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- **Qingdao Haier Refrigerator Co., Ltd**
Qingdao, Shandong 266101 (CN)
- **Aqua Co., Ltd.**
Tokyo 103-0012 (JP)

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(72) Inventors:
• **TOYOSHIMA, Masashi**
Tokyo 103-0012 (JP)
• **KOMATSU, Hajime**
Tokyo 103-0012 (JP)

(71) Applicants:
• **Haier Smart Home Co., Ltd.**
Qingdao, Shandong 266101 (CN)

(74) Representative: **Lavoix**
Bayerstraße 83
80335 München (DE)

(54) **SHIELDING DEVICE AND REFRIGERATOR HAVING SAME**

(57) The present invention aims to provide a shielding device (70) that occupies less volume of storage compartments, and a refrigerator (10, 100). The shielding device (70) is used to properly close air passages (109) for supplying cold air in the refrigerator (10, 100). The shielding device (70) comprises: a plurality of rotatable shielding walls (71, 711, 712, 713, 714, 715) disposed surrounding a blower (47) from radially outside, and

shielding wall driving mechanisms (60, 601, 602) configured to drive the rotatable shielding walls (71, 711, 712, 713, 714, 715) to perform the opening or closing action. With a plurality of shielding wall driving mechanisms (60, 601, 602) being provided, the shielding device (70) improves a degree of freedom of the rotatable shielding walls (71, 711, 712, 713, 714, 715) in performing the opening or closing action.

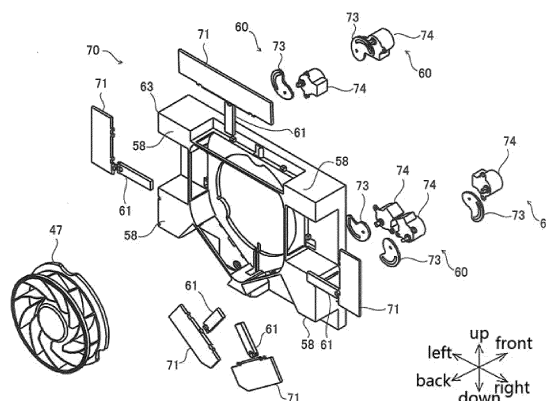


Fig. 5(A)

Description

TECHNICAL FIELD

[0001] The present invention relates to a shielding device and a refrigerator having the same, and particularly to a shielding device for properly closing an air passage connecting a cooling chamber with a storage compartment, and a refrigerator having the shielding device.

BACKGROUND

[0002] Conventionally, a refrigerator disclosed in patent document D1 (JP Patent Laid-open 2013-2664) is known in which a plurality of storage compartments are cooled properly by a cooler.

[0003] FIG 28 illustrates a refrigerator 100 disclosed in D1. In the refrigerator 100 shown in the figure, a refrigerating compartment 101, a freezing compartment 102 and a vegetable compartment 103 are formed from top to bottom. A cooling chamber 104 accommodating a cooler 108 is formed on an inner side of the freezing compartment 102, an opening portion 106 is formed in a partition wall 105 which partitions the cooling chamber 104 from the freezing compartment 102, and the opening portion 106 is used to supply cold air to each storage compartment. In addition, a blower fan 107 for blowing cold air is disposed at the opening portion 106, and a blower cover 110 for covering the blower fan 107 is disposed on the side of the freezing compartment 102. A damper 114 is disposed in an air passage 109 through which the cold air supplied to the refrigerating compartment 101 flows.

[0004] The blower cover 110 is described in detail with reference to FIG 29. The blower cover 110 is formed with a recess 111 having a substantially rectangular shape, and an opening portion 113 is formed by notching an upper portion of the recess 111. Here, when the blower cover 110 covers the blower fan 107, the opening portion 113 of the blower cover 110 communicates with the air passage 109 on the side of the main body of the refrigerator.

[0005] During operation of the refrigerator 100 with the above configuration, when the refrigerating compartment 101 and the freezing compartment 102 are cooled simultaneously, the blower cover 110 is separated from the blower fan 107, the damper 114 is opened, and the blower fan 107 rotates in this state. As such, part of the cold air cooled by the cooler 108 in the cooling chamber 104 is blown into the freezing compartment 102 by a blowing force of the blower fan 107. In addition, a remaining part of the cold air is blown into the refrigerating compartment 101 via the air passage 109, the damper 114 and the air passage 109. Thereby, both the freezing compartment 102 and the refrigerating compartment 101 are cooled.

[0006] On the other hand, when only the refrigerating compartment 101 needs to be cooled, the blower fan 107 is covered by the blower cover 110, the damper 114 is

opened, and the blower fan 107 blows the cold air cooled by the cooler 108 in this state. When the blower cover 110 is in a closed state, the opening portion 113 formed in the upper portion of the blower cover 110 communicates with the air passage 109. Therefore, the cold air blown by the blower fan 107 is supplied to the refrigerating compartment 101 via the opening portion 113, the damper 114 and the air passage 109.

[0007] As described above, a plurality of storage compartments can be cooled with one cooler 108 by using the blower cover 110 formed with the opening portion 113.

[0008] However, the blower cover 110 having the abovementioned configuration closes the opening portion 106 of the cooling chamber 104 by moving backward, and opens the opening portion 106 of the cooling chamber 104 by moving forward. In addition, a driving mechanism for driving the blower cover 110 to move in a front-rear direction needs to be disposed.

[0009] The blower cover 110 needs a space for opening and closing operations in the front-rear direction. Therefore, in the interior of the refrigerator 100, a large space is required for opening and closing the blower cover 110. As a result, there occurs the following problem: an internal volume of the freezing compartment 102 formed in front of the blower cover 110 is reduced, and the amount of articles that can be accommodated in the freezing compartment 102 is limited. In addition, a driving sound is generated when the blower cover 110 is moved in the front-rear direction by a motor, and the driving sound might be uncomfortable to the user when it is loud.

SUMMARY

[0010] In view of the above situations, an object of the present invention is to provide a shielding that does not occupy the internal volume of the refrigerator and exhibits a small driving sound, and a refrigerator having the shielding device.

[0011] In order to achieve the above-mentioned object, an embodiment of the present invention provides a shielding device, wherein the shielding device is configured to close air passages through which cold air is blown in a refrigerator, the shielding device comprising: a plurality of rotatable shielding walls disposed surrounding a blower from radially outside, and a shielding wall driving mechanism configured to drive the rotatable shielding wall to rotate, a plurality of the shielding wall driving mechanisms are disposed.

[0012] As a further improvement of one embodiment of the present invention, each of the rotatable shielding walls is provided with one of the shielding wall driving mechanisms.

[0013] As a further improvement of one embodiment of the present invention, the shielding wall driving mechanism comprises: a cam rotatably connected with the rotatable shielding wall; a rotary disk formed with a slot for moving the cam; and a drive motor for driving the

rotary disk to rotate.

[0014] As a further improvement of one embodiment of the present invention, the shielding wall driving mechanism comprises: a cam rotatably connected with the rotatable shielding wall; and a solenoid for moving the cam.

[0015] Another embodiment of the present invention provides a refrigerator, comprising: a freezing circuit having a cooler for cooling air to be supplied through air passages to storage compartments, a cooling chamber formed with an air blowing port communicated with the storage compartments, the cooler being disposed in the cooling chamber, a blower configured to blow air supplied through the air blowing port to the storage compartments, and the shielding device as mentioned above at least partially closing the air passages.

[0016] Effects of the present invention are as follows: in the shielding device according to the present invention, a plurality of shielding wall driving mechanisms can enable the respective rotatable shielding walls to act respectively, and the degree of freedom of the rotatable shielding walls as a whole in performing the opening or closing action can be improved.

[0017] In addition, the shielding wall driving mechanisms are disposed corresponding to respective rotatable shielding walls, so that each of the rotatable shielding walls can achieve its own rotation, and the degree of freedom of the rotatable shielding walls in performing the opening or closing action can be further improved.

[0018] In addition, in the present invention, the rotatable shielding walls are opened and closed through a simple configuration including the drive motors.

[0019] In addition, in the present invention, the rotatable shielding walls are opened and closed through a simple configuration including the solenoids.

[0020] In addition, since the rotatable shielding walls of the shielding device of the refrigerator of the present invention are driven by a plurality of shielding wall driving mechanisms, the amount of cold air supplied to the storage compartments can be set more accurately, and the temperatures in the storage compartments in the refrigerator can be controlled more accurately.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a front view showing the appearance of a refrigerator according to an embodiment of the present invention.

FIG. 2 is a side cross-sectional view showing an internal structure of the refrigerator according to the embodiment of the present invention.

FIG. 3 is an enlarged side cross-sectional view showing a structure nearby a cooling chamber of the refrigerator according to the embodiment of the present invention.

FIG. 4 is a view showing a state after a shielding device of the refrigerator according to the embodi-

ment of the present invention is assembled, wherein FIG. 4(A) is a perspective view, FIG. 4(B) is a cross-sectional view taken along a section line A-A, and FIG. 4(C) is a schematic view of an air passage as viewed from the rear.

FIG. 5 is a view of the shielding device according to the embodiment of the present invention, wherein FIG. 5(A) is a perspective view, and FIG. 5(B) is an exploded cross-sectional view.

FIG. 6 is a view showing the shielding device according to the embodiment of the present invention, wherein FIG. 6(A) is an exploded perspective view partially showing the shielding device, and FIG. 6(B) is a perspective view of a cam.

FIG. 7 is a view showing the shielding device according to the embodiment of the present invention, wherein FIG. 7(A) is a view of rotatable shielding walls of the shielding device as viewed from the rear, and FIG. 7(B) is a view showing the configuration of rotary disks as viewed from front.

FIG. 8 is a view showing a fully-closed state of the shielding device according to the embodiment of the present invention, wherein FIG. 8(A) is a view showing the shielding device as viewed from the rear, FIG. 8(B) is a cross-sectional view of the shielding device taken along a section line B-B of FIG. 8(A), FIG. 8(C) is a view showing rotary disks as viewed from the front, and FIG. 8(D) is a partially-enlarged view of FIG. 8(B).

FIG. 9 is a view showing a fully-open state of the shielding device according to the embodiment of the present invention, wherein FIG. 9(A) is a view showing the shielding device as viewed from the rear, FIG. 9(B) is a cross-sectional view of the shielding device taken along a section line C-C, FIG. 9(C) is a view showing rotary disks as viewed from the front, and FIG. 9(D) is a partially-enlarged view of FIG. 9(B).

FIG. 10 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the lower freezing compartment only, wherein FIG. 10(A) is a view showing the shielding device, and FIG. 10(B) is a view showing rotary disks and so on.

FIG. 11 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the lower freezing compartment only, as viewed from the rear.

FIG. 12 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the freezing compartment only, wherein FIG. 12(A) is a view showing the shielding device, and FIG. 12(B) is a view showing rotary disks and so on.

FIG. 13 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the freezing compartment only, as viewed from the rear.

FIG. 14 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the upper freezing compartment only, wherein FIG. 14(A) is a view showing the shielding device, and FIG. 14(B) is a view showing rotary disks and so on.

FIG. 15 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the upper freezing compartment as a whole only, as viewed from the rear.

FIG. 16 is a view showing a state when the shielding device according to the embodiment of the present invention does not supply cold air, wherein FIG. 16(A) is a view showing the shielding device, and FIG. 16(B) is a view showing rotary disks and so on. FIG. 17 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention does not supply cold air, as viewed from the rear.

FIG. 18 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the refrigerating compartment only, wherein FIG. 18(A) is a view showing the shielding device, and FIG. 18(B) is a view showing rotary disks and so on.

FIG. 19 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the refrigerating compartment only, as viewed from the rear.

FIG. 20 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the upper freezing compartment and the refrigerating compartment, wherein FIG. 20(A) is a view showing the shielding device, and FIG. 20(B) is a view showing rotary disks and so on.

FIG. 21 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the upper freezing compartment and refrigerating compartment, as viewed from the rear.

FIG. 22 is a view showing a state when the shielding device according to the embodiment of the present invention supplies cold air to the freezing compartment as a whole and the refrigerating compartment, wherein FIG. 22(A) is a view showing the shielding device, and FIG. 22(B) is a view showing rotary disks and so on.

FIG. 23 is a view showing conditions of air passages when the shielding device according to the embodiment of the present invention supplies cold air to the freezing compartment as a whole and refrigerating compartment, as viewed from the rear.

FIG. 24 is a view of a shielding device according to another embodiment of the present invention, wherein FIG. 24(A) is an exploded perspective view,

and FIG. 24(B) is an enlarged cross-sectional view of a shielding wall driving mechanism.

FIG. 25 is a view showing a fully-closed state of the shielding device according to the another embodiment of the present invention, wherein FIG. 25(A) is a view of the shielding device as viewed from the rear, FIG. 25(B) is a cross-sectional view of the shielding device taken along a section line D-D of FIG. 25(A), FIG. 25(C) is a view showing a solenoid and so on as viewed from the front, and FIG. 25(D) is a partially-enlarged view of FIG. 25(B).

FIG. 26 is a view showing a fully-open state of the shielding device according to the another embodiment of the present invention, wherein FIG. 26(A) is a view of the shielding device as viewed from the rear, FIG. 26(B) is a cross-sectional view of the shielding device taken along a section line E-E of FIG. 26(A), FIG. 26(C) is a view showing a solenoid and so on as viewed from the front, and FIG. 26(D) is a partially-enlarged view of FIG. 26(B).

FIG. 27 is a view of a shielding device according to a further embodiment of the present invention.

FIG. 28 is an enlarged cross-sectional view of a refrigerator according to the background art.

FIG. 29 is a perspective view of a blower cover used in the refrigerator according to the background art.

DETAILED DESCRIPTION

[0022] The figures are only for illustrative purposes and cannot be understood as limiting the present invention; to better illustrate the embodiments, some parts of the figures may be omitted, enlarged or reduced, and do not represent the dimensions of the actual product; those skilled in the art appreciate that some well-known structures in the figures and depictions thereof may be omitted.

[0023] Hereinafter, a shielding device 70 and a refrigerator 10 according to embodiments of the present invention will be described in detail based on the figures. In the following depictions, the same component is denoted by the same symbol in principle, and repeated depictions will be omitted. In addition, in the following depictions, directions such as up, down, front, back, left and right are appropriately used, wherein left and right indicate left and right when the refrigerator 10 is viewed from the rear. Furthermore, in the following depictions, rotation directions will be expressed by clockwise direction and counter-clockwise direction. These rotation directions indicate directions as viewed from a back side of the refrigerator 10. In addition, in the following depictions, the clockwise direction is sometimes referred to as a forward direction, and the counter-clockwise direction is sometimes referred to as a reverse direction.

[0024] FIG 1 is a front view showing the appearance of a refrigerator 10 according to the present embodiment. As shown in FIG 1, the refrigerator 10 comprises a heat-insulating cabinet 11 as a main body, and storage com-

partments for storing foods and the like are formed in the heat-insulating cabinet 11. As for the storage compartments, the uppermost layer is the refrigerating compartment 15, an upper freezing compartment 18 is below the refrigerating compartment 15, a lower freezing compartment 19 is below the upper freezing compartment 18, and the lowermost layer is a vegetable compartment 20. In addition, the upper freezing compartment 18 and the lower freezing compartment 19 are both storage compartments within a freezing temperature range, and they may be collectively referred to as a freezing compartment 17 in the following depictions. Here, the upper freezing compartment 18 may be partitioned in a left-right direction, and one side may be used as an ice making compartment.

