shafts 45a and 45b which is capable of rotating independently of each other, and they correspond respectively to a pair of discharge ports 16a and 16b. Furthermore, a pair of transmission parts 61a and 61b for respectively driving the pair of horizontal dispersing blades 43a and 43b are provided.

[0053] In the present embodiment, the construction of the vertical dispersing blades 71, the link member 81, the elevation/de-elevation member 86, and the elevation/de-elevation guide part 95 is the same as that of the above-described fifth embodiment. Accordingly, while the cam 51 is rotated by the driving motor 59, the horizontal dispersing blades 43a and 43b are rotated reciprocally in horizontal direction by the transmission parts 61a and 61b within a predetermined angle, and simultaneously the vertical dispersing blades 71 are rotated reciprocally in vertical direction by the elevation/de-elevation guide part 95, the elevation/de-elevation member 86, and the link member 81 within a predetermined angle. Therefore, the cool air is dispersed horizontally and vertically. Further, as described in the third embodiment, the horizontal dispersing blades 43a and 43b rotate oppositely to each other.

[0054] Figures 19 through 22 show a cool air dispersing device 80 according to the sixth embodiment of the present invention.

[0055] In the present embodiment, as in the above-described first embodiment, the rotational shaft 45 disposed vertically is installed in the supply duct 15, and the horizontal dispersing blade 43 is fixed to the rotational shaft 45.

[0056] A hinge protrusion 45d is formed on the upper part of the horizontal dispersing blade 43. The hinge protrusion 45d has a predetermined angle with respect to the plane of the horizontal dispersing blade 43. On the hinge protrusion 45d is formed a hinge pin 45e protruding downward so as to be parallel with the rotational shaft 45. The hinge pin 45e interacts with an operation bar 115 which will be described later.

[0057] In the present embodiment, the construction of the driving motor 109 and the cam 101 is similar to that of the first embodiment. That is, the

cam 101 has a cam body 103 and a cam groove 105, and a cam shaft 106 is installed on the cam body 103. However, in the present embodiment, the direction of the cam 101 is different from that of the first embodiment. In other words, the cam 101 is disposed horizontally as that of the first embodiment, but it is orthogonal to the cam 51 of the first embodiment.

[0058] The driving motor 109 is fixed by a motor bracket 110 attached to the rear surface of the duct plate 27. One end of the cam shaft 106 is assembled with the driving shaft of the driving motor 109, and the other end thereof is inserted into a rear wall provided in the rear of the duct plate 27. Accordingly, the cam 101 is rotatably supported. A guide member 117 is fixed on the rear wall 29, which is parallel with the cam shaft 106.

[0059] The guide member 117 has a guide groove (not shown) formed along the longitudinal direction thereof, and the guide bar 115 passes through the guide member 117 via the guide groove. A pair of guide plates 116 are provided at the middle part of the operation bar 115. The guide plates 116 are disposed at both sides of the guide member 117 so that they are contacted therewith. The guide plates 116 support the operation bar 115 so that the operation bar 115 is maintained orthogonal to the guide member 117, whereby the operation bar 115 is capable of sliding along the guide groove of the guide member 117.

[0060] One end of the operation bar 115 is inserted into the cam groove 105, and the other end thereof is formed with a slot 111 for accommodating the hinge pin 45e. Therefore, when the operation bar 115 moves along the longitudinal direction of the guide member 117, the hinge pin 45e moves along the slot 111, whereby the horizontal dispersing blade 43 is rotated as shown in Figures 21 and 22.

[0061] Accordingly, while the cam 101 is being rotated by the driving motor 109, the operation bar 115 is reciprocated by the cam 101, and thereby the horizontal dispersing blade 43 rotates reciprocally within a predetermined angle. Thus, the cool air is dispersed horizontally.

[0062] As described above, according to the present invention, a stable cool air flow and a uniform distribution of cool air in vertical and horizontal directions can be achieved without the vortex of cool air about the cool air discharge ports.

[0063] Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation.

Claims

1. A refrigerator comprising a cooling compartment (3), an aperture (16) opening into the compartment (3), a heat pump and cool air distributing means (30) for supplying cool air generated by the heat pump to the compartment (3) through the aperture

(16), **characterised in that** the cool air distributing means (30) comprises a vertical blade (43) and drive means (51, 61) for reciprocating the blade (43) about a vertical axis, the drive means (51, 61) comprising a cam member (53), rotatable about a horizontal axis and having a groove in the form of an oblique loop, and a cam follower member received in the groove and drivingly coupled to the blade.

2. A refrigerator comprising:

a duct plate being installed on a side wall of a cooling compartment, said duct plate for forming a cool air duct in said side wall, said duct plate having at least one cool air discharge port opened into said cooling compartment;

a horizontal dispersing blade of planar plate shape being disposed vertically in said cool air duct, said horizontal dispersing blade being capable of rotating around a vertical axis, said horizontal dispersing blades for dispersing cool air in said cool air duct horizontally according to a rotational position thereof;

a cam being installed in said cool air duct so as to be capable of rotating around a horizontal axis, said cam having a cam profile which is a closed loop reciprocating along said horizontal axis;

a means for rotating said cam; and

a transmission part for converting a rotation of said cam to a reciprocal rotation of said horizontal dispersing blade.

3. The refrigerator as claimed in claim 2, wherein said transmission part comprises:

a guide member having a guide groove parallel with said horizontal axis; and

an operation bar being installed on said guide member so as to be capable of sliding along said guide groove, said operation bar being disposed vertically so as to be parallel with said horizontal dispersing blade, said operation bar of which one end is contacted with said cam and the other end is engaged with said horizontal dispersing blade.

4. The refrigerator as claimed in claim 3, wherein said horizontal dispersing blade has an operation groove formed horizontally on a part thereof, and said operation bar is engaged with said operation groove by being inserted thereinto.

5. The refrigerator as claimed in claim 3, wherein said operation bar is formed with a guide rib on a part thereof, said guide rib being accommodated in said guide groove, said guide rib for guiding a sliding of

said operation bar.

6. The refrigerator as claimed in claim 3, wherein said guide member is fixed on said duct plate.

7. The refrigerator as claimed in claim 3, wherein a plurality of said discharge ports, and a plurality of said horizontal dispersing blades respectively corresponding to said plurality of discharge ports are provided.

8. The refrigerator as claimed in claim 7, wherein

a pair of said discharge ports are formed at an upper area and a lower area of said duct plate, respectively; and

a pair of said horizontal dispersing blades are provided so as to correspond to said pair of discharge ports, respectively.

9. The refrigerator as claimed in claim 8, wherein said transmission part is disposed between said pair of discharge ports.

10. The refrigerator as claimed in claim 9, wherein said pair of horizontal dispersing blades are rotatable independently of each other, and a pair of said transmission parts respectively corresponding to said pair of horizontal dispersing blades are provided.

11. The refrigerator as claimed in claim 10, wherein said pair of horizontal dispersing blades are rotated oppositely to each other by said pair of transmission parts, respectively.

12. The refrigerator as claimed in claim 3, further comprising:

a plurality of vertical dispersing blades of planar plate shape being installed in said cool air duct so as to be capable of rotating around horizontal shafts respectively, said vertical dispersing blades being disposed parallel with each other, said vertical dispersing blades for dispersing cool air in said cool air duct vertically according to a rotational position thereof; and
a means for reciprocally rotating said vertical dispersing blades within a predetermined angle.

13. The refrigerator as claimed in claim 12, wherein said reciprocally rotating means comprises:

a link member being assembled with said vertical dispersing blades at positions distanced from said horizontal shafts, said link member

being disposed vertically; and

a means for elevating/de-elevating said link member according to a reciprocal sliding of said operation bar.

14. The refrigerator as claimed in claim 13, wherein said elevating/de-elevating means comprises an elevation/de-elevation member being rotatably fixed on a predetermined position and having a pair of slots spaced by a predetermined angle, said slots being respectively assembled with an operating protrusion formed on said operation bar and an elevating/de-elevating protrusion formed on said link member.

15. The refrigerator as claimed in claim 2, wherein said horizontal dispersing blade has an assembly protrusion having a predetermined angle with respect to a plane thereof, and a hinge pin formed on said assembly protrusion; and said transmission part comprises, a guide member having a guide groove parallel with said horizontal axis, and an operation bar being installed on said guide member so as to be capable of sliding along said guide groove, said operation bar of which one end is contacted with said cam and the other end is formed with a slot for accommodating said hinge pin.