[0025] The front of the heat-insulating cabinet 11 comprises an opening, the openings corresponding to the abovementioned storage compartments are each provided with a heat-insulating door 21, and these heat-insulating doors may be opened and closed freely. The refrigerating compartment 15 is divided in the left-right direction and the left and right parts are closed by respective heat-insulating doors 21. Upper and lower ends of the heat-insulating doors 21 on outer sides in a width-wise direction are rotatably mounted on the heat-insulating cabinet 11. In addition, the heat-insulating doors 23, 24 and 25 are integrally assembled with respective storage containers, may be drawn freely along the front of the refrigerator 10, and be supported by the heat-insulating cabinet 11. Specifically, the heat-insulating door 23 closes the upper freezing compartment 18, the heat-insulating door 24 closes the lower freezing compartment 19, and the heat-insulating door 25 closes the vegetable compartment 20.

[0026] FIG 2 is a side cross-sectional view showing the schematic structure of the refrigerator 10. The heat-insulating cabinet 11 as the main body of the refrigerator 10 comprises a housing 12 made of a steel plate with an opening in the front, and a liner 13 made of a synthetic resin, disposed within the housing 12 with a gap between the liner 13 and the housing 12 and having an opening in the front. The gap between the housing 12 and the liner 13 is filled with a heat-insulating material 14 made of foamed polyurethane. In addition, each of the abovementioned heat-insulating doors 21 employs the same heat-insulating structure as the heat-insulating cabinet 11.

[0027] The refrigerating compartment 15 and the freezing compartment 17 located at the layer therebelow are partitioned by a heat-insulating partition wall 42. In addition, the upper freezing compartment 18 and the lower freezing compartment 19 disposed at the layer therebelow communicate with each other, and the cooled air, namely, the cold air may circulate freely. Furthermore, the freezing compartment 17 and the vegetable compartment 20 are partitioned by a heat-insulating partition wall 43.

[0028] The rear of the refrigerating compartment 15 is

partitioned by a partition 65 made of a synthetic resin to form a refrigerating compartment cold air supply passage 29 for supplying cold air to the refrigerating compartment 15. In the refrigerating compartment cold air supply passage 29, air outlets 33 through which cold air flows into the refrigerating compartment 15 are formed.

[0029] A freezing compartment cold air supply passage 31 is formed on an inner side of the refrigerating compartment 17, and cold air cooled by a cooler 45 flows through the freezing compartment cold air supply passage 31 into the freezing compartment 17. A cooling chamber 26 is formed on an inner side behind the freezing compartment cold air supply path 31. A cooler 45 is disposed in the cooling chamber and is an evaporator for cooling air circulating in the refrigerator. The freezing compartment cold air supply passage 31 is a space surrounded by a front cover 67 in the front and a partition 66 in the rear.

[0030] The cooler 45 is connected to a compressor 44, a heat radiator (not shown), and a capillary tube (not shown) as an expansion means via a refrigerant pipe, and is a member constituting a vapor compression type refrigeration cycle circuit.

[0031] FIG 3 is a side cross-sectional view showing a structure nearby the cooling chamber 26 of the refrigerator 10. The cooling chamber 26 is disposed in an interior of the heat-insulating cabinet 11 and inside the freezing compartment cold air supply passage 31. The cooling chamber 26 and the freezing compartment 17 are partitioned by the partition 66 made of a synthetic resin.

[0032] The freezing compartment cold air supply passage 31 formed in the front of the cooling chamber 26 is a space formed between the cooling chamber 26 and the front cover 67 made of the synthetic resin and assembled in the front of the freezing compartment cold air supply passage 31, and is a passage through which the cold air cooled by the cooler 45 flows into the freezing compartment 17. The front cover 67 is formed with air outlets 34 which are openings through which cold air is blown into the refrigerating compartment 17.

[0033] An air return vent 38 for returning air from the freezing compartment 17 to the cooling chamber 26 is formed on a back side of a lower portion of the lower freezing compartment 19. Furthermore, an air return vent 28 is formed below the cooling chamber 26 and communicated with the air return vent 38, and sucks return cold air from respective storage compartments into the cooling chamber 26. The cold air returning through an air return vent 39 (FIG. 2) of the vegetable compartment 20 and a vegetable compartment cold air return passage 37 also flows into the air return vent 28.

[0034] In addition, a defrosting heater 46 is disposed below the cooler 45 to melt the frost attached to the cooler 45. The defrosting heater 46 is a resistive heater.

[0035] An air blowing vent 27 is formed in an upper portion of the cooling chamber 26 and is an opening connected to the respective storage compartments. The air blowing vent 27 is an opening into which the cold air

cooled by the cooler 45 flows, and enables the cooling chamber 26, the refrigerating compartment cold air supply passage 29 and the freezing compartment cold air supply passage 31 to be communicated with one another. The air blowing vent 27 is provided with a blower 47 that blows cold air to the freezing compartment 17 and the like from the front. In addition, a function of a damper is assumed by a rotatable shielding wall 71 of a shielding device 70 described later, so the damper may be omitted.

[0036] A shielding device 70 is disposed outside the air blowing vent 27 of the cooling chamber 26, to properly close the air passage connected to the air blowing vent 27. The shielding device 70 is covered by the front cover 67 from the front.

[0037] Reference is made to FIG 4 to illustrate a configuration in which the shielding device 70 for limiting the air passage is assembled. FIG 4(A) is a perspective view of the partition 66 with the shielding device 70 being assembled, FIG 4(B) is a cross-sectional view taken along line A-A of FIG 4(A), and FIG 4(C) is a view of the construction of the air passage when the front cover 67 is viewed from the rear.

[0038] Referring to FIG 4(A), in the partition 66, the air blowing vent 27 penetrating in a thickness direction is formed in an upper portion of the partition 66, and the blower 47 and the shielding device 70 are disposed in front of the air blowing vent 27. Here, the shielding device 70 is hidden by the partition 66. In addition, an opening section 59 formed on an upper end side of the partition 66 is communicated with the refrigerating compartment cold air supply passage 29 shown in FIG 3.

[0039] Referring to FIG 4(B), as described above, the freezing compartment cold air supply passage 31 is formed in a space surrounded by the partition 66 and the front cover 67. As described later, the freezing compartment cold air supply passage 31 is divided into a plurality of air passages. In addition, the shielding device 70 and a shielding wall driving mechanism 60 are disposed between the partition 66 and the front cover 67. The shielding device 70 shields the blower 47, and the shielding wall driving mechanism 60 drives the shielding device 70. The configuration of the shielding device 70 and the shielding wall driving mechanism 60 will be described below with reference to FIG 5.

[0040] Referring to FIG 4(C), a plurality of air passages are formed by partitioning an internal space of the front cover 67. Specifically, rib-shaped air passage partition walls 50 and 56 extending rearward from a rear main surface of the front cover 67 are formed. The rear ends of the air passage partition walls 50 and 56 abut against the partition 66 shown in FIG. 4(B).

[0041] Here, the air passage through which the cold air is blown and supplied is divided into a refrigerating compartment cold air supply passage 51, an upper refrigerating compartment cold air supply passage 52, and a lower refrigerating compartment cold air supply passage 53 in turn from top. The cold air blown to the refrigerating compartment 15 circulates in the refrigerating

compartment cold air supply passage 51, the cold air blown to the upper freezing compartment 18 circulates in the upper freezing compartment cold air supply passage 51, and the cold air blown to the lower freezing compartment 19 circulates in the lower freezing compartment cold air supply passage 53. The cold air flowing through the refrigerating compartment cold air supply passage 51 is blown through the opening section 59 to the refrigerating compartment 15 shown in FIG. 2. The cold air flowing through the upper freezing compartment cold air supply passage 52 is blown through the air outlet 34 to the upper freezing compartment 18 shown in FIG. 2. The cold air flowing through the lower freezing compartment cold air supply passage 53 is blown through the air outlet 34 to the lower freezing compartment 19 shown in FIG. 2. Here, the refrigerating compartment cold air supply passage 51, the upper freezing compartment cold air supply passage 52 and the lower freezing compartment cold air supply passage 53 spread around with the shielding device 70 as a center.

[0042] The refrigerating compartment cold air supply passage 51 and the upper freezing compartment cold air supply passage 52 are partitioned by an air passage partitioning wall 50. Then, the upper freezing compartment cold air supply passage 52 and the lower freezing compartment cold air supply passage 53 are partitioned by an air passage partitioning wall 56.

[0043] Reference is made to FIG. 5 to illustrate the configuration of the shielding device 70. FIG. 5(A) is an exploded perspective view showing the shielding device 70, and FIG. 5(B) is a side cross-sectional view showing the shielding device 70.

[0044] Referring to FIG. 5(A) and FIG. 5(B), the shielding device 70 comprises a support base 63, a rotatable shielding wall 71 and a shielding wall driving mechanism 60. The shielding device 70 is a device that shields the air passages of the cold air blown by the blower 47. The air passages connecting the cooling chamber 26 with respective storage compartments are made communicated by making the shielding device 70 in an open state, and, the air passages are cut off by making the shielding device 70 in a closed state.

[0045] The blower 47 is disposed at a center of the support base 63 by fastening with screws. Although not shown here, the blower 47 has for example a centrifugal fan such as a turbo fan, and a blowing motor that rotates the centrifugal fan, and blows cold air outward in a radial direction.

[0046] The support base 63 is an integrally-formed member made of a synthetic resin. The rotatable shielding walls 71 are rotatably disposed on a rear side of the support base 63.

[0047] Side wall portions 58 are formed in a peripheral portion of the support base 63. The side wall portions 58 are portions extending rearward from the support base 63. A plurality of side wall portions 58 are disposed at substantially equal intervals in a circumferential direction of the support base 63. The side wall portions 58 are

disposed between the rotatable shielding walls 71. The rear ends of the side walls 58 are fastened to a partition 66 shown in FIG. 4(B) in a fastening manner such as screws.

[0048] The rotatable shielding walls 71 each are a rectangular plate-shaped member formed of a synthetic resin, and have long sides along a line tangential to the outer side of the blower 47. The rotatable shielding walls 71 are mounted adjacent to the edges of the support base 63 and rotatable about an axis parallel to a plane of the support base 63. A plurality of rotatable shielding walls 71 (five in the present embodiment) are disposed. The rotatable shielding walls 71 are disposed on paths through which the cold air blown by the blower 47 circulates, and shield respective air passages.

[0049] The shielding wall driving mechanism 60 comprises a cam 61, a rotary disk 73, and a drive motor 74 that rotates the rotary disk 73. Here, each rotatable shielding wall 71 comprises a shielding wall driving mechanism 60. That is, five shielding wall driving mechanisms 60 are provided for the five rotatable shielding walls 71. By employing this configuration, the respective shielding wall driving mechanisms 60 rotate the rotatable shielding walls 71 according to an instruction from a control device not shown, so that diversity of the rotation types of the rotatable shielding walls 71 can be achieved without restriction. The specific shapes and functions of the shielding wall driving mechanisms 60 will be described later.

[0050] Reference is made to FIG. 6 to illustrate the shielding wall driving mechanism 60 for driving the rotatable shielding walls 71. FIG. 6(A) is an exploded perspective view showing the shielding wall driving mechanism 60, and FIG. 6(B) is a perspective view of a cam 61.

[0051] Referring to FIG. 6(A), the shielding wall driving mechanism 60 comprises a cam 61, a rotary disk 73 that engages with a moving shaft 76 of the cam 61, and a drive motor 74 for rotating the rotary disk 73.

[0052] The cam 61 is a flat rectangular parallelepiped member formed of a synthetic resin. As shown in FIG. 6(B), a right end of the cam 61 is formed with a rotatable connection portion 48 in which is formed a hole portion through which a pin 55 can run. The cam 61 is received in a cam-receiving portion in a slidable state, the cam-receiving portion being formed by recessing a front surface of the support base 63 shown in FIG 5(A).

[0053] The rotary disk 73 is a substantially tongue-shaped plate-shaped member, with a left end portion being connected to a rotation shaft of the drive motor 74 in a way that the left end portion is non-rotatable relative to the rotation shaft. Therefore, the rotary disk 73 rotates driven by the drive motor 74. In addition, on a right side of the rotary disk 73 is formed a moving shaft sliding slot 80 for rotating the moving shaft 76 of the cam 61. The moving shaft sliding slot 80 is in an arcuate curved shape, and the moving shaft sliding slot 80 is slidably fitted with the moving shaft 76 of the cam 61.

[0054] The rotatable shielding wall 71 is formed with a rotatable connection portion 68 which protrudes oblique-

ly from a base end of the rotatable shielding wall 71. The rotatable connection portion 68 is formed with a hole portion through which a pin 55 can run. Rotational connection portions 64 are formed adjacent to both ends of a lateral side of the rotatable shielding wall 71. The rotatable connection portions 64 each are formed with a hole through which a pin 69 can run.

[0055] As shown in FIG. 6(B), the moving shaft 76 is a cylindrical protrusion protruding from the front of the cam 61. A diameter of the moving shaft 76 is slightly shorter than a width of the moving shaft sliding slot 80 formed in the rotary disk 73. The moving shaft 76 slidably engages with the moving shaft sliding slot 80.

[0056] Referring to FIG 6(A) again, the pin 55 runs through the hole portion of the rotatable connection portion 48 of the cam 61 and the hole portion of the rotatable connection portion 68 of the rotatable shielding wall 71, and the cam 61 is connected with the rotatable shielding wall 71 and rotatable about the pin 55. In addition, the rotatable shielding wall 71 is rotatably connected with the support base 63 shown in FIG. 5(A) via the pin 69 which runs through the rotatable connection portions 64 of the rotatable shielding wall 71.

[0057] With this configuration, referring to FIG. 6(A), the moving shaft sliding slot 80 can be rotated by the drive motor 74, thereby performing the opening and closing operations of the rotatable shielding wall 71. Specifically, when the drive motor 74 rotates the rotary disk 73, the moving shaft 76 moves in a left-right direction along the moving shaft sliding slot 80, i.e., the cam 61 moves in the left-right direction. As the cam 61 moves, the rotatable shielding wall 71 rotatably connected with the cam 61 rotates with the rotatable connection portion 64 as a rotation center, thereby performing the opening and closing operations of the rotatable shielding wall 71.

[0058] Here, as shown in FIG. 4(B), members constituting the shielding wall driving mechanism 60 are not exposed to the freezing compartment cold air supply passage 31 through which cold air flows. Therefore, cold air does not blow on the shielding wall driving device 60, thereby preventing the shielding wall driving device 60 from freezing.

[0059] FIG. 7 is a view showing the shielding device 70 according to the embodiment of the present invention, wherein FIG. 7(A) is a view of rotatable shielding walls of the shielding device 70 as viewed from the rear, and FIG. 7(B) is a view showing the configuration of rotary disks as viewed from front.

[0060] Referring to FIG. 7(A), the shielding device 70 comprises rotatable shielding walls 711, 712, 713, 714, and 715 as the above-mentioned rotatable shielding walls 71. The rotatable shielding walls 711-715 have a rectangular shape having long sides substantially parallel to a line tangential to the outside of the blower 47 shown in FIG. 5(A). In addition, the rotatable shielding walls 711-715 are rotatably mounted on the peripheral portion of the support base 63 shown in FIG. 5(A).

[0061] A radially inner end of the rotatable shielding

wall 711 is rotatably connected to a cam 611 on which a moving shaft 761 is formed. Similarly, a radially inner end of the rotatable shielding wall 712 is rotatably connected to a cam 612 on which a moving shaft 762 is formed. A radially inner end of the rotatable shielding wall 711 is rotatably connected to a cam 613 on which a moving shaft 763 is formed. In addition, a radially inner end of the rotatable shielding wall 714 is rotatably connected to a cam 614 on which a moving shaft 764 is formed. A radially inner end of the rotatable shielding wall 715 is rotatably connected to a cam 615 on which a moving shaft 765 is formed

[0062] The cams 611-615 are respectively rotatably connected to inside edges of the rotatable shielding walls 711-715. In this way, when the cams 611 to 615 are arranged outside, the rotatable shielding walls 711-715 are in an upstanding state. On the other hand, when the cams 612 to 615 are arranged inside, and the rotatable shielding walls 712-715 are in a horizontally-lying state.

[0063] Referring to FIG. 7(B), the moving shaft sliding slot 801 of the rotary disk 731 slidably engages with the moving shaft 761 of the cam 611. The moving shaft sliding slot 802 of the rotary disk 732 slidably engages with the moving shaft 762 of the cam 612. The moving shaft sliding slot 803 of the rotary disk 733 slidably engages with the moving shaft 763 of the cam 613. The moving shaft sliding slot 804 of the rotary disk 734 slidably engages with the moving shaft 764 of the cam 614. The moving shaft sliding slot 805 of the rotary disk 735 slidably engages with the moving shaft 765 of the cam 615. With this configuration, the rotary disks 731 to 735 rotate to cause the cams 611-615 to slide in specified directions, thereby opening and closing the rotatable shielding walls 711-715.

[0064] FIG. 8 shows the configuration of the shielding device 70 in a fully-closed state. FIG. 8(A) is a view of the shielding device 70 in the fully-closed state as viewed from the rear, FIG. 8(B) is a cross-sectional view taken along a section line B-B of FIG. 8(A), FIG. 8(C) is a view of rotary disks 73 in the fully-closed state as viewed from the front, and FIG. 8(D) is an enlarged view of main points of FIG. 8(B). Here, the fully-closed state refers to a state in which the surrounding of the blower 47 is shielded by the rotatable shielding walls 71 to thereby close the air blowing vent 27 shown in FIG. 4. In addition, in the fully-closed state, the blower 47 does not rotate.

[0065] Referring to FIG. 8(A), the shielding device 70 prevents air from flowing out from the blower 47 to the outside in the fully-closed state. That is, in the fully-closed state, all the rotatable shielding walls 71 are in the upstanding state, and the communication with the air passages for supplying cold air is cut off so that cold air is not supplied to the refrigerating compartment 15 and the freezing compartment 17. In addition, during the defrosting process of defrosting the cooler 45 shown in FIG. 2, the shielding device 70 is also in the fully-closed state so that cold air does not flow from the cooling chamber 26 into the refrigerating compartment 15 and the freezing

compartment 17.

[0066] Referring to FIG. 8(B), in the fully-closed state, the rotatable shielding wall 71 is in a closed state in which the rotatable shielding wall 71 stands substantially perpendicular to the main surface of the support base 63. Here, all the rotatable shielding walls 71 of the shielding device 70 are in a closed state. In this state, the rear end of the rotatable shielding wall 71 abuts against the partition 66 shown in FIG. 4 or is arranged close to the partition 66. With such a configuration, the airtightness when the rotatable shielding wall 71 closes the air passage can be improved.

[0067] Referring to FIG. 8(C), when the shielding device 70 is in the fully-closed state, first, the drive motor 74 is turned on to rotate the rotary disk 73. Here, the rotary disk 73 rotates counterclockwise to cause the moving shaft 76 to slide in the moving shaft sliding slot 80, so that the moving shaft 76 is disposed at the outside end of the moving shaft sliding slot 80. As a result, as shown in FIG. 8(D), the cam 61 moves radially outward. Then, the rotatable shielding wall 71 rotatably connected with the cam 61 rotates with the vicinity of the rotatable connection portion 68 as a rotation center, and is in a closed state in which the rotatable shielding wall 71 stands up substantially at a right angle to the main surface of the support base 63.

[0068] FIG. 9 shows the configuration of the shielding device 70 in a fully-open state. FIG. 9(A) is a view showing the shielding device 70 in the fully-open state as viewed from the rear, FIG. 9(B) is a cross-sectional view of the shielding device taken along a section line C-C of FIG. 9(A), FIG. 9(C) is a view showing rotary disks 73 in the fully-open state as viewed from the front, and FIG. 9(D) is an enlarged view of main points of FIG. 9(B). Here, the fully-open state refers to a state in which the communication between the blower 47 and the air passages for supplying cold air is not shielded by the rotatable shielding walls 71, so that the cold air blown by the blower 47 diffuses around.

[0069] Referring to FIG. 9(A), the shielding device 70, in the fully-open state, does not hinder air from flowing from the blower 47 to the outside. That is, in the fully-open state, the cold air blown from the blower 47 to the shielding device 70 is blown to the refrigerating compartment 15 and the freezing compartment 17 without being interfered by the rotatable shielding wall 71. As shown in FIG. 9(A), in the fully-open state, all the rotatable shielding walls 71 tilt outward in the radial direction and get into a horizontally-lying state.

[0070] Referring to FIG. 9(B), in the fully-open state, all the rotatable shielding walls 71 are in the horizontally-lying state in which they are substantially parallel to the main surface of the support base 63. Since all the rotatable shielding walls 71 of the shielding device 70 are in the open state, there are no rotatable shielding walls 71 in the air passages through which the blower 47 blows cold air, so that the flow resistance of the air passages can be reduced and the amount of the cold air supplied

by the blower 47 can be increased.

[0071] Referring to FIG. 9(C), when the shielding device 70 is in the fully-open state, the drive motor 74 is driven to rotate the rotary disk 73 clockwise so that the moving shaft 76 slides in the moving shaft sliding slot 80. In this way, the moving shaft 76 moves to the inner end of the moving shaft sliding slot 80. Upon doing so, as shown in FIG. 9(D), the cam 61 moves inward in the radial direction. As a result, the rotatable shielding wall 71 rotatably connected with the end of the cam 61 rotates and tilts with the vicinity of the rotatable connection portion 68 as a rotation center, and gets into a state in which the main surface of the rotatable shielding wall 71 is substantially parallel to the main surface of the support base 63.

[0072] Reference is made to FIG. 10 through FIG. 23 to illustrate a method of switching air passages using the shielding device 70 with the above configuration.

[0073] FIG. 10 shows a state in which the cold air is supplied to the lower freezing compartment 19 only, FIG. 10(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 10(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 11 is a view showing conditions of the air passage when cold air is supplied to the lower freezing compartment 19 only, as viewed from the rear. FIG. 12 shows a situation when cold air is supplied to the freezing compartment 17 only, FIG. 12(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 12(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 13 is a view of a state of the air passage when cold air is supplied to the freezing compartment 17 only, as viewed from the rear. FIG. 14 shows a state in which the cold air is supplied to the upper freezing compartment 18 only, FIG. 14(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 14(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 15 is a view of conditions of the air passage when cold air is supplied to the upper freezing compartment 18 only as viewed from the rear. FIG. 16 shows a state when cold air is not supplied, FIG. 16(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 16(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 17 is a view of a state of air passages when cold air is not supplied, as viewed from the rear.

[0074] FIG. 18 shows a state when cold air is supplied to the refrigerating compartment 15 only. FIG. 18(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 18(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 19 is a view of a state of the air passage when cold air is supplied to the refrigerating compartment 15 only, as viewed from the rear. FIG. 20 shows a state when cold air is supplied to the upper freezing compartment 18 and the refrigerating compartment 15, FIG. 20(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 20(B) is a view of rotary disks such as the rotary disk 731 as viewed

from the front. FIG. 21 is a view of conditions of air passages when cold air is supplied to the upper freezing compartment 18 and the refrigerating compartment 15 as viewed from the rear. FIG. 22 shows a state when cold air is supplied to the entire freezing compartment 17 and the refrigerating compartment 15. FIG. 22(A) is a view of the shielding device 70 as viewed from the rear, and FIG. 22(B) is a view of rotary disks such as the rotary disk 731 as viewed from the front. FIG. 23 is a view of conditions of air passages when cold air is supplied to the entire freezing compartment 17 and the refrigerating compartment 15 as viewed from the rear.

[0075] In the following figures, the clockwise direction when the shielding device 70 is viewed from the rear is sometimes referred to as a "forward direction", and the counterclockwise direction when the shielding device 70 is viewed from the rear is sometimes referred to as a "reverse direction". Furthermore, in the following depictions, a radial direction and a circumferential direction of the blower 47 are briefly referred to as a radial direction and a circumferential direction.

[0076] FIG. 10 and FIG. 11 show a state in which cold air is supplied to the lower freezing compartment 19. FIG. 10(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 10(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 11 is a view of conditions of air passages in this state as viewed from rear.

[0077] Referring to FIG. 10 (A), in a case where cold air is supplied to the lower freezing compartment 19 only, the rotatable shielding wall 711, the rotatable shielding wall 712 and the rotatable shielding wall 715 are in the closed state, and the rotatable shielding wall 713 and the rotatable shielding wall 714 are in the open state. With the closed state and the open state being set, cold air can be blown by the blower 47 to the lower freezing compartment 19 only.

[0078] Referring to FIG. 10(B), a drive motor 741 rotates a rotary disk 731 in the reverse direction, and a moving shaft 761 is arranged at a radially outer end of a moving shaft sliding slot 801 of the rotary disk 731. A rotary disk 732 is rotated in the reverse direction by a drive motor 742.

[0079] A moving shaft 762 is arranged at a radially outer end of a moving shaft sliding slot 802 of the rotary disk 732. A drive motor 743 rotates a rotary disk 733 in the forward direction, and a moving shaft 763 is arranged at a radially inner end of a moving shaft sliding slot 803 of the rotary disk 733. A drive motor 744 rotates a rotary disk 734 in the forward direction, and a moving shaft 764 is arranged at a radially inner end of a moving shaft sliding slot 804 of the rotary disk 734. A drive motor 745 rotates a rotary disk 735 in the reverse direction, and a moving shaft 765 is arranged at a radially outer end of a moving shaft sliding slot 805 of the rotary disk 735.

[0080] With the cam 611 together with the moving shaft 761 being arranged radially outside, the rotatable shielding wall 711 is in a closed state. With the cam 612 together

with the moving shaft 762 being arranged radially outside, the rotatable shielding wall 712 is in a closed state. With the cam 613 together with the moving shaft 763 being arranged radially inside, the rotatable shielding wall 713 is in an open state. With the cam 614 together with the moving shaft 764 being arranged radially inside, the rotatable shielding wall 714 is in an open state. With the cam 615 together with the moving shaft 765 being arranged radially outside, the rotatable shielding wall 715 is in a closed state.

[0081] Referring to FIG. 11, when the shielding device 70 is in the state shown in FIG. 10, the rotatable shielding walls 713, 714 are in the open state, so cold air is blown from the lower freezing compartment cold air supply passage 53. The cold air that has flowed into the lower freezing compartment cold air supply passage 53 is blown out through an air outlet 34 to the lower freezing compartment 19 shown in FIG. 2. On the other hand, when the rotatable shielding walls 711, 712 and 715 are in the closed state, cold air is not blown to the refrigerating compartment 15 and the upper freezing compartment 18 shown in FIG. 2.

[0082] FIG. 12 and FIG. 13 each show a state in which cold air is supplied to the freezing compartment 17 only. FIG. 12(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 12(B) is a view of rotary disks such as the rotary disk 731 in this state as seen from the front, and FIG. 13 is a view of conditions of the air passage in this state as viewed from rear.

[0083] Referring to FIG. 12(A), in a case where cold air is supplied to the freezing compartment 17 only, the rotatable shielding wall 711 is in the closed state, and the rotatable shielding walls 712, 713, 714 and 715 are in the open state. With the open state and closed state being set, cold air can be blown by the blower 47 to the freezing compartment 17 shown in FIG. 2.

[0084] Referring to FIG. 12(B), the drive motor 741 rotates the rotary disk 731 in the reverse direction, and the moving shaft 761 is arranged at a radially outer end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the forward direction, and the moving shaft 762 is arranged at a radially inner end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the forward direction, and the moving shaft 763 is arranged at a radially inner end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the forward direction, and the moving shaft 764 is arranged at a radially inner end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the forward direction, and the moving shaft 765 is arranged at a radially inner end of the moving shaft sliding slot 805 of the rotary disk 735.

[0085] With the cam 611 together with the moving shaft 761 being arranged radially outside, the rotatable shielding wall 711 is in the closed state. With the cam 612 together with the moving shaft 762 being arranged radially outside, the rotatable shielding wall 712 is in the open

state. With the cam 613 together with the moving shaft 763 being arranged radially inside, the rotatable shielding wall 713 is in the open state. With the cam 614 together with the moving shaft 764 being arranged radially inside, the rotatable shielding wall 714 is in the open state. With the cam 615 together with the moving shaft 765 being arranged radially inside, the rotatable shielding wall 715 is in the open state.

[0086] Referring to FIG. 13, when the shielding device 70 is in the state shown in FIG. 12, the rotatable shielding walls 712, 715 are in the open state, so cold air is blown to the upper freezing compartment cold air supply passage 52, and blown to the upper freezing compartment 18 shown in FIG. 2 through the air outlet 34. In addition, when the rotatable shielding walls 713, 714 are in the open state, cold air is blown to the lower freezing compartment cold air supply passage 53, and blown to the lower freezing compartment 19 shown in FIG. 2 via the air outlet 34. On the other hand, with the rotatable shielding wall 711 being in the closed state, cold air is not blown to the refrigerating compartment 15.

[0087] FIG. 14 and FIG. 15 show a state in which the cold air is supplied to the upper freezing compartment 18 only. FIG. 14(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 14(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 15 is a view of conditions of air passages in this state as viewed from the rear.

[0088] Referring to FIG. 14(A), in the case where cold air is supplied to the upper freezing compartment 18 only as shown in FIG. 2, the rotatable shielding walls 711, 713, and 714 are in the closed state, and the rotatable shielding walls 712, 715 are in the open state. With the open state and the closed state being set, cold air is blown to the upper freezing compartment 18 only by the blower 47.

[0089] Referring to FIG. 14(B), the drive motor 741 rotates the rotary disk 731 in the reverse direction, and the moving shaft 761 is arranged at a radially outer end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the forward direction.

[0090] The moving shaft 762 is arranged at a radially inner end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the reverse direction, and the moving shaft 763 is arranged at a radially outer end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the reverse direction, and the moving shaft 764 is arranged at a radially outer end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the forward direction, and the moving shaft 765 is arranged at a radially inner end of the moving shaft sliding slot 805 of the rotary disk 735.

[0091] With the cam 611 together with the moving shaft 761 being arranged radially outside, the rotatable shielding wall 711 is in the closed state. With the cam 612

together with the moving shaft 762 being arranged radially inside, the rotatable shielding wall 712 is in the open state. With the cam 613 together with the moving shaft 763 being arranged radially outside, the rotatable shielding wall 713 is in the closed state. With the cam 614 together with the moving shaft 764 being arranged radially outside, the rotatable shielding wall 714 is in the closed state. With the cam 615 together with the moving shaft 765 being arranged radially inside, the rotatable shielding wall 715 is in the open state.