16. The refrigerator as claimed in claim 2, wherein said rotating means is a stepping motor.

FIG. 1
(PRIOR ART)

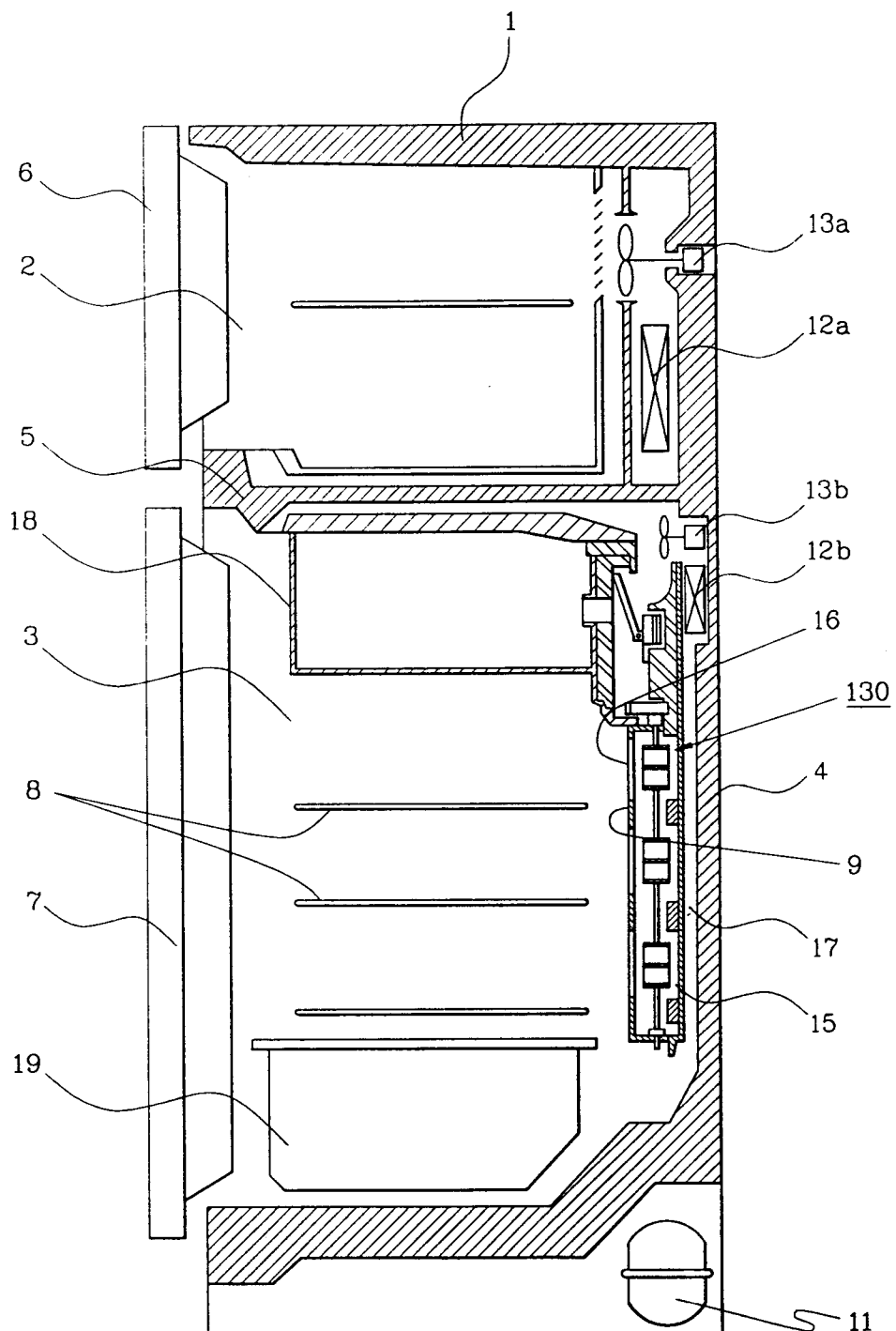


FIG. 2
(PRIOR ART)

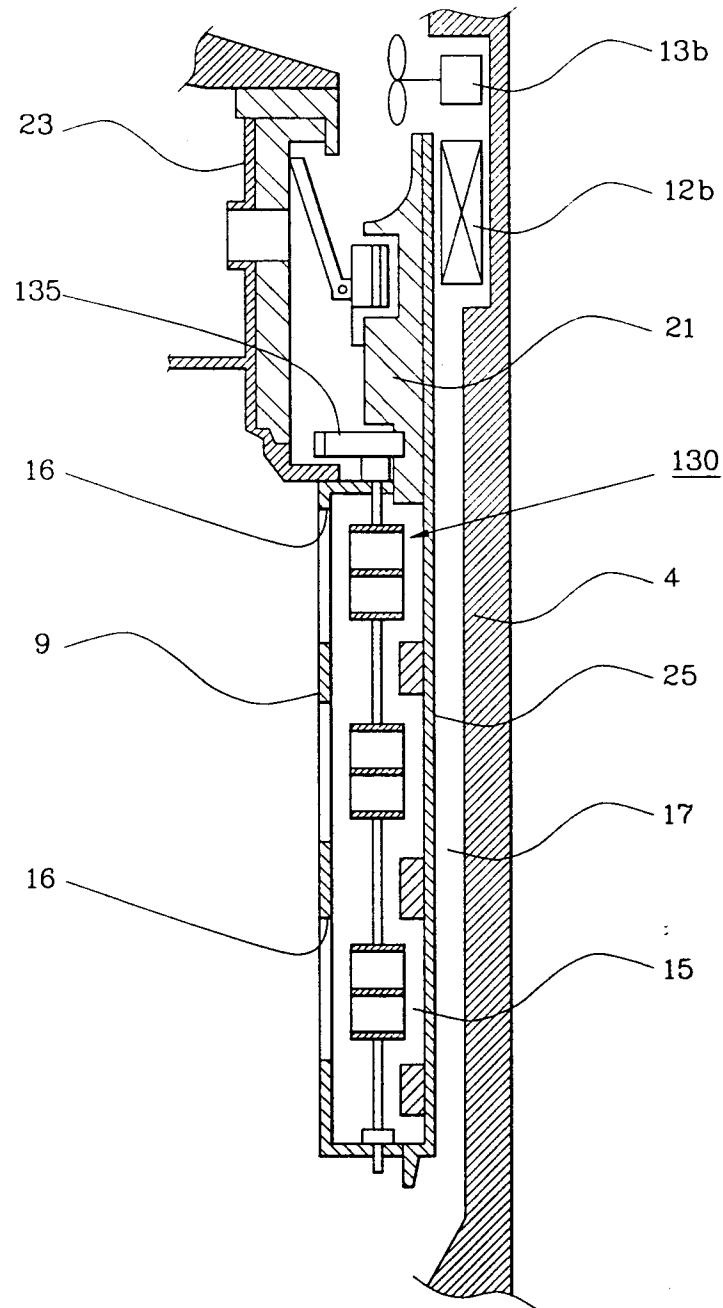


FIG. 3
(PRIOR ART)