[0092] Referring to FIG. 15, when the shielding device 70 is in the state shown in FIG. 14, the rotatable shielding walls 712, 715 are in the open state, and the cold air is blown to the upper freezing compartment cold air supply passage 52 and blown out through the air outlet 34 to the upper freezing compartment 18.

[0093] On the other hand, the rotatable shielding wall 711 is in the closed state, so cold air is not blown to the refrigerating compartment 15. In addition, the rotatable shielding walls 713 and 714 are also in the closed state, so cold air is not blown to the lower freezing compartment 19.

[0094] FIG. 16 and FIG. 17 show the fully-closed state in which the shielding device 70 closes all the air passages. FIG. 16(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 16(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 17 is a view of conditions of air passages in this state as viewed from the rear.

[0095] Referring to FIG. 16 (A), in the fully-closed state, the rotatable shielding walls 711-715 are in the closed state. In this state, air can be prevented from flowing into respective air passages.

[0096] Referring to FIG. 16(B), the drive motor 741 rotates the rotary disk 731 in the reverse direction, and the moving shaft 761 is arranged at a radially outer end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the reverse direction, and the moving shaft 762 is arranged at a radially outer end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the reverse direction, and the moving shaft 763 is arranged at a radially outer end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the reverse direction, and the moving shaft 764 is arranged at a radially outer end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the reverse direction, and the moving shaft 765 is arranged at a reverse direction end of the moving shaft sliding slot 805 of the rotary disk 735.

[0097] With the cam 611 together with the moving shaft 761 being arranged radially outside, the rotatable shielding wall 711 is in the closed state. With the cam 612 together with the moving shaft 762 being arranged radially outside, the rotatable shielding wall 712 is in the closed state. With the cam 613 together with the moving shaft 763 being arranged radially outside, the rotatable

shielding wall 713 is in the closed state. With the cam 614 together with the moving shaft 764 being arranged radially outside, the rotatable shielding wall 714 is in the closed state. With the cam 615 together with the moving shaft 765 being arranged radially outside, the rotatable shielding wall 715 is in the closed state.

[0098] Referring to FIG. 17, when the shielding device 70 is in the state shown in FIG. 16, the rotatable shielding walls 711-715 are in the closed state, and cold air is not supplied to all the storage compartments. In other words, the cooling chamber 26 and the air passages can be shielded by the rotatable shielding wall 71. Therefore, when the interior of the cooling chamber 26 is heated during the defrosting process, the warm air in the interior of the cooling chamber 26 can be prevented from leaking to the respective storage compartments via the respective air passages.

[0099] FIG. 18 and FIG. 19 show a state in which cold air is supplied to the refrigerating compartment 15 only. FIG. 18(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 18(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 19 is a view of conditions of air passages in this state as viewed from the rear.

[0100] Referring to FIG. 18 (A), in a case where cold air is supplied to the refrigerating compartment 15 only, the rotatable shielding wall 711 is in the open state, and the rotatable shielding walls 712-715 are in the closed state. With the open state and the closed state being set, cold air can be blown by the blower 47 to the refrigerating compartment 15 only, as described later.

[0101] Referring to FIG. 18(B), the drive motor 741 rotates the rotary disk 731 in the forward direction, and the moving shaft 761 is arranged at a radially inner end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the reverse direction, and the moving shaft 762 is arranged at a radially outer end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the reverse direction, and the moving shaft 763 is arranged at a radially outer end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the reverse direction, and the moving shaft 764 is arranged at a radially outer end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the reverse direction, and the moving shaft 765 is arranged at a radially outer end of the moving shaft sliding slot 805 of the rotary disk 735.

[0102] With the cam 611 together with the moving shaft 761 being arranged radially inside, the rotatable shielding wall 711 is in the open state. With the cam 612 together with the moving shaft 762 being arranged radially outside, the rotatable shielding wall 712 is in the closed state. With the cam 613 together with the moving shaft 763 being arranged radially outside, the rotatable shielding wall 713 is in the closed state. With the cam 614 together with the moving shaft 764 being arranged radially out-

side, the rotatable shielding wall 714 is in the closed state. With the cam 615 together with the moving shaft 765 being arranged radially outside, the rotatable shielding wall 715 is in the closed state.

[0103] Referring to FIG. 19, when the shielding device 70 is in the state shown in FIG. 18, the rotatable shielding wall 711 is in the open state, cold air is blown to the refrigerating compartment cold air supply passage 51, and blown via the refrigerating compartment cold air supply passage 29 to the refrigerating compartment 15. In addition, part of the cold air blown to the refrigerating compartment 15 can also be blown to the vegetable compartment 20. On the other hand, when the rotatable shielding walls 712-715 are in the closed state, cold air is not blown to the freezing compartment 17.

[0104] FIG. 20 and FIG. 21 show a state in which the shielding device 70 supplies cold air to the refrigerating compartment 15 and the upper freezing compartment 18. FIG. 20(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 20(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 21 is a view of conditions of air passages in this state as viewed from the rear.

[0105] Referring to FIG. 20(A), in a case where cold air is supplied to the refrigerating compartment 15 and the upper freezing compartment 18 shown in FIG. 2, the rotatable shielding walls 711, 712 and 715 are in the open state, and the rotatable shielding walls 713, 714 are in the closed state. With the open state and the closed state being set, cold air can be blown by the blower 47 to the refrigerating compartment 15 and the upper freezing compartment 18.

[0106] Referring to FIG. 20(B), the drive motor 741 rotates the rotary disk 731 in the forward direction, and the moving shaft 761 is arranged at a radially inner end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the forward direction, and the moving shaft 762 is arranged at a radially inner end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the reverse direction, and the moving shaft 763 is arranged at a radially outer end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the reverse direction, and the moving shaft 764 is arranged at a radially outer end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the forward direction, and the moving shaft 765 is arranged at a radially inner end of the moving shaft sliding slot 805 of the rotary disk 735.

[0107] With the cam 611 together with the moving shaft 761 being arranged radially inside, the rotatable shielding wall 711 is in the open state. With the cam 612 together with the moving shaft 762 being arranged radially inside, the rotatable shielding wall 712 is in the open state. With the cam 613 together with the moving shaft 763 being arranged radially outside, the rotatable shielding wall 713 is in the closed state. With the cam 614 together with the

moving shaft 764 being arranged radially outside, the rotatable shielding wall 714 is in the closed state. With the cam 615 together with the moving shaft 765 being arranged radially inside, the rotatable shielding wall 715 is in the open state.

[0108] Referring to FIG. 21, when the shielding device 70 is in the state shown in FIG. 20, the rotatable shielding wall 711 is in the open state, and cold air is blown to the refrigerating compartment 15 via the refrigerating compartment cold air supply passage 29. In addition, with the rotatable shielding walls 712, 715 being in the open state, the cold air is blown to the upper freezing compartment cold air supply passage 52 and blown out via the air outlet 34 to the upper freezing compartment 18. On the other hand, the rotatable shielding walls 713-714 are in the closed state, so cold air is not blown to the lower freezing compartment 19.

[0109] FIG. 22 and FIG. 23 show a fully-open state in which cold air is supplied to both the refrigerating compartment 15 and the freezing compartment 17. FIG. 22(A) is a view of the shielding device 70 in this state as viewed from the rear, FIG. 22(B) is a view of rotary disks such as the rotary disk 731 in this state as viewed from the front, and FIG. 23 is a view of conditions of air passages in this state as viewed from the rear.

[0110] Referring to FIG. 22(A), in a case where cold air is supplied to the refrigerating compartment 15 and the freezing compartment 17 shown in FIG. 2, the rotatable shielding walls 711, 712, 713, 714 and 715 are in the open state. With the fully-open state being set, cold air can be blown by the blower 47 to the refrigerating compartment 15 and the freezing compartment 17 as described later.

[0111] Referring to 22(B), the drive motor 741 rotates the rotary disk 731 in the forward direction, and the moving shaft 761 is arranged at a radially inner end of the moving shaft sliding slot 801 of the rotary disk 731. The drive motor 742 rotates the rotary disk 732 in the forward direction, and the moving shaft 762 is arranged at a radially inner end of the moving shaft sliding slot 802 of the rotary disk 732. The drive motor 743 rotates the rotary disk 733 in the forward direction, and the moving shaft 763 is arranged at a radially inner end of the moving shaft sliding slot 803 of the rotary disk 733. The drive motor 744 rotates the rotary disk 734 in the forward direction, and the moving shaft 764 is arranged at a radially inner end of the moving shaft sliding slot 804 of the rotary disk 734. The drive motor 745 rotates the rotary disk 735 in the forward direction, and the moving shaft 765 is arranged at a radially inner end of the moving shaft sliding slot 805 of the rotary disk 735.

[0112] With the cam 611 together with the moving shaft 761 being arranged radially inside, the rotatable shielding wall 711 is in the open state. With the cam 612 together with the moving shaft 762 being arranged radially inside, the rotatable shielding wall 712 is in the open state. With the cam 613 together with the moving shaft 763 being arranged radially inside, the rotatable shielding wall 713

is in the open state. With the cam 614 together with the moving shaft 764 being arranged radially inside, the rotatable shielding wall 714 is in the open state. With the cam 615 together with the moving shaft 765 being arranged radially inside, the rotatable shielding wall 715 is in the open state.

[0113] Referring to FIG. 23, when the shielding device 70 is in the state shown in FIG. 22, the rotatable shielding wall 711 is in the open state, and cold air is blown to the refrigerating compartment cold air supply passage 51, and blown out to the refrigerating compartment 15 via the refrigerating compartment cold air supply passage 29. In addition, with the rotatable shielding walls 712, 715 being in the open state, the cold air is blown to the upper freezing compartment cold air supply passage 52 and blown out via the air outlet 34 to the upper freezing compartment 18. Then, with the rotatable shielding walls 713-714 being in the open state, cold air can be supplied to the lower freezing compartment 19 via the lower freezing compartment cold air supply passage 53 and the air outlet 34.

[0114] As described above, in the shielding device 70 according to the present embodiment, the rotary disks 731-735 are rotated by the drive motors 741-745 shown in FIG. 10(B), respectively, so that the rotatable shielding walls 711-715 shown in FIG. 10(A) are respectively rotated to open and close. Therefore, the rotation actions of the rotatable shielding walls 711-715 can be controlled freely, so the amount of the supplied cold air can be precisely controlled according to temperatures in the refrigerating compartment 15, the freezing compartment 17 and vegetable compartment 20 in the refrigerator shown in FIG. 3.

[0115] Then, referring to FIG. 3, since the volume occupied by the shielding device 70 can be reduced, the internal volume of the freezing compartment 17 formed in front of the shielding device 70 can be increased so that more articles to be frozen can be stored in the refrigerating compartment 17.

[0116] Referring to FIG. 24 through FIG. 6, a shielding device 70 according to another embodiment will be described. The configuration of the shielding device 70 described with reference to these figures is substantially the same as that of the shielding device 70 described with reference to FIG. 1 through FIG. 23, and differs in that a solenoid 81 serves as a drive source of the shielding wall driving mechanism 60. Depictions will be centered on the aspect.

[0117] The configuration of the shielding device 70 according to the another embodiment will be illustrated with reference to FIG. 24. FIG. 24(A) is an exploded perspective view of the shielding device 70, and FIG. 24(B) is a cross-sectional view showing the shielding wall driving mechanism 60.

[0118] Referring to FIG. 24 (A), the shielding device 70 comprises a blower 47, a rotatable shielding wall 71, a support base 63 and a shielding wall driving mechanism 60 in turn from the rear side. Here, the shielding wall

driving mechanism 60 is arranged corresponding to each rotatable shielding wall 71. Except for the configuration of the shielding wall driving mechanism 60, the shielding device 70 shown in FIG. 24(A) is the same as the covering device 70 shown in FIG. 5.

[0119] Referring to FIG. 24(B), the shielding wall driving mechanism 60 comprises a cam 61 formed with an abutting portion 82, and the solenoid 8.

[0120] The cam 61 is formed of an integrally-molded synthetic resin or the like, and an upper end of the cam 61 is rotatably connected with the rotatable shielding wall 71. In addition, a lower portion of the cam 61 is formed with an abutting portion 82 protruding forward. FIG. 6(A) shows the configuration in which the cam 61 is rotatably connected with the rotatable shielding wall 71.

[0121] A lower end of the solenoid 81 is downwardly formed with a movable portion 87. The lower end of the movable portion 87 of the solenoid 81 is connected with the abutting portion 82 of the cam 61. When the solenoid 81 is energized, the movable part 87 is arranged up, and when the solenoid 81 is not energized, the movable part 87 is arranged down.

[0122] According to the shielding wall driving mechanism 60 with such a configuration, by controlling the solenoid 81 to be energized or not energized, the cam 61 can be moved, the rotatable shielding wall 71 can be rotated, and the rotatable shielding wall 71 can be opened and closed.

[0123] FIG. 25 shows the configuration of the shielding device 70 in a fully-closed state. FIG. 25(A) is a view of the shielding device 70 in the fully-closed state as viewed from the rear, FIG. 25(B) is a cross-sectional view taken along the line D-D of FIG. 25(A), FIG. 25(C) is a view of the solenoid 81 in the fully-closed state as viewed from the front, and FIG. 25(D) is an enlarged view showing main points of FIG. 25(B).

[0124] Referring to FIG. 25(A) and FIG. 25(B), the shielding device 70 prevents air from flowing from the blower 47 to the outside in the fully-closed state. In the fully-closed state, the rotatable shielding walls 71 are in the closed state of standing up substantially perpendicular to the main surface of the support base 63. Here, all the rotatable shielding walls 71 of the shielding device 70 are in the closed state.

[0125] Referring to FIG. 25(C), when the shielding device 70 is in the fully-closed state, first, the solenoid 81 is driven to move the movable portion 87 radially outside. As a result, as shown in FIG. 25(D), the cam 61 connected to the movable portion 87 of the solenoid 81 via the abutting portion 82 moves radially outward. As viewed from the sheet surface, the cam 61 moves upward. Then, the rotatable shielding walls 71 rotatably connected with the cam 61 rotate about the vicinity of the rotatable connection portion 68 as a rotation center, and are in the closed state of standing up substantially perpendicular to the main surface of the support base 63.

[0126] FIG. 26 shows the configuration of the shielding device 70 in a fully-open state. FIG. 26(A) is a view of

the shielding device 70 in the fully-open state as viewed from the rear, FIG. 26(B) is a cross-sectional view taken along a section line E-E of FIG. 26(A), FIG. 26(C) is a view showing parts such as the solenoid 81 in the fully-open state as viewed from the front, and FIG. 26(D) is an enlarged view showing main points of FIG. 26(B).

[0127] Referring to FIG. 26(A) and FIG. 26(B), the shielding device 70 does not hinder air from flowing from the blower 47 to the outside in the fully-open state. In the fully-open state, all the rotatable shielding walls 71 are in a horizontally-lying state in which they are substantially parallel to the main surface of the support base 63.

[0128] Referring to FIG. 26(C), when the shielding device 70 is in the fully-open state, first, the solenoid 81 is driven to make the movable portion 87 protrude. As a result, as shown in FIG. 26(D), the movable portion 87 presses the abutting portion 82 and the cam 61 moves radially inside. As a result, the rotatable shielding walls 71 rotatably connected with ends of the cams 61 rotate and tilt about a rotatable connection portion 68 as a rotation center, and get into a state in which the main surface of the rotatable shielding wall 71 is substantially parallel to the main surface of the support base 63.