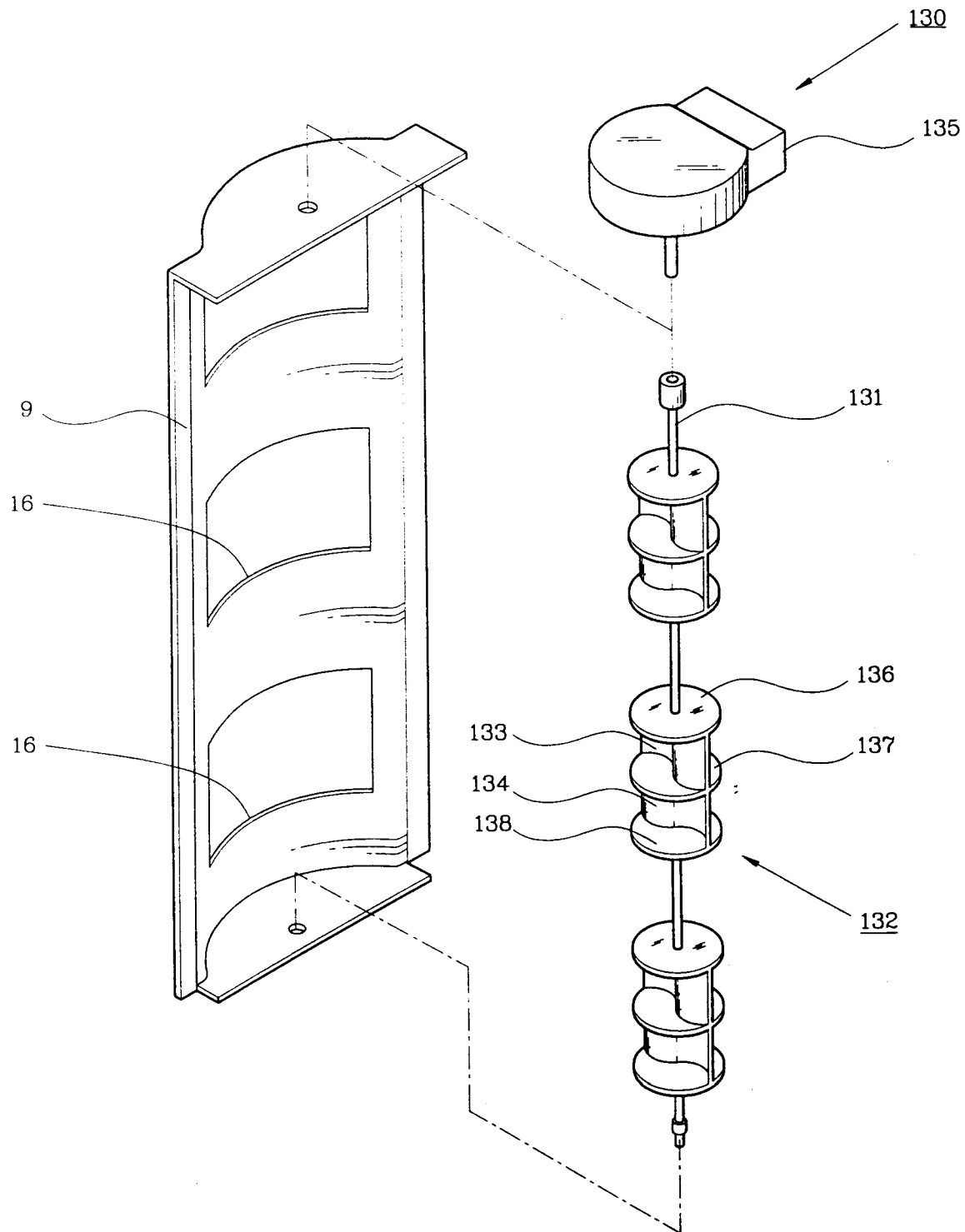


FIG. 4

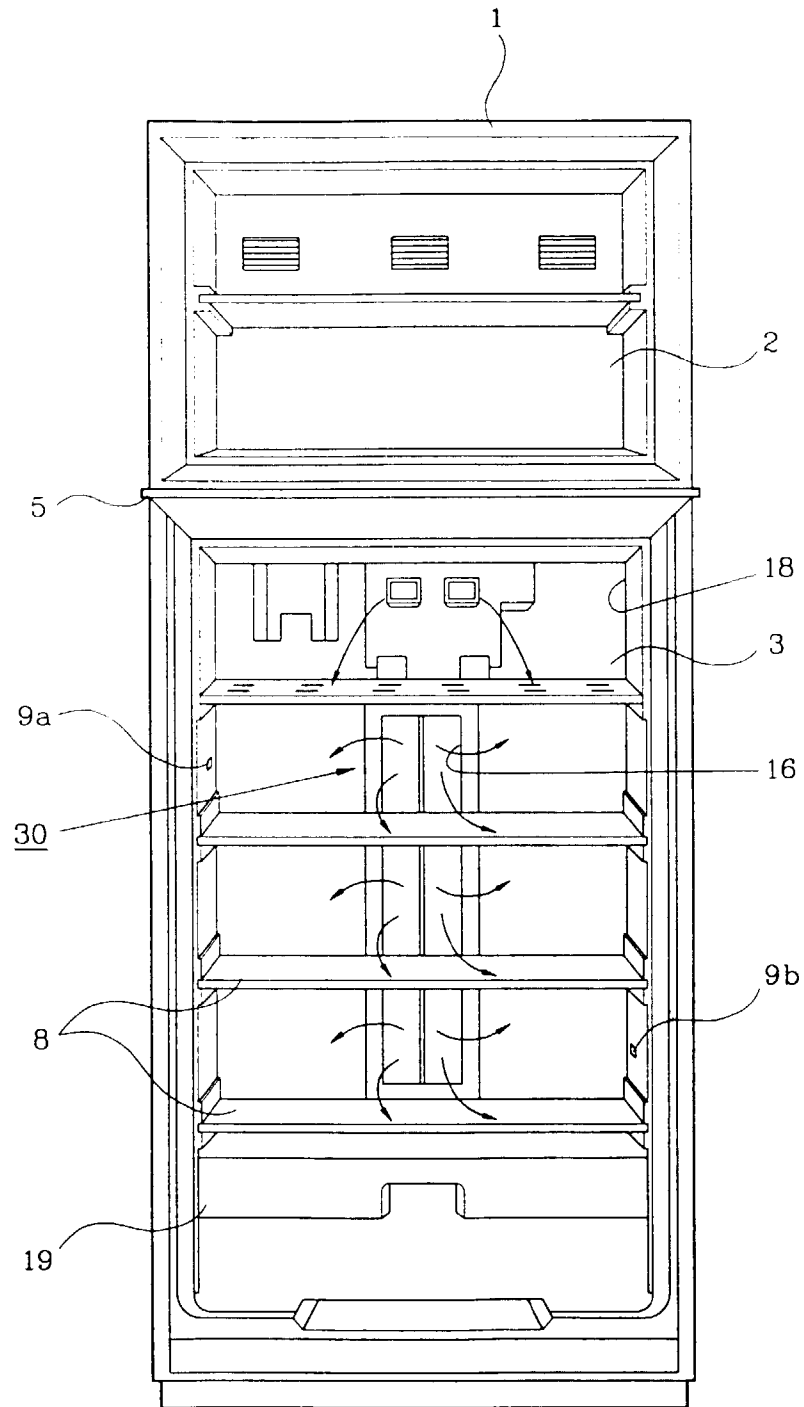


FIG. 5

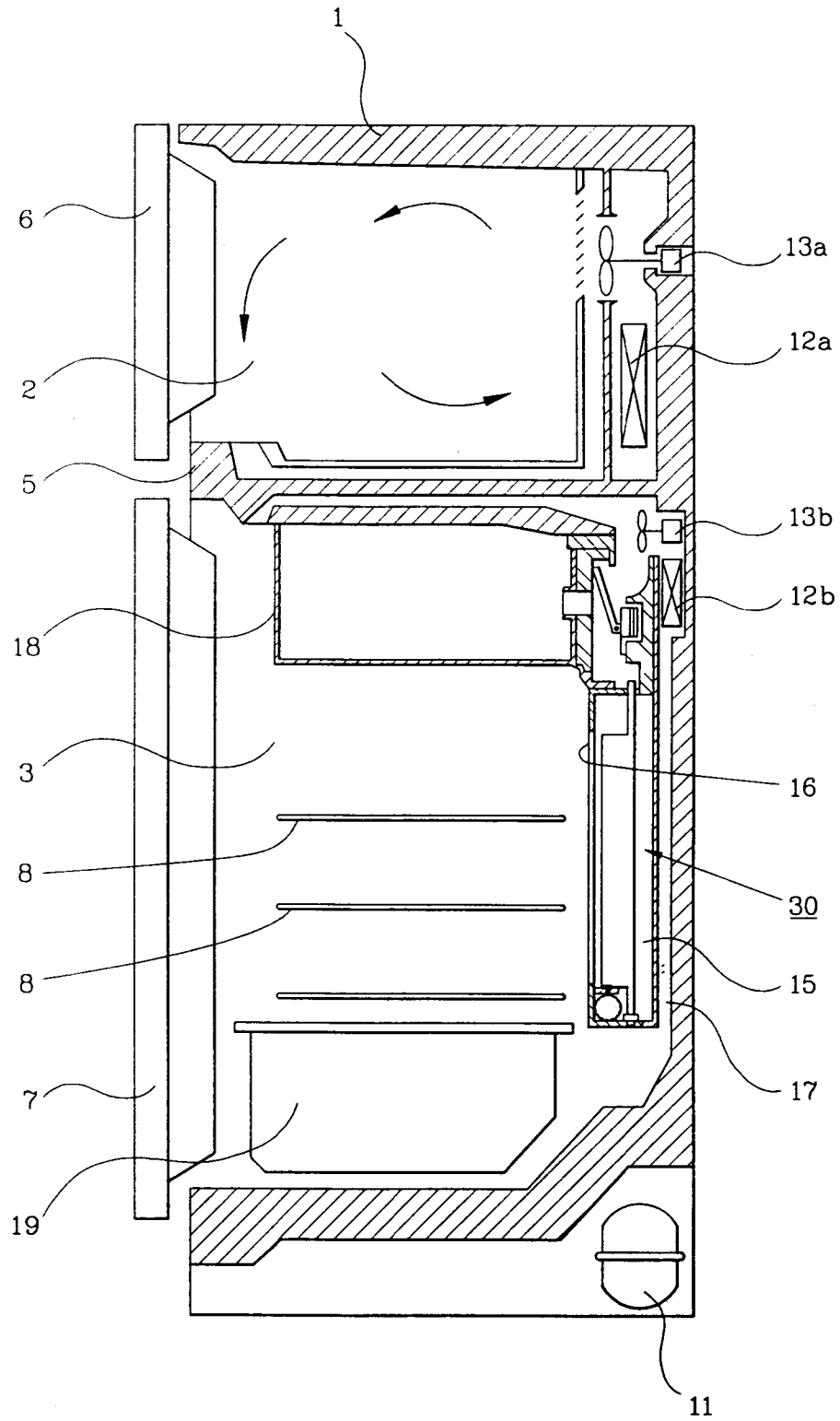


FIG. 6

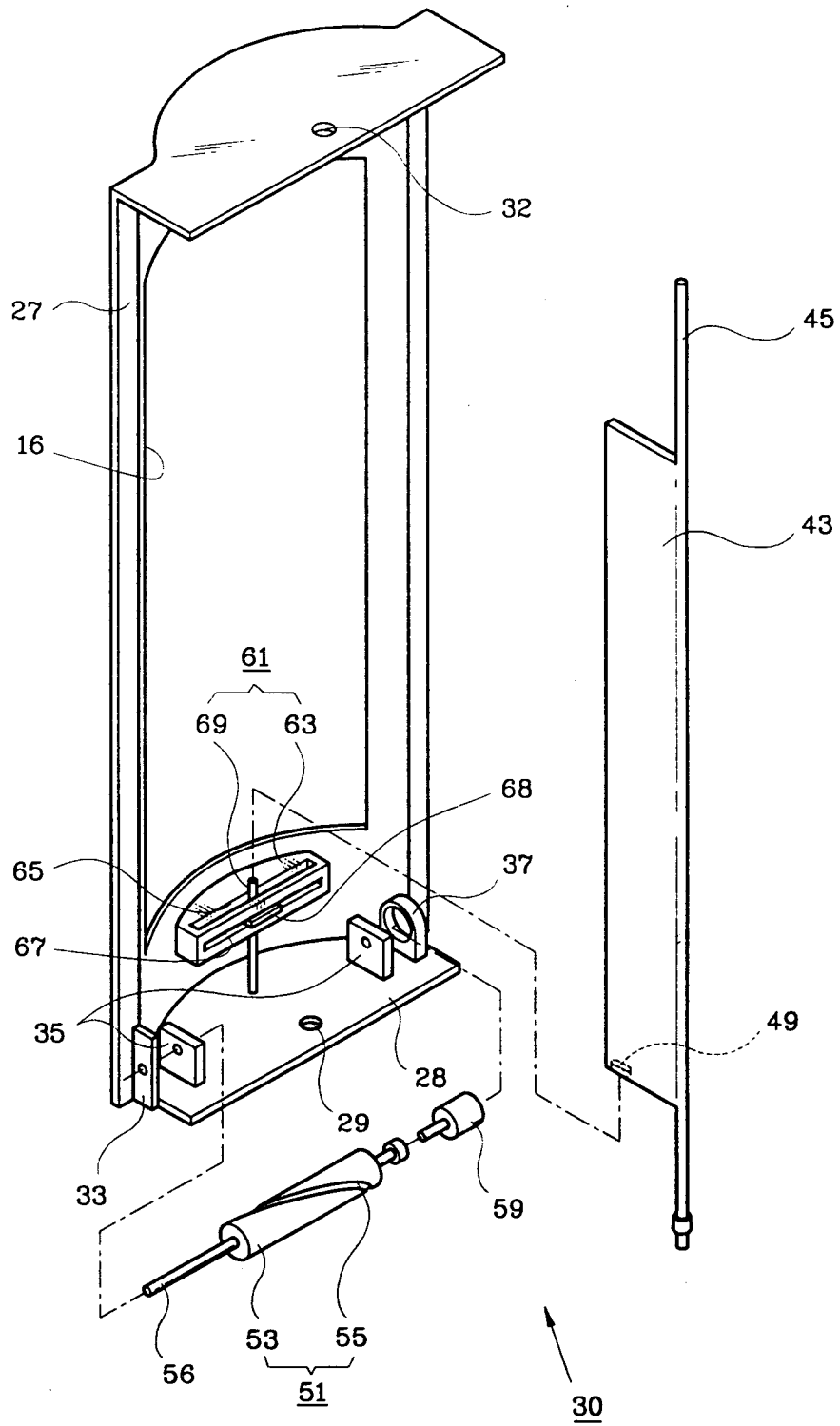


FIG. 7

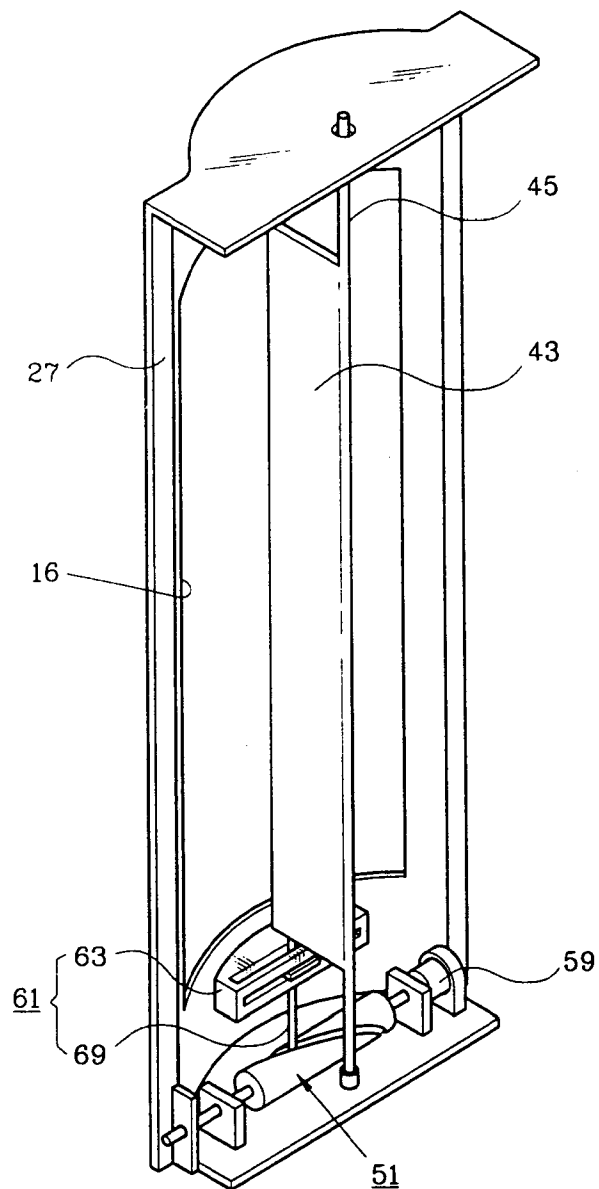


FIG. 8

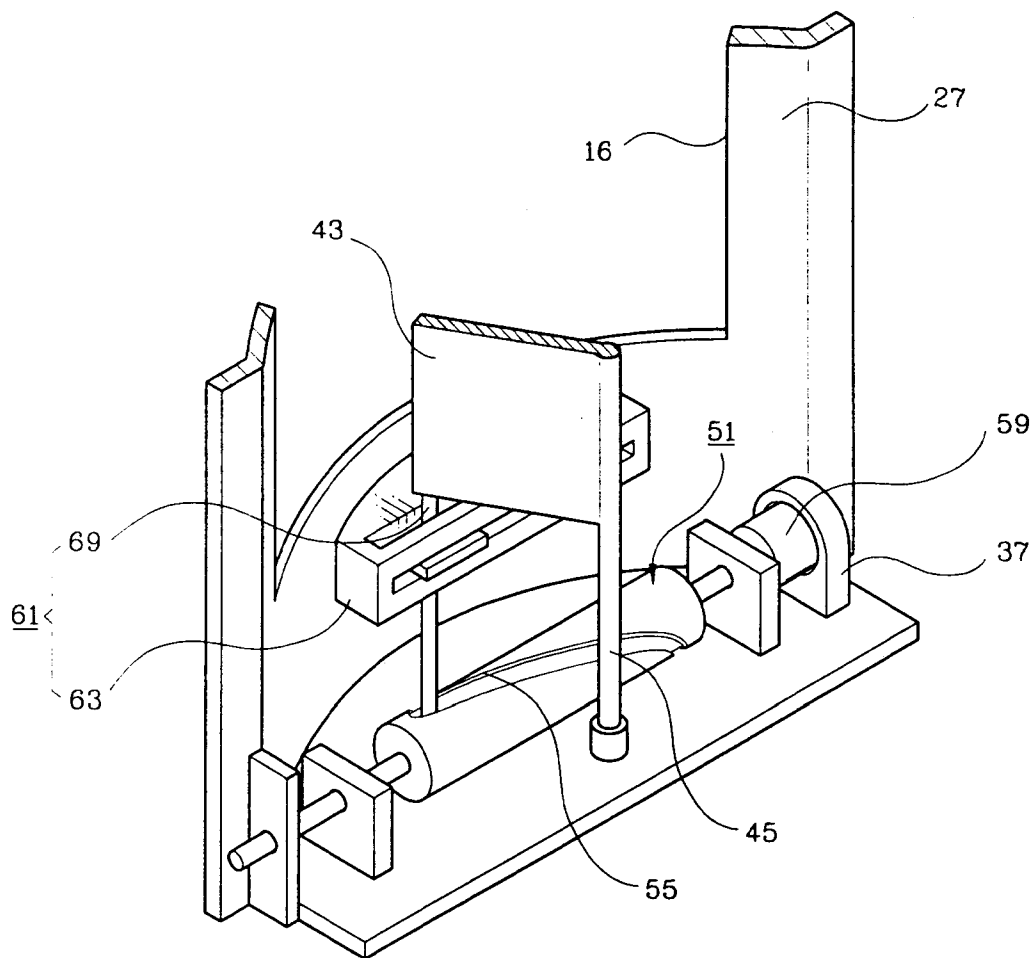


FIG. 9