[0129] As described above, even though in a case where the solenoid 81 is used as the driving source of the shielding wall driving mechanism 60, an effect equivalent to the case where the drive motor 74 is used as the driving source of the shielding wall driving mechanism 60 can be achieved. That is, it is possible to control the respectively rotatable shielding walls 71 by opening and closing, improve a degree of freedom of controlling the air passages by opening and closing, and accurately regulate the temperatures of the storage compartments in the refrigerator.

[0130] The configuration of the shielding device 70 according to a further embodiment will be described with reference to FIG. 27. In the shielding device 70, as shown in for example FIG. 5(A), the rotatable shielding walls 71 each are provided with the shielding wall driving mechanism 60. On the other hand, in the shielding device 70 shown in FIG. 27, the shielding wall driving mechanisms 601-602 drive the rotatable shielding walls 711-714 to perform the opening or closing action. That is, four rotatable shielding walls 711-714 are driven by two shielding wall driving mechanisms, namely, the shielding wall driving mechanism 601-602, to perform the opening or closing action. Here, inside edges of the rotatable shielding walls 711-714 may be mounted in a manner rotatable relative to the support base 63 shown in FIG. 26(A).

[0131] The shielding wall driving mechanism 601 comprises a winding portion 851, a drive motor 741, a cable 861 and a cable 862. The drive motor 741 drives the substantially rod-shaped winding portion 851 to rotate in a forward rotation direction or a reverse rotation direction. One end of the cable 861 is connected to the rotatable shielding wall 711 and the other end of the cable 861 is connected to the winding portion 851. One end of the cable 862 is connected to the rotatable shielding wall 712

and the other end of the cable 862 is connected to the winding portion 851. The shielding wall driving mechanism 601 drives the rotatable shielding wall 711 and the rotatable shielding wall 712 to perform the opening or closing action.

[0132] According to this configuration, the drive motor 741 rotates in the forward rotation direction, the winding portion 851 rotates, the cable 861 and the cable 862 are wound, and the rotatable shielding wall 711 and the rotatable shielding wall 712 transition from the horizontally-lying state to the upstanding state and get into a closed state of closing the above air passages. On the other hand, the drive motor 741 rotates in the reverse direction, the winding portion 851 rotates, the cable 861 and the cable 862 are released, and the rotatable shielding wall 711 and the rotatable shielding wall 712 transition from the upstanding state to the horizontally-lying state, and get into an open state of opening the above air passages.

[0133] The shielding wall driving mechanism 602 comprises a winding portion 855, a drive motor 742, a cable 863 and a cable 864. The drive motor 742 drives the substantially rod-shaped winding portion 852 to rotate in a forward rotation direction or a reverse rotation direction. One end of the cable 863 is connected to the rotatable shielding wall 713 and the other end of the cable 863 is connected to the winding portion 852. One end of the cable 864 is connected to the rotatable shielding wall 714 and the other end of the cable 864 is connected to the winding portion 852. The shielding wall driving mechanism 602 drives the rotatable shielding wall 713 and the rotatable shielding wall 714 to perform the opening or closing action.

[0134] According to this configuration, the drive motor 742 rotates in the forward rotation direction, the winding portion 852 rotates, the cable 863 and the cable 864 are wound, and the rotatable shielding wall 713 and the rotatable shielding wall 714 transition from the horizontally-lying state to the upstanding state and get into a closed state of closing the above air passages. On the other hand, the drive motor 742 rotates in the reverse direction, the winding portion 852 rotates, the cable 863 and the cable 864 are released, and the rotatable shielding wall 713 and the rotatable shielding wall 714 transition from the upstanding state to the horizontally-lying state, and get into an open state of opening the above air passages.

[0135] As described above, the shielding wall driving mechanism 601 and the shielding wall driving mechanism 602 respectively drive the rotatable shielding walls 711-714 to perform the opening or closing action, so that the degree of freedom of the opening or closing action of the rotatable shielding walls 711-714 can be ensured, and the structure of the shielding device 70 can be simplified.

[0136] The present invention is not limited to the above embodiments, and various variations can be implemented without departing from the scope of the spirit of the present invention.

[0137] For example, referring to FIG. 6(A), the rotatable shielding wall 71 can be made in a half-open state by disposing the moving shaft 76 at a middle part of the moving shaft sliding slot 80. With such a setting, the amount of cold air blown to the storage compartments can be finely controlled.

Description of Reference Signs

[0138]

10 refrigerator
 11 Heat-insulating cabinet
 12 housing
 13 Liner
 14 heat-insulating material
 15 Refrigerating compartment
 17 Freezing compartment
 18 Upper freezing compartment
 19 Lower freezing compartment
 20 Vegetable compartment
 21 Heat-insulating door
 23 Heat-insulating door
 24 Heat-insulating door
 25 Heat-insulating door
 26 Cooling chamber
 27 Air blowing vent
 28 Air return vent
 29 Refrigerating compartment cold air supply passage
 31 Freezing compartment cold air supply passage
 33 Air outlet
 34 Air outlet
 37. Vegetable compartment air return passage
 38 Air return vent
 39 Air return vent
 42 Heat-insulating partition wall
 43 Heat-insulating partition wall
 44 Compressor
 45 Cooler
 46 Defrosting heater
 47 Blower
 48 Rotatable connection portion
 50 Air passage partition wall
 51 Refrigerating compartment cold air supply passage
 52 Upper freezing compartment cold air supply passage
 53 Lower freezing compartment cold air supply passage
 55 Pin
 56 Air passage partition wall
 58 Side wall portion
 59 Opening section
 60, 601, 602 Shielding wall driving mechanism
 61, 611, 612, 613, 614, 615 Cam
 63 Support base
 64 Rotatable connection portion

65 Partition
 66 Partition
 67 Front cover
 68 Rotatable connection portion
 69 Pin
 70 Shielding device
 71, 711, 712, 713, 714, 715 Rotatable shielding wall
 73, 731, 732, 733, 734, 735 Rotary disk
 74, 741, 742, 743, 744, 745 Drive motor
 76, 761, 762, 763, 764, 765 Moving shaft
 80, 801, 802, 803, 804, 805 Moving shaft sliding slot
 81 Solenoid
 82 Abutting portion
 851, 852 Winding portion
 861, 862, 863, 864 Cable
 87 Movable portion
 100 Refrigerator
 101 Refrigerating compartment
 102 Freezing compartment
 103 Vegetable compartment
 104 Cooling chamber
 105 Partition wall
 106 Opening portion
 107 Blower fan
 108 Cooler
 109 Air passage
 110 Blower cover
 111 Recess
 113 Opening portion
 114 Damper

Claims

1. A shielding device, wherein the shielding device is configured to close air passages through which cold air is blown in a refrigerator, the shielding device comprising:
 - a plurality of rotatable shielding walls disposed surrounding a blower from radially outside, and
 - a shielding wall driving mechanism configured to drive the rotatable shielding wall to rotate,
 - a plurality of the shielding wall driving mechanisms are disposed.
2. The shielding device according to claim 1, wherein each of the rotatable shielding walls is provided with one of the shielding wall driving mechanisms.
3. The shielding device according to claim 1 or claim 2, wherein the shielding wall driving mechanism comprises:
 - a cam rotatably connected with the rotatable shielding wall;
 - a rotary disk formed with a slot for moving the cam; and

a drive motor for driving the rotary disk to rotate.

4. The shielding device according to claim 1 or claim 2, wherein the shielding wall driving mechanism comprises:

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a cam rotatably connected with the rotatable shielding wall; and
a solenoid for moving the cam.

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5. A refrigerator, wherein the refrigerator comprises:

a freezing circuit having a cooler for cooling air to be supplied through air passages to storage compartments,

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a cooling chamber formed with an air blowing port communicated with the storage compartments, the cooler being disposed in the cooling chamber,

a blower configured to blow air supplied through the air blowing port to the storage compartments, and

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the shielding device according to any of claims 1-4 at least partially closing the air passages.

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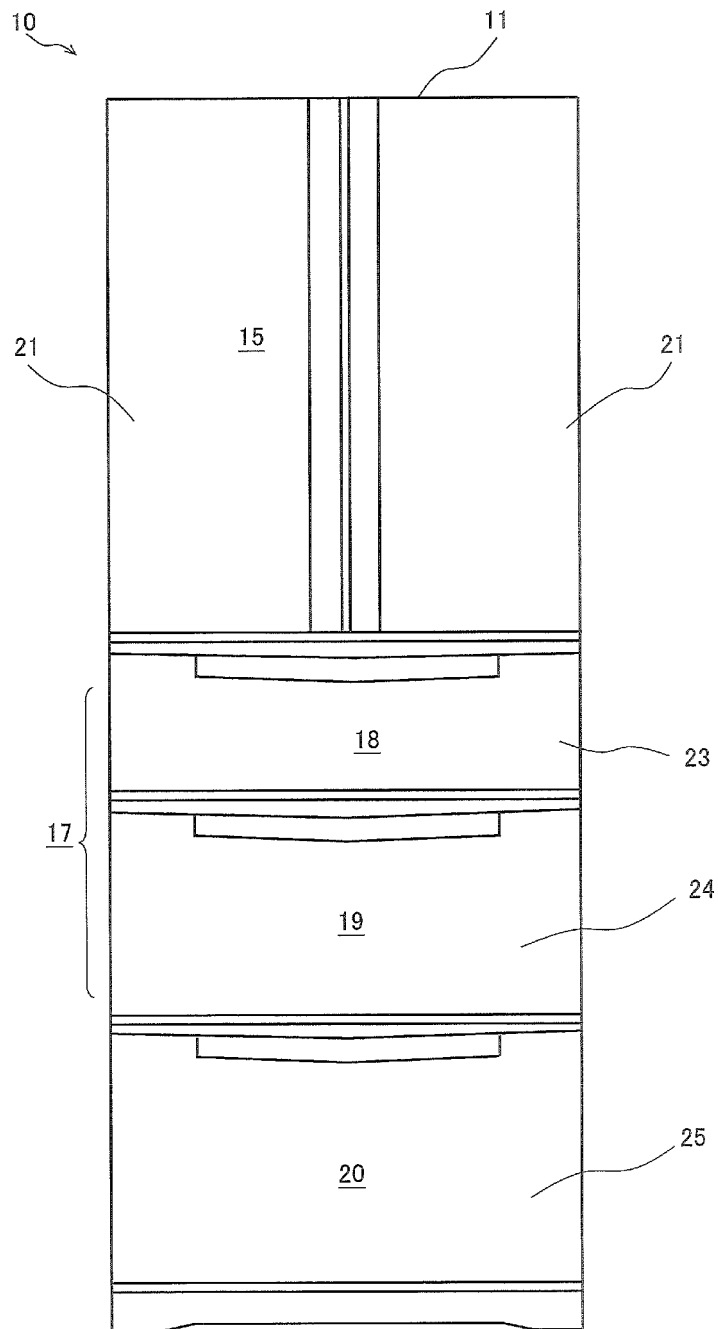