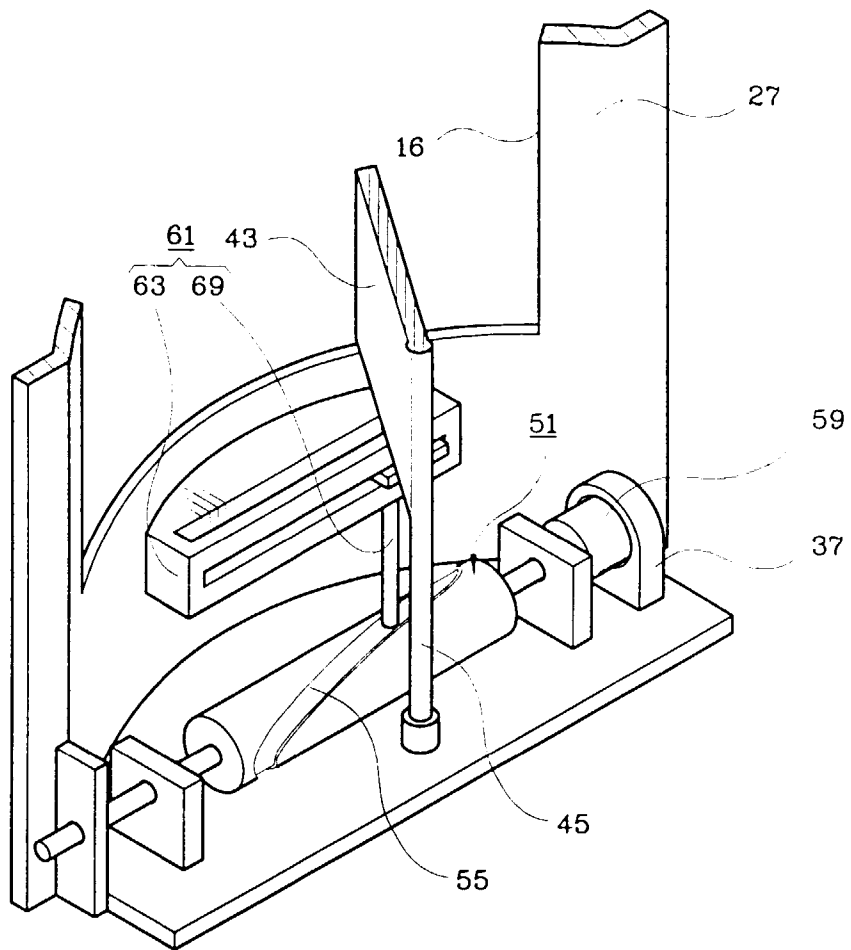


FIG. 10

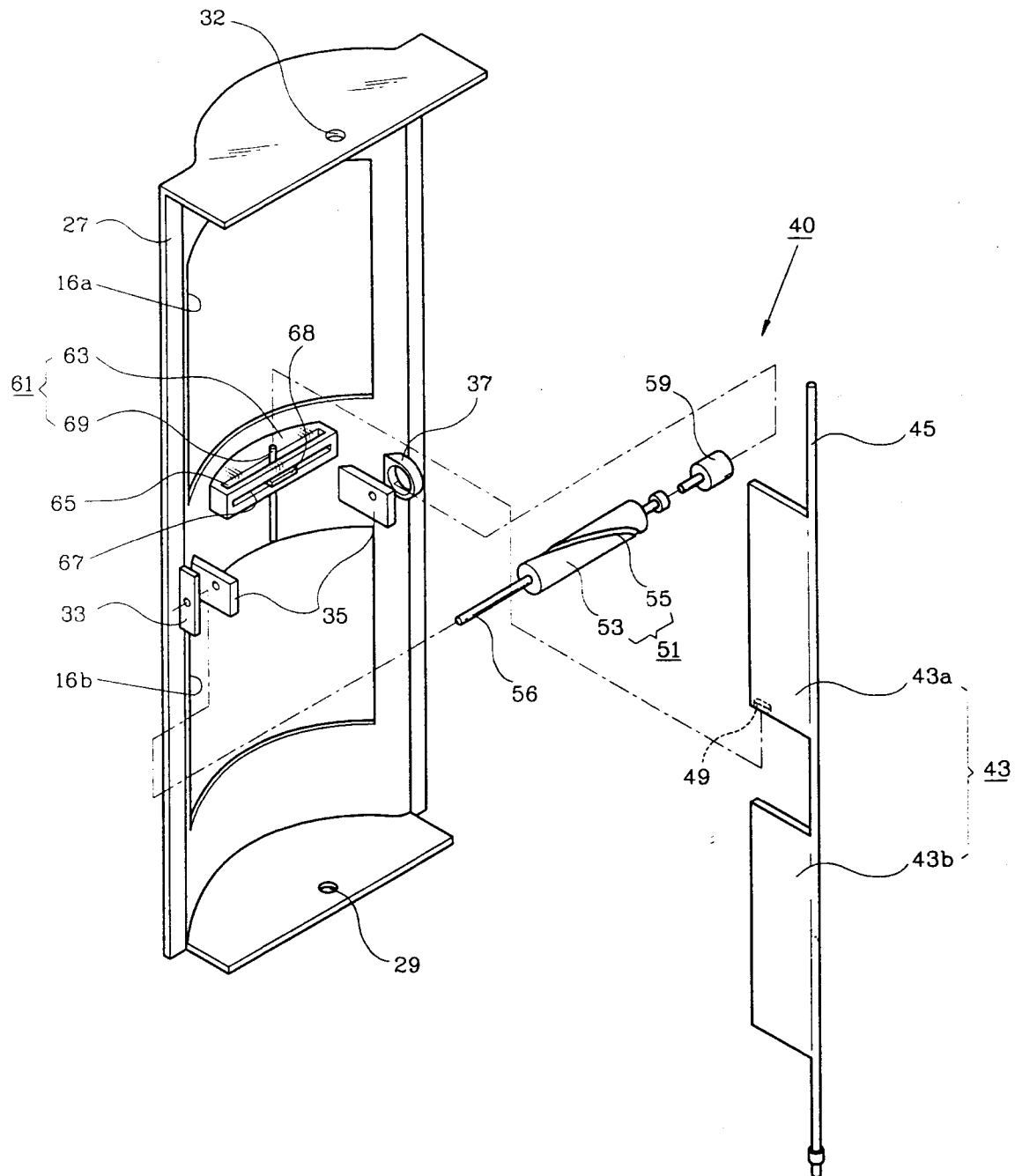


FIG. 11

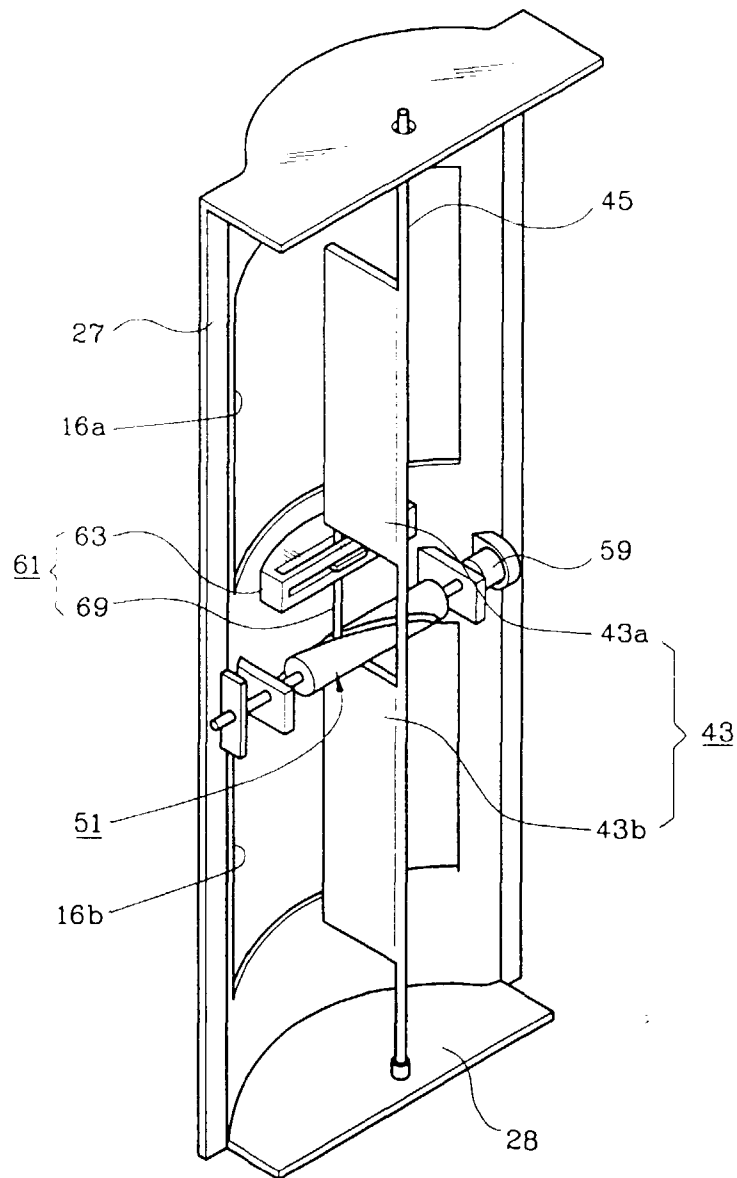


FIG. 12

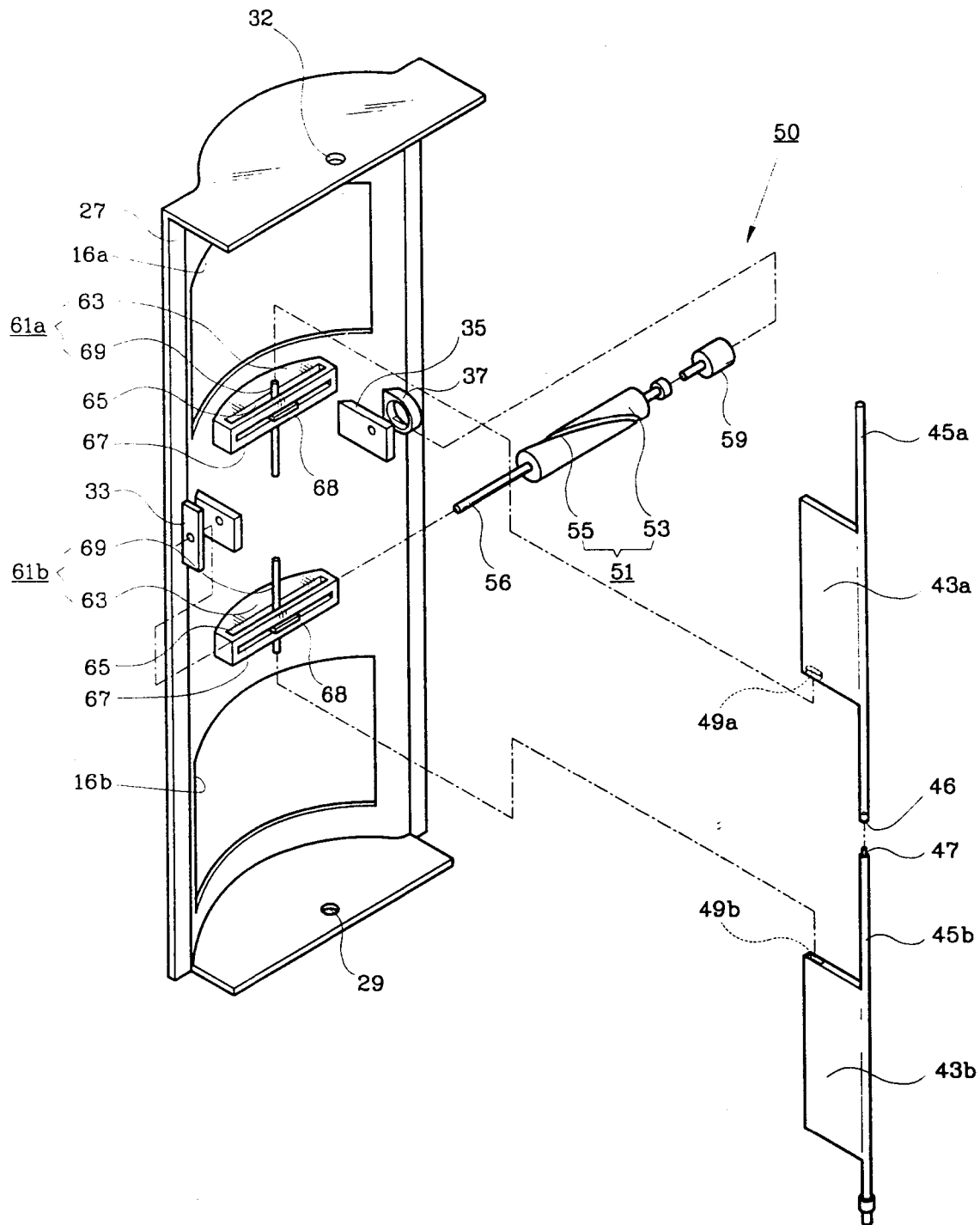