Fig. 1

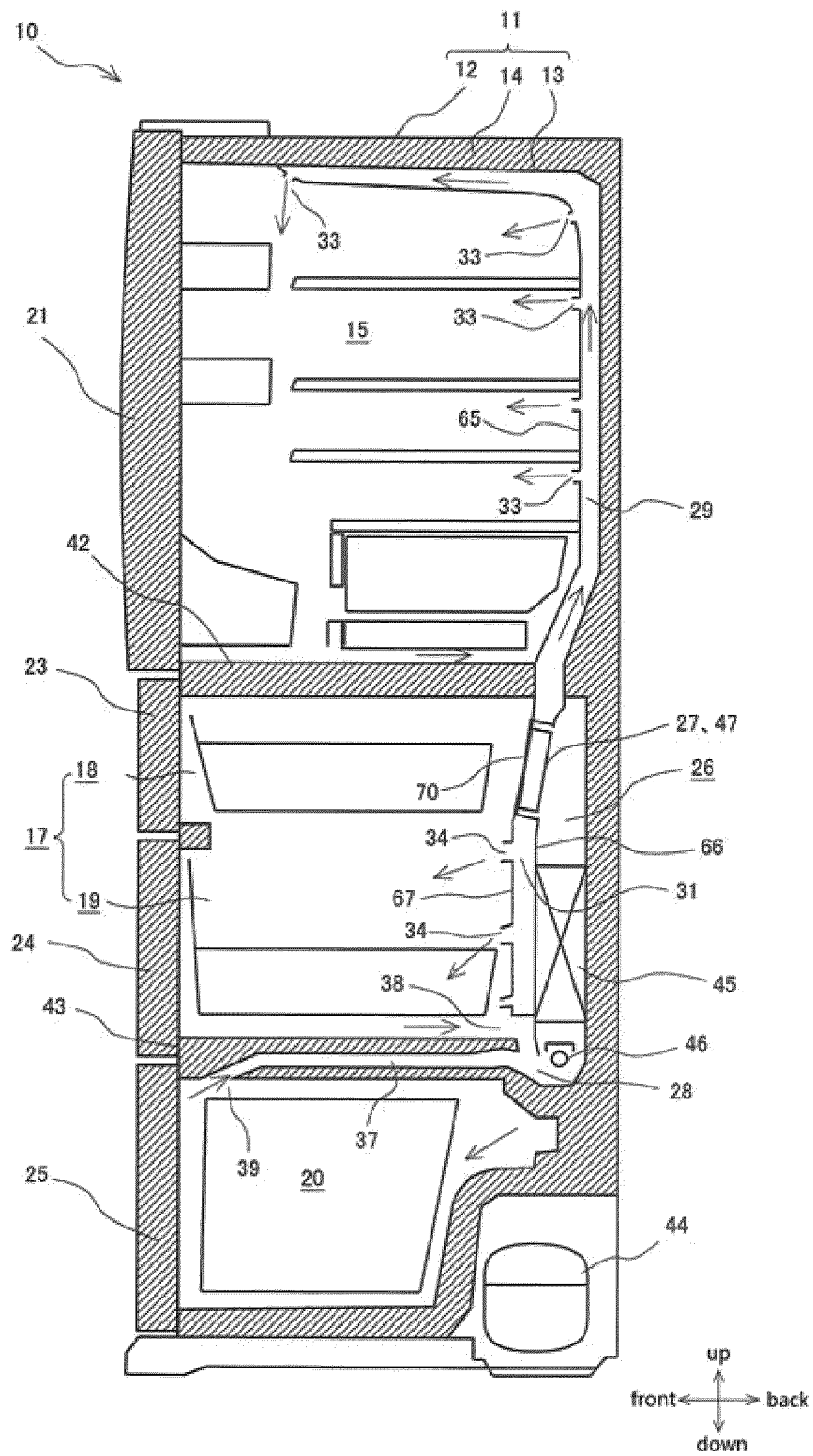


Fig. 2

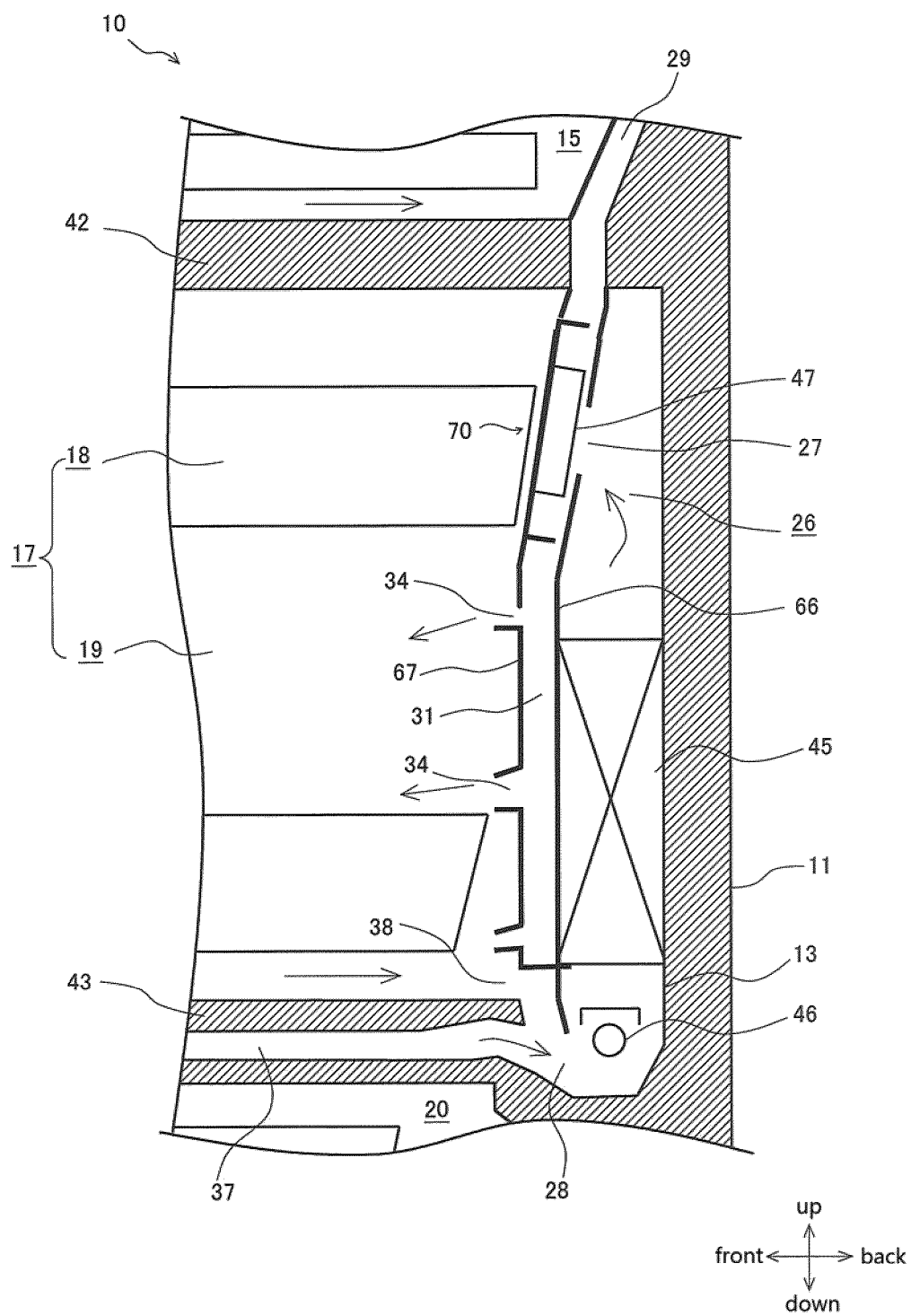


Fig. 3

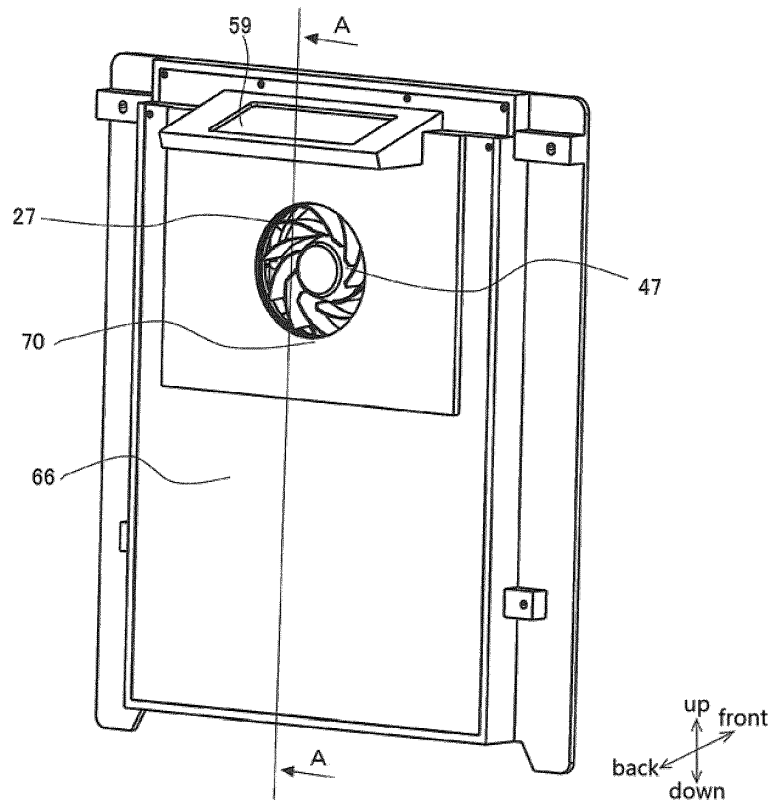


Fig. 4(A)

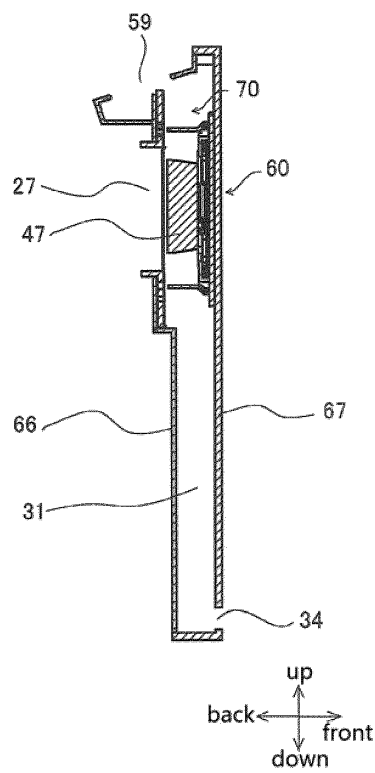


Fig. 4(B)

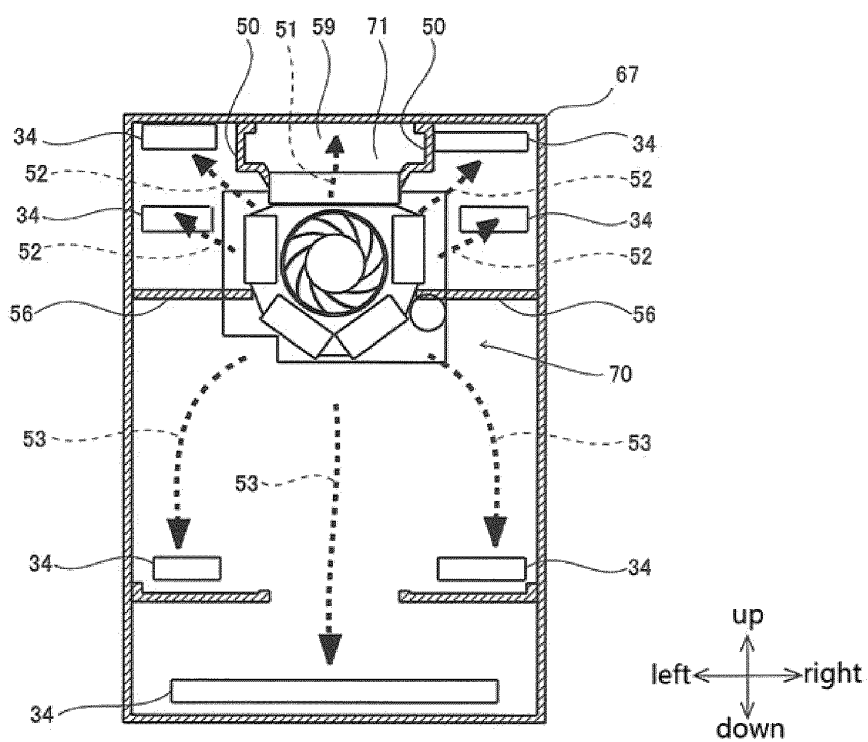


Fig. 4(C)

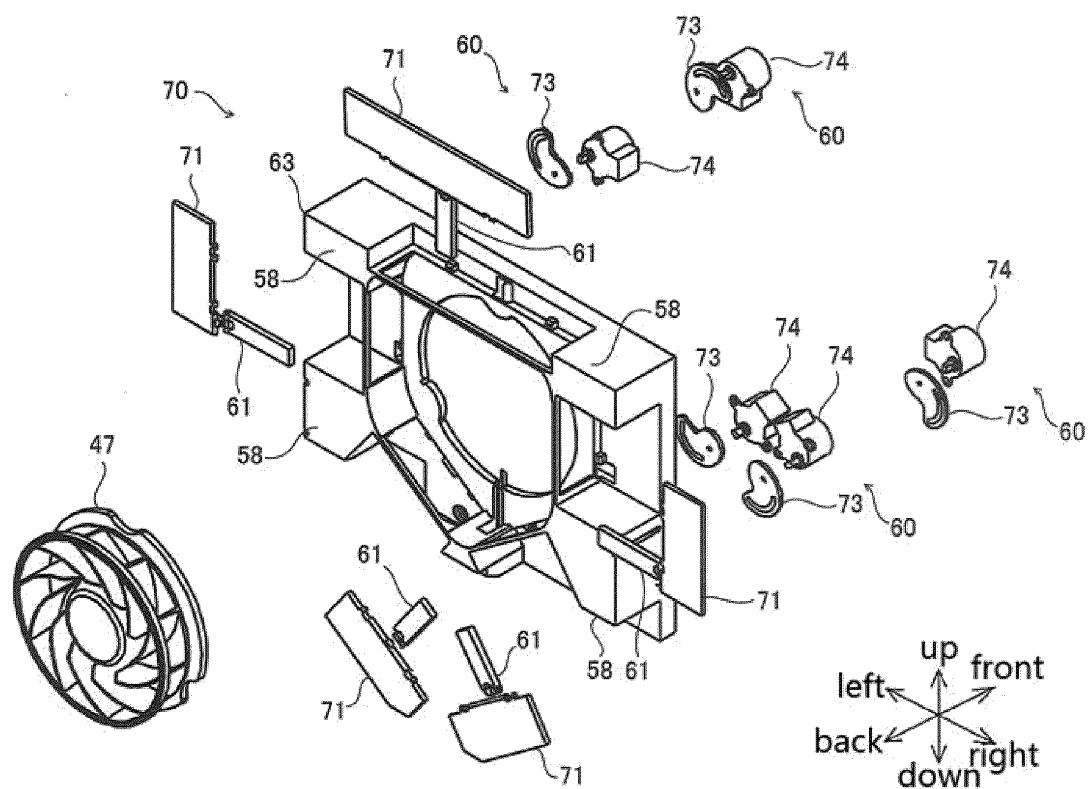


Fig. 5(A)

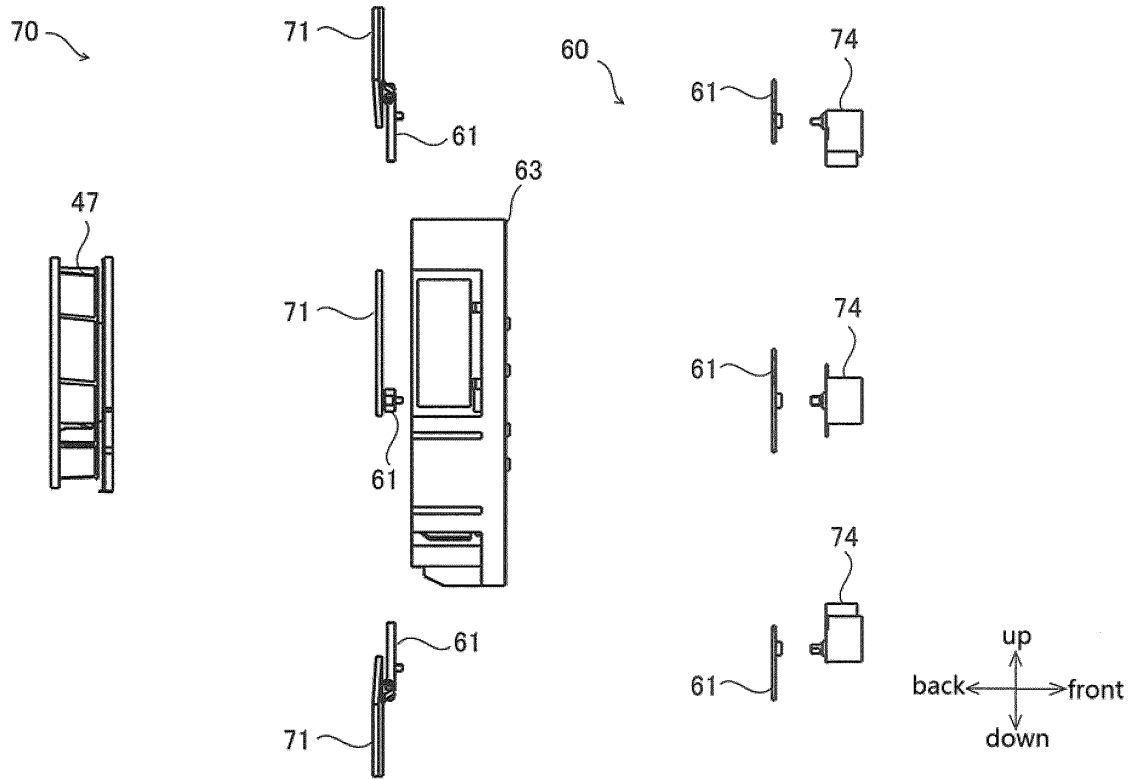


Fig. 5(B)

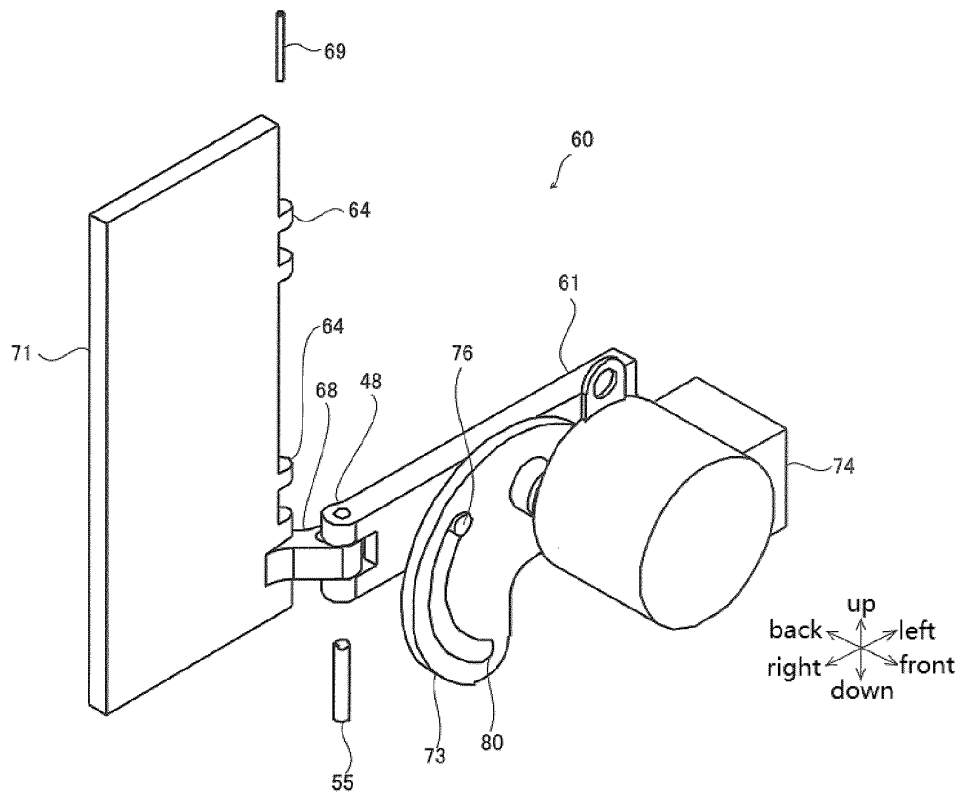


Fig. 6(A)

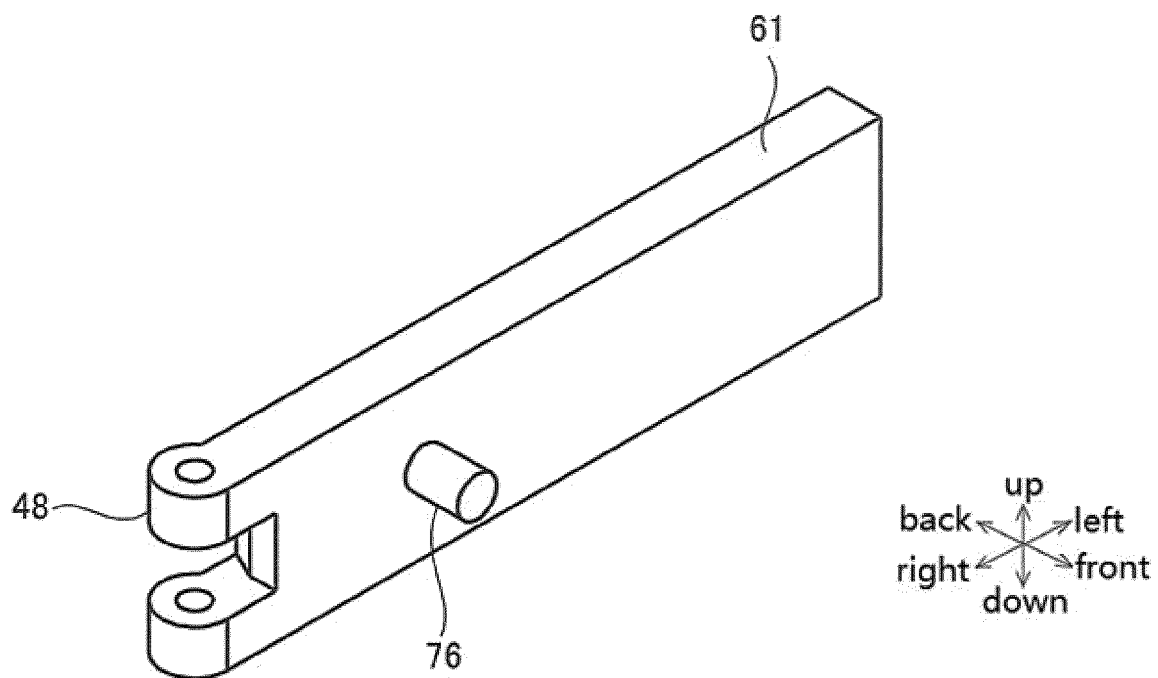


Fig. 6(B)

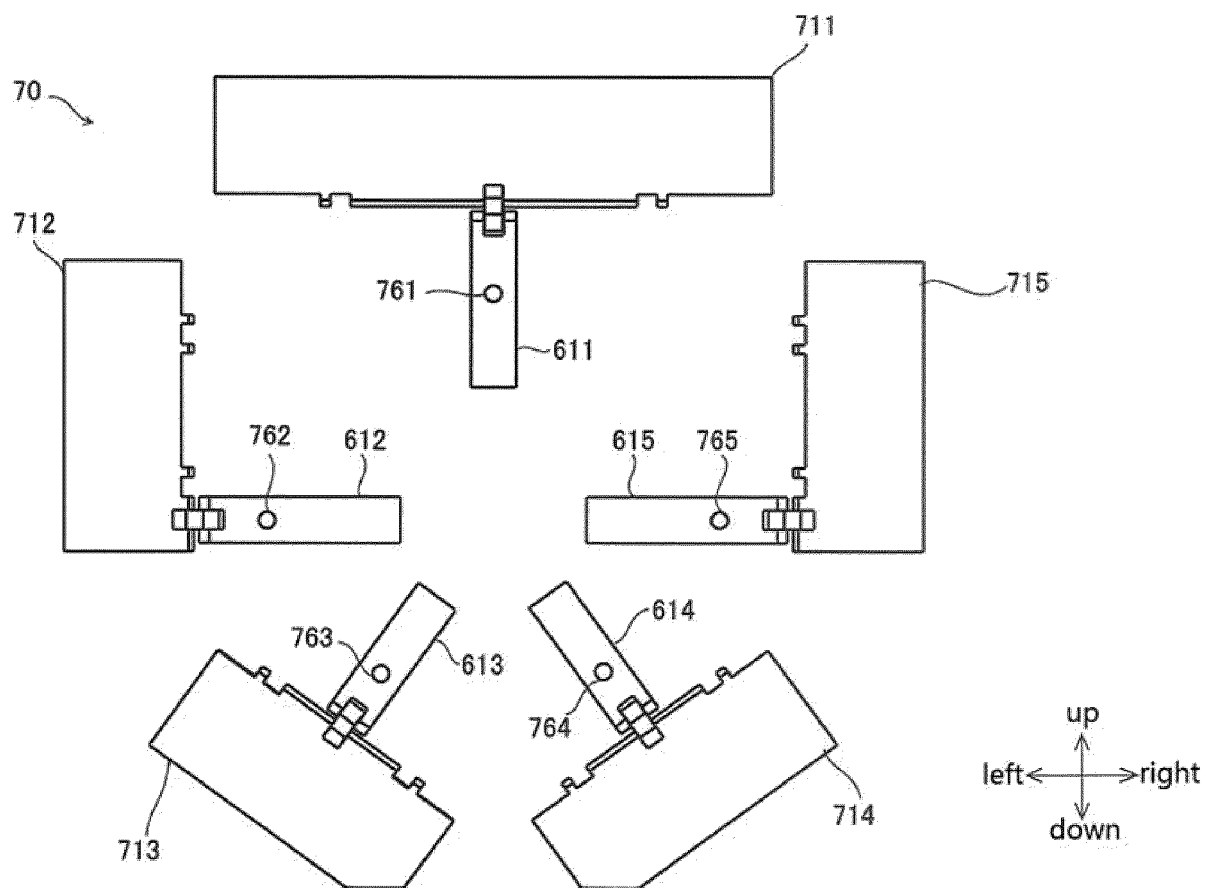


Fig. 7(A)

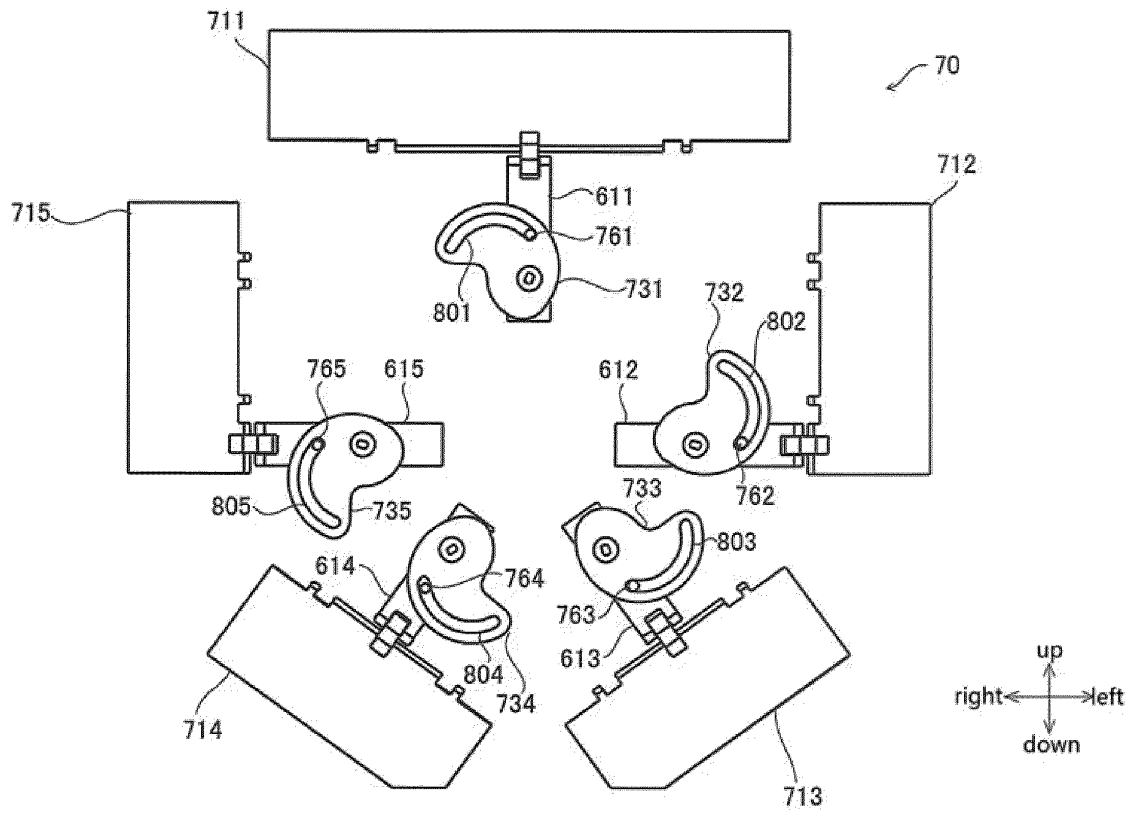


Fig. 7(B)

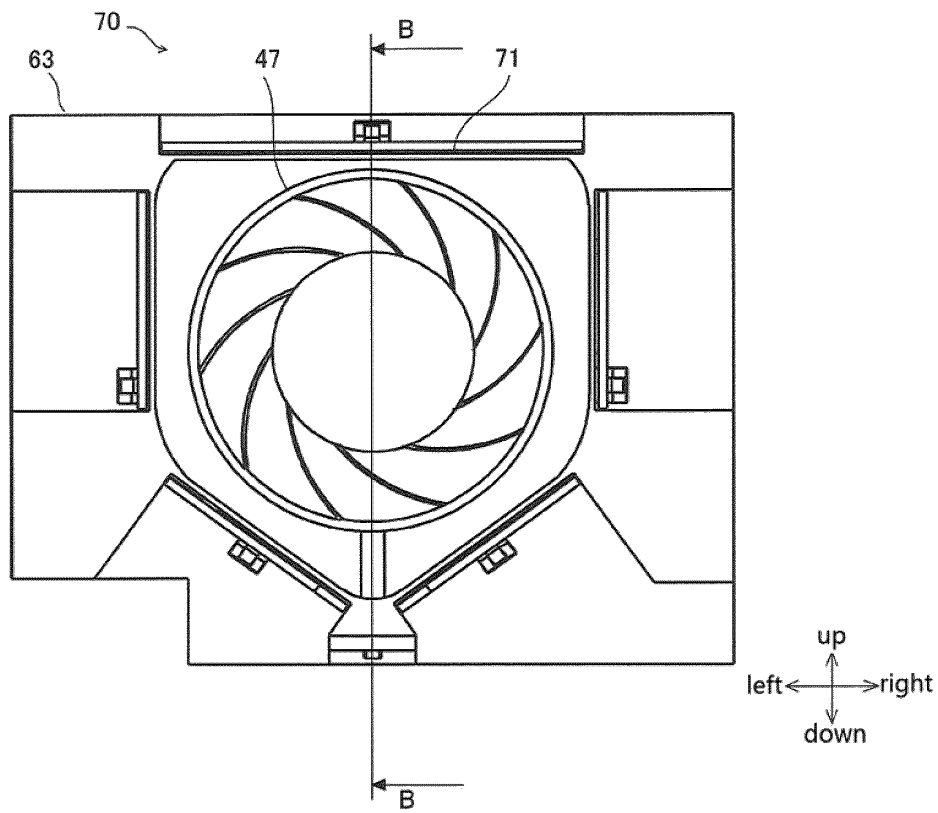


Fig. 8(A)

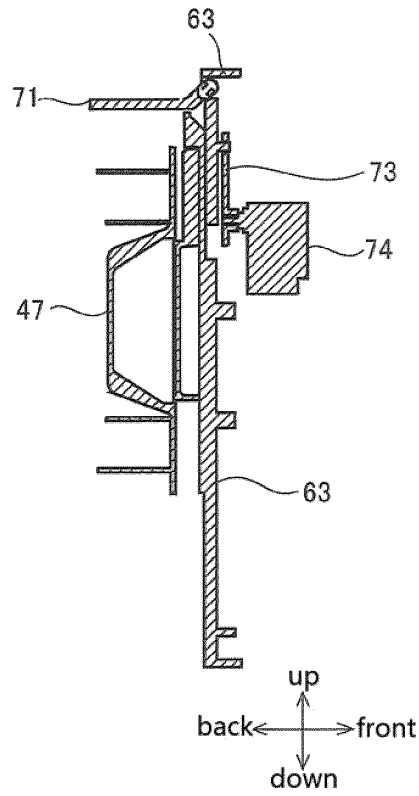


Fig. 8(B)