FIG. 13

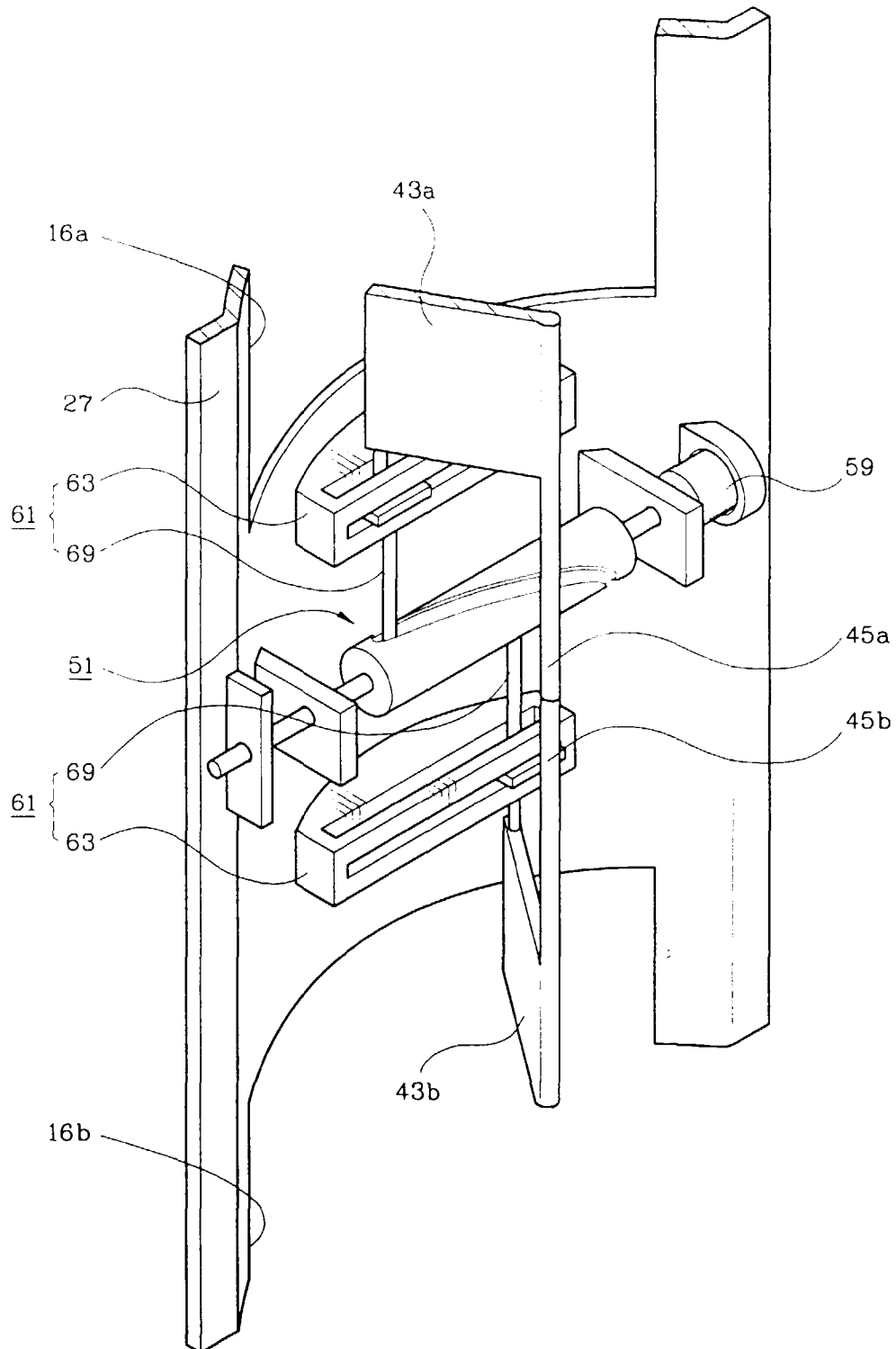


FIG. 14

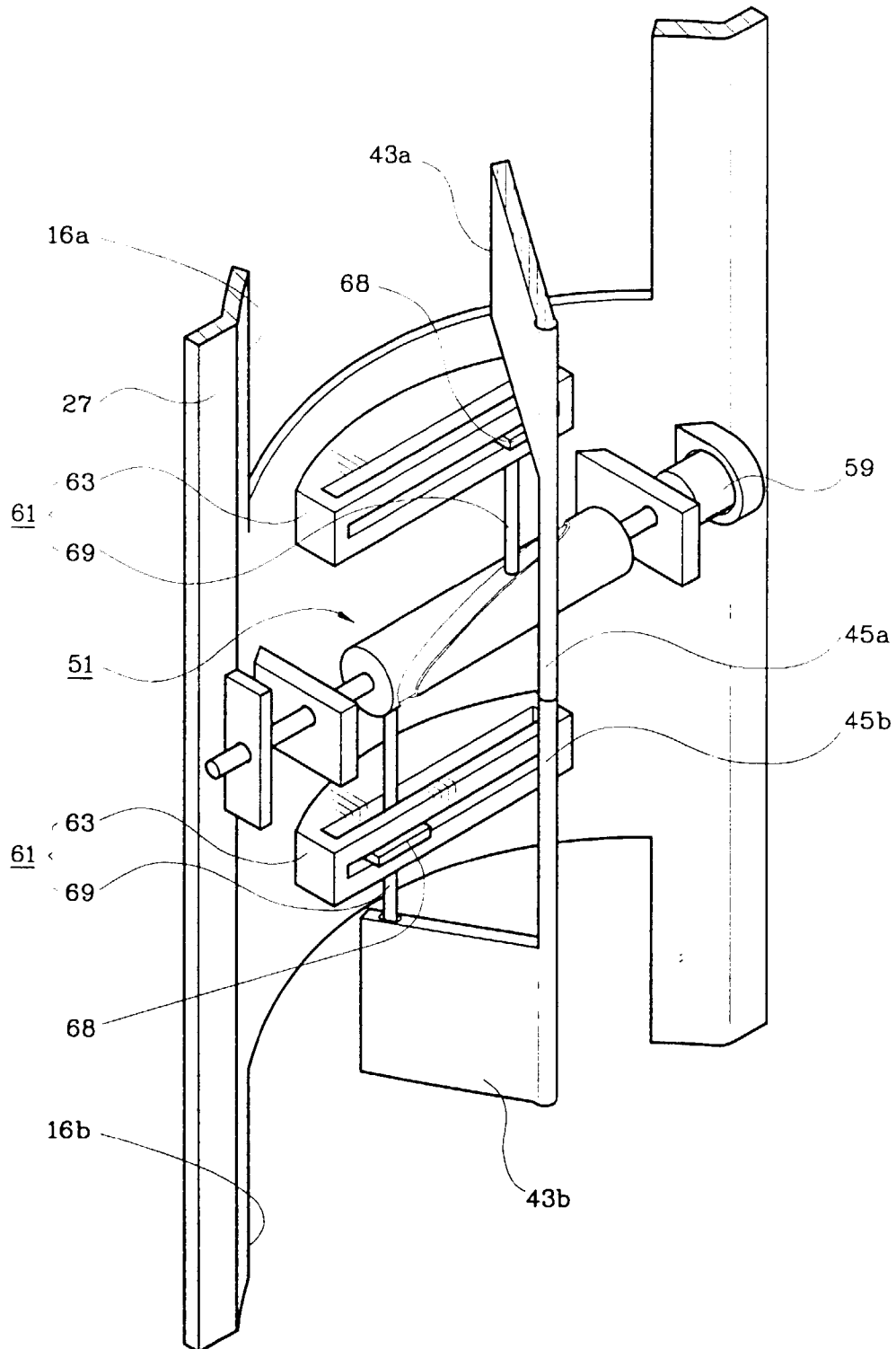


FIG. 15

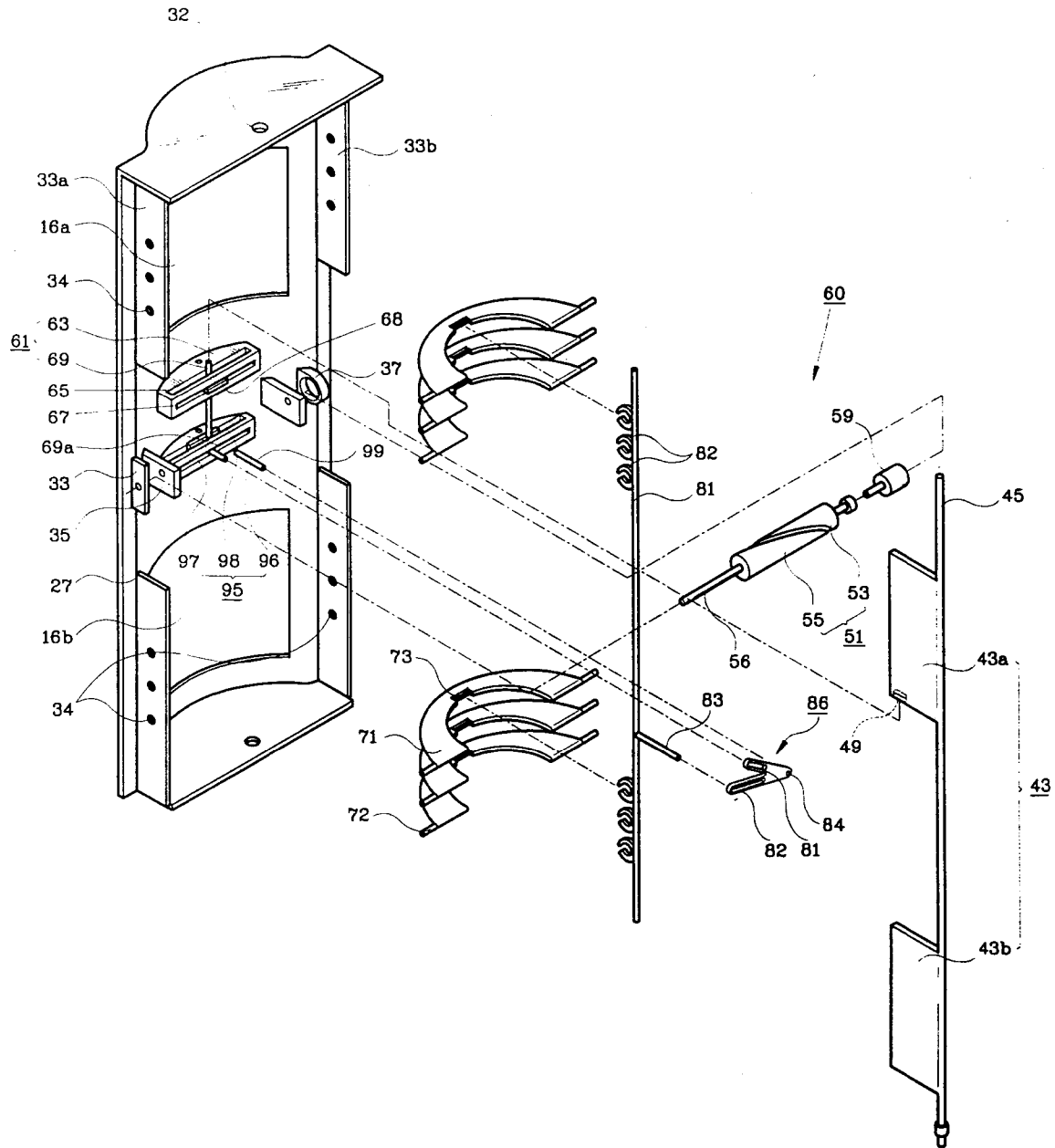


FIG. 16

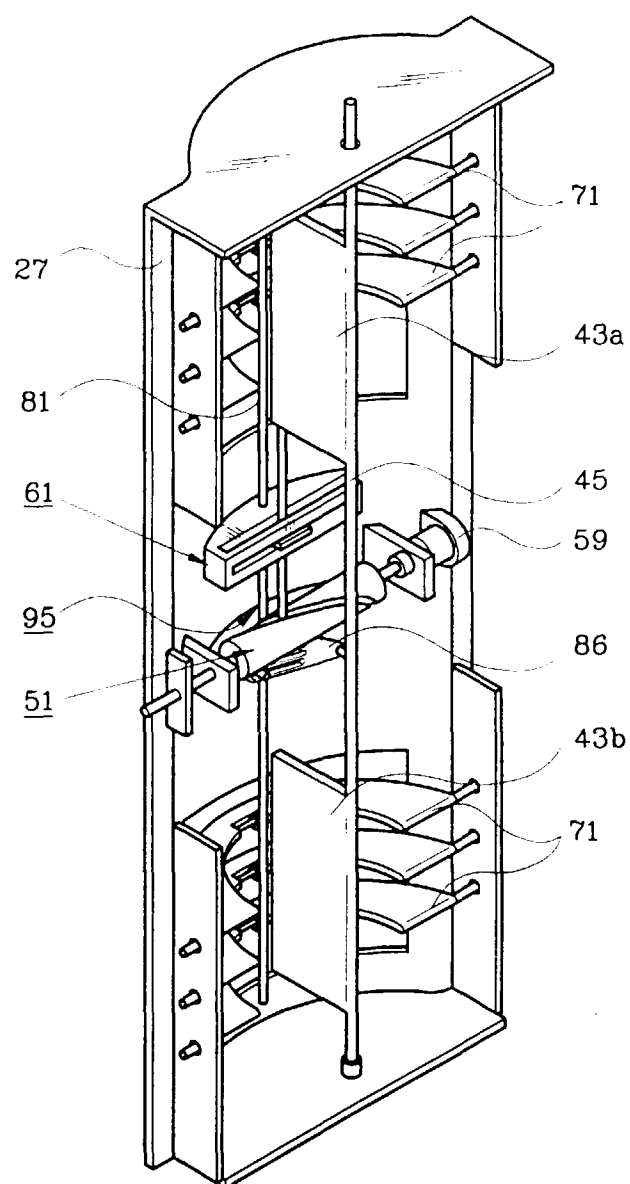


FIG. 17

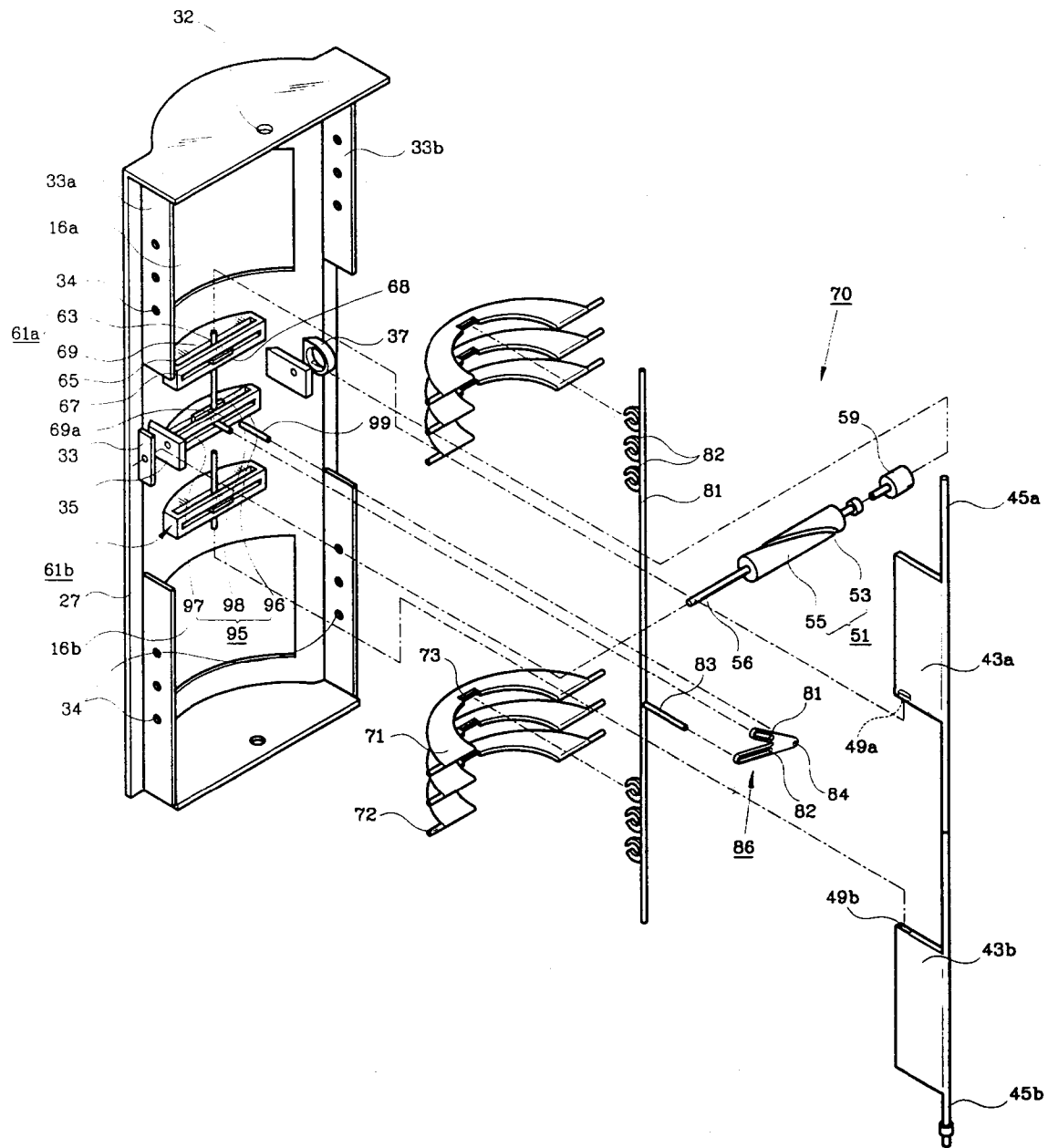


FIG. 18

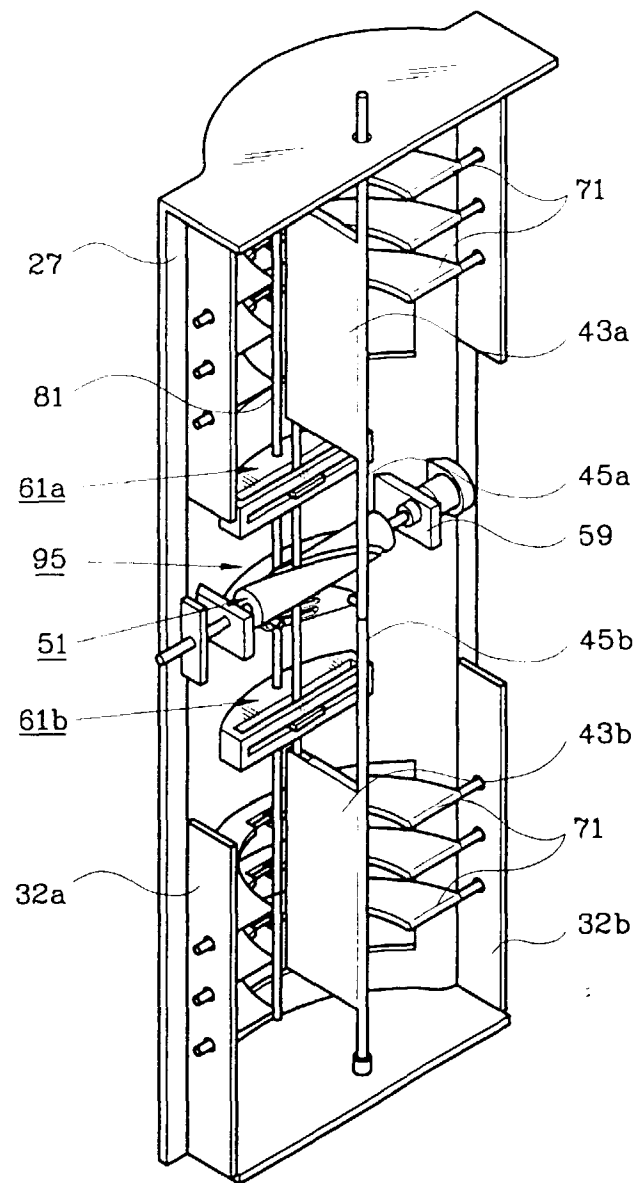


FIG. 19

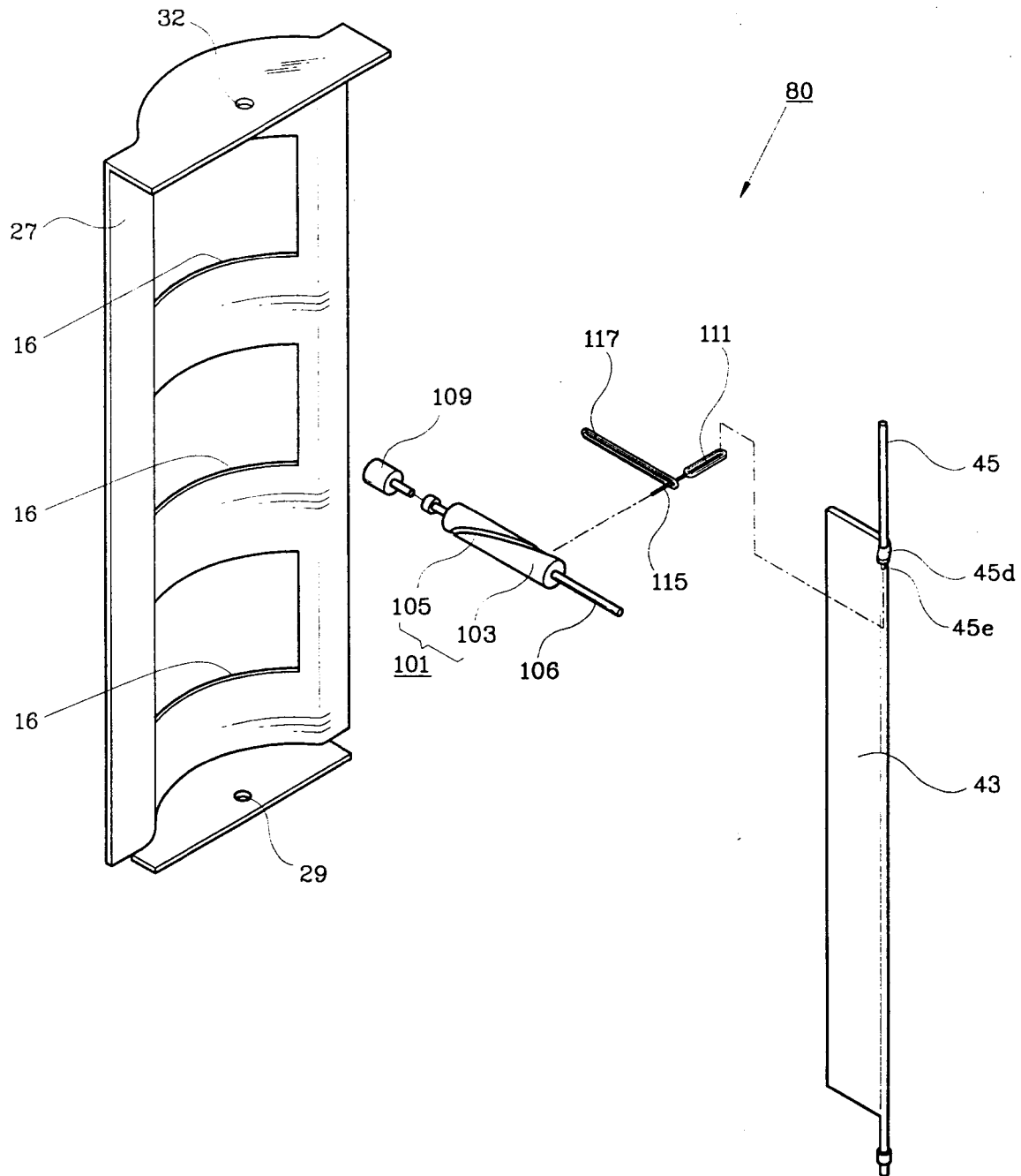


FIG. 20

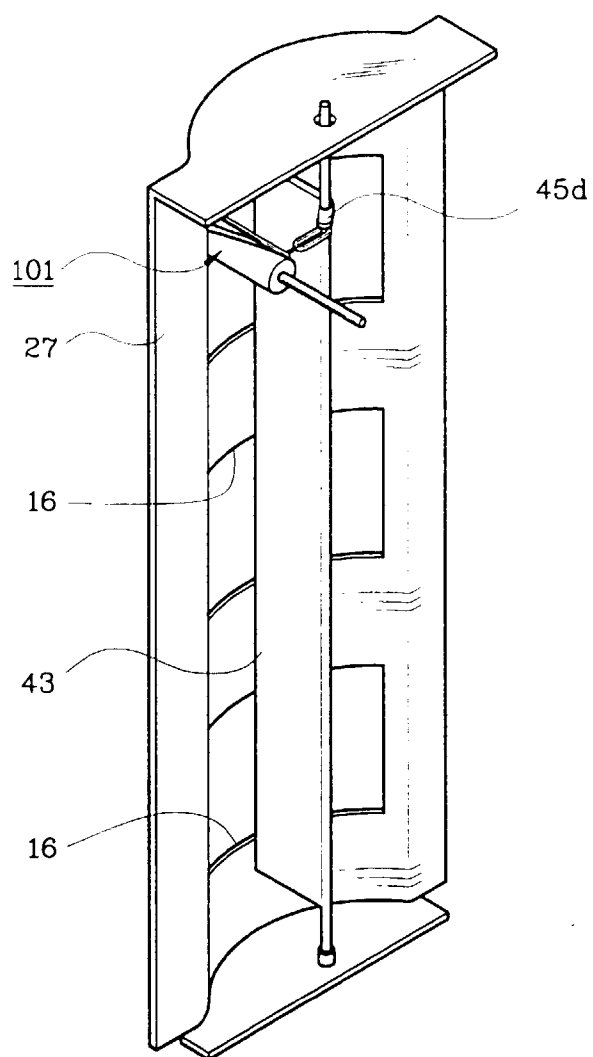


FIG. 21

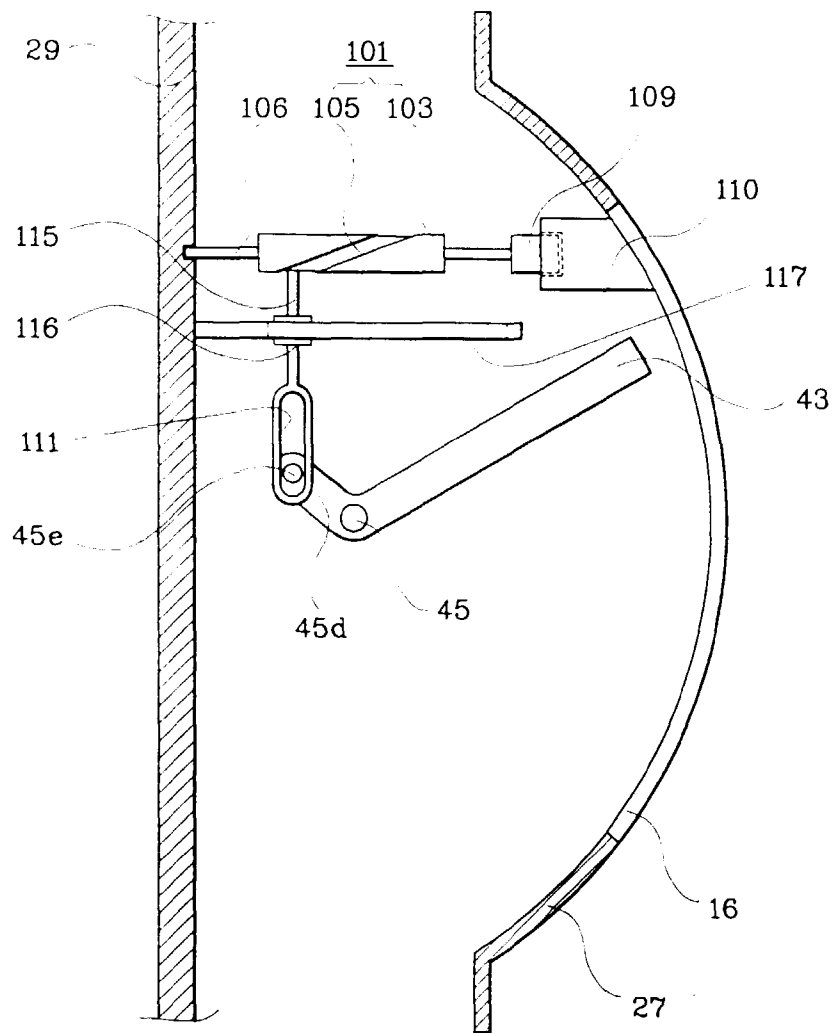


FIG. 22