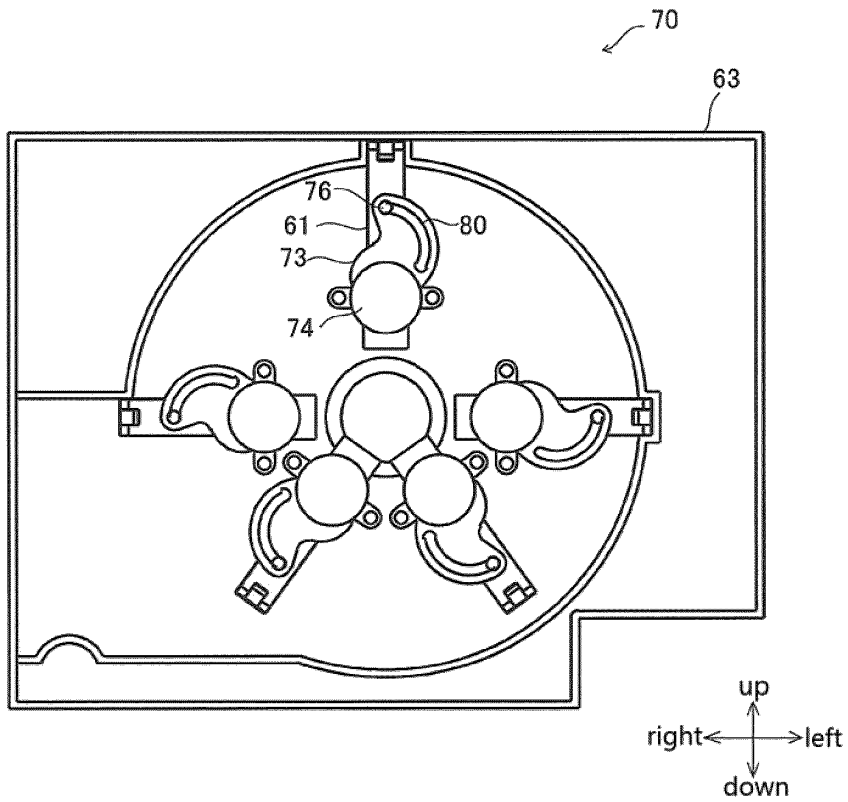
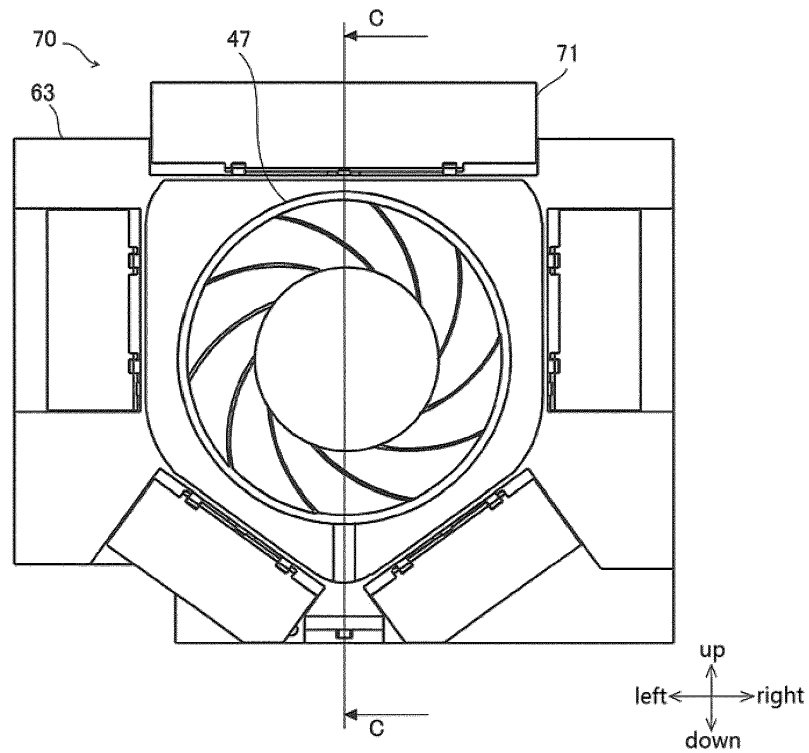
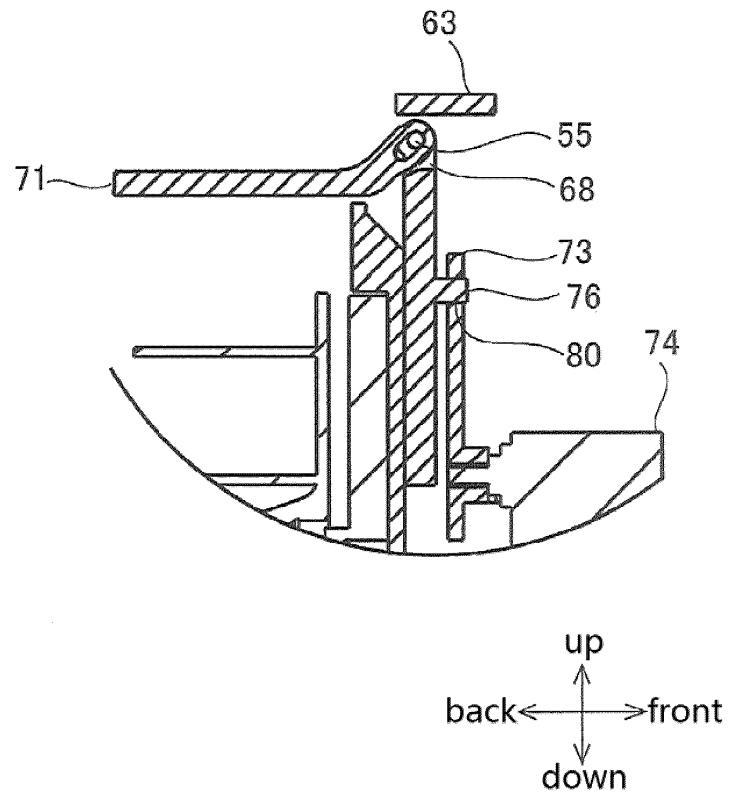


Fig. 8(C)



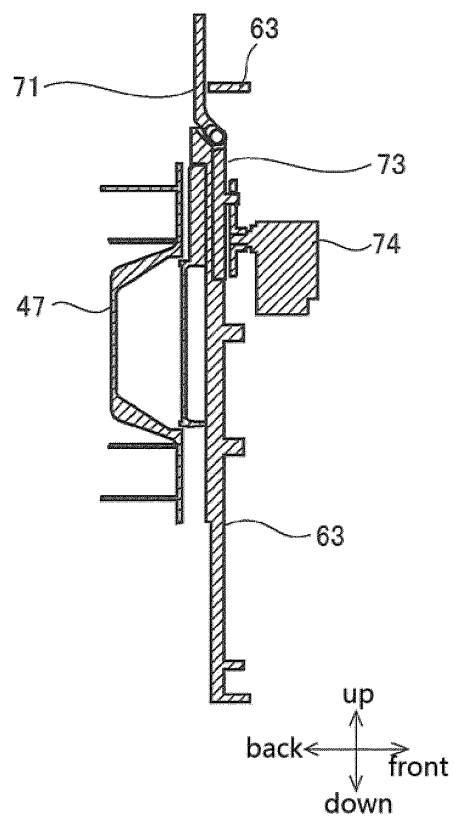


Fig. 9(B)

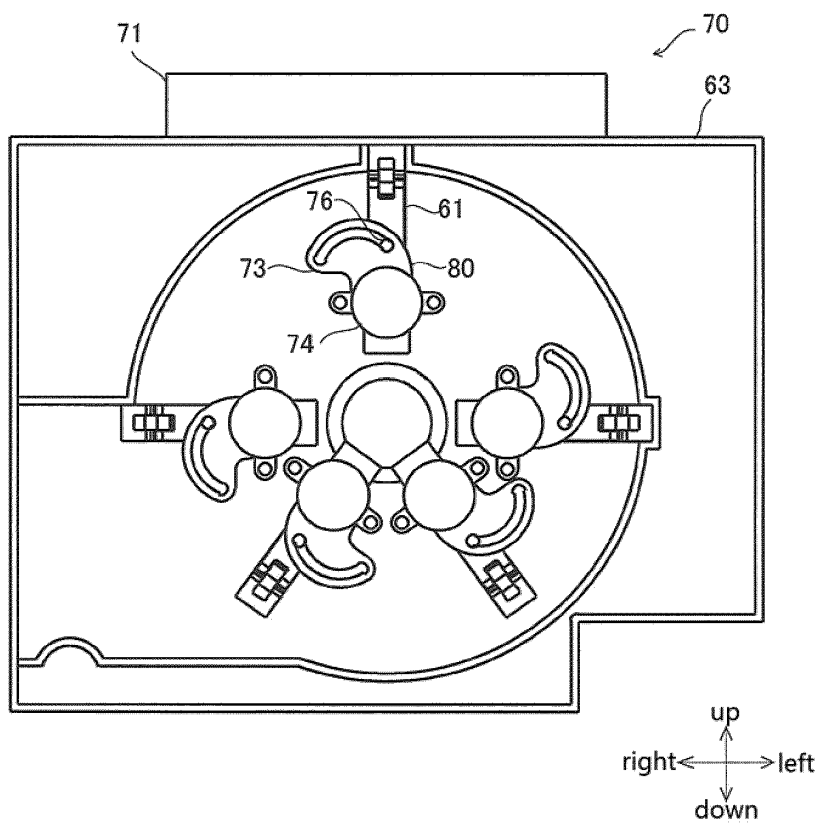


Fig. 9(C)

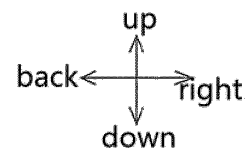
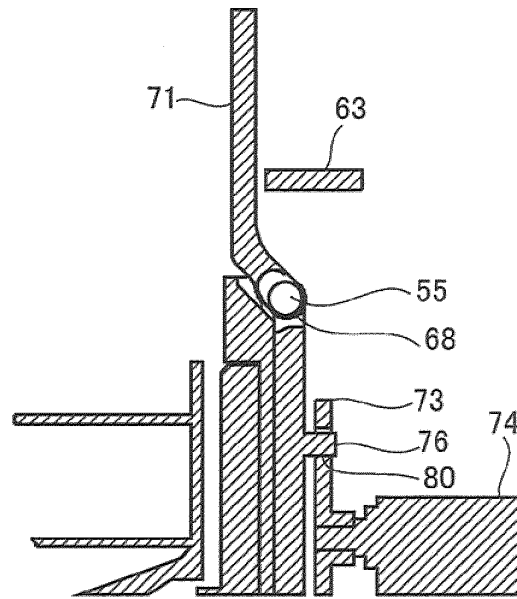


Fig. 9(D)

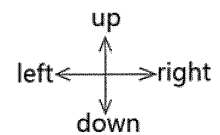
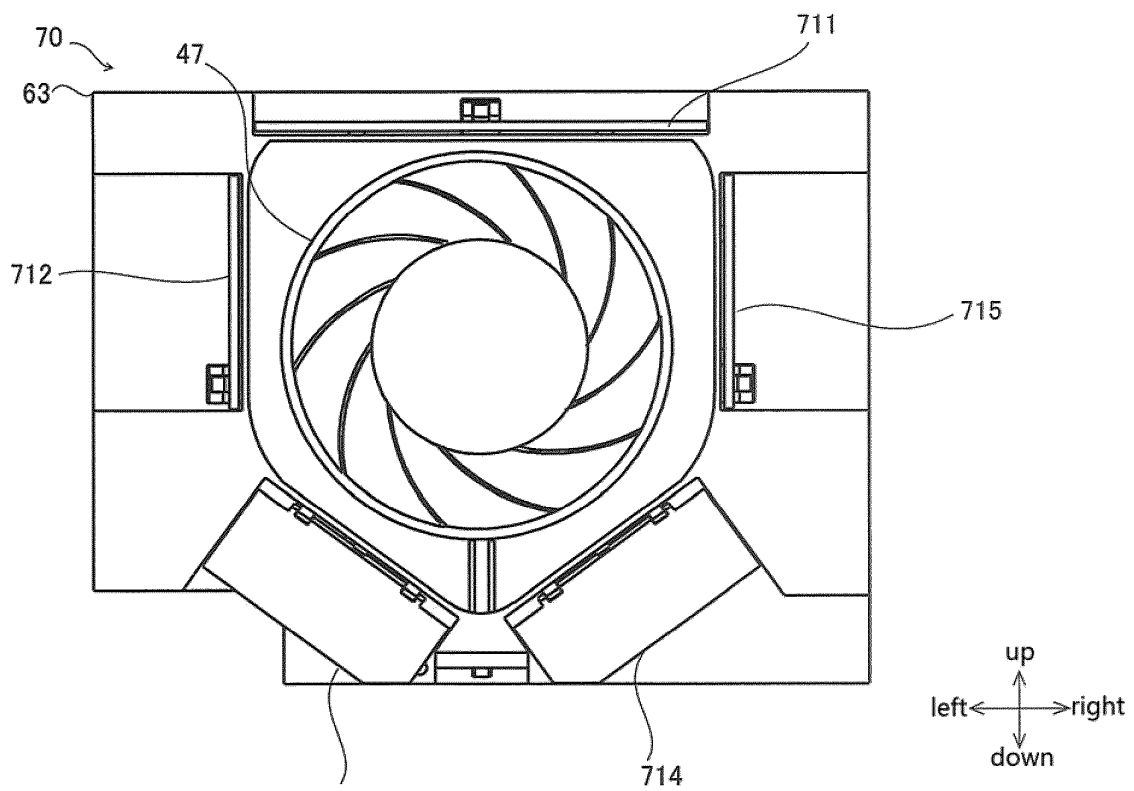


Fig. 10(A)

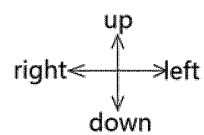
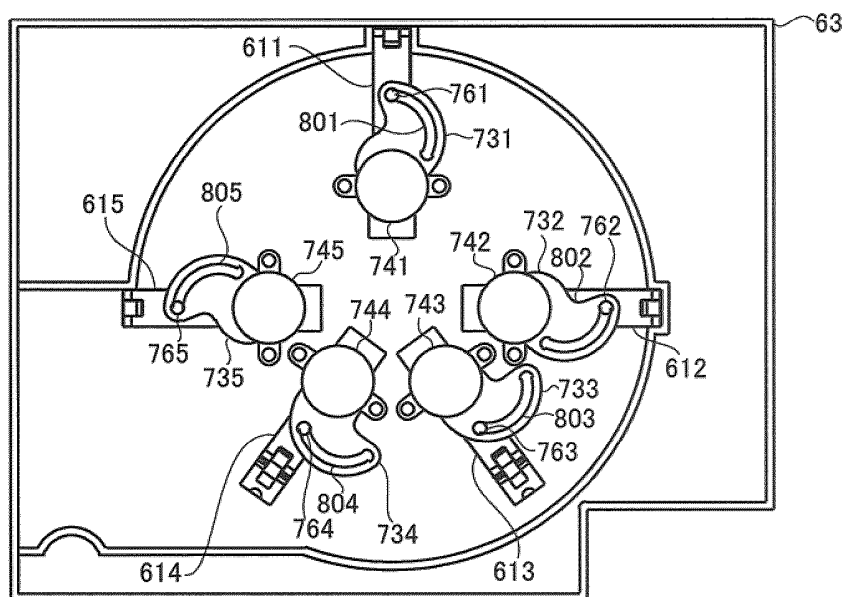


Fig. 10(B)

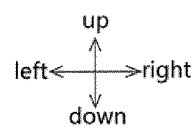
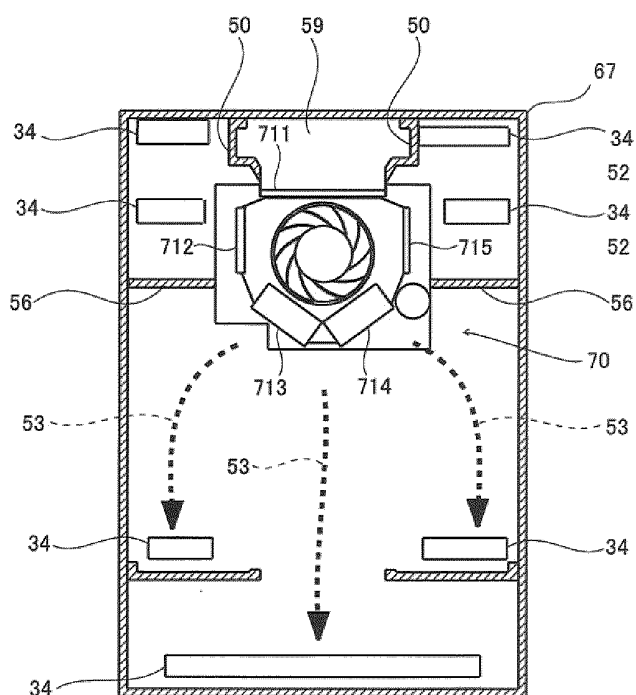


Fig. 11

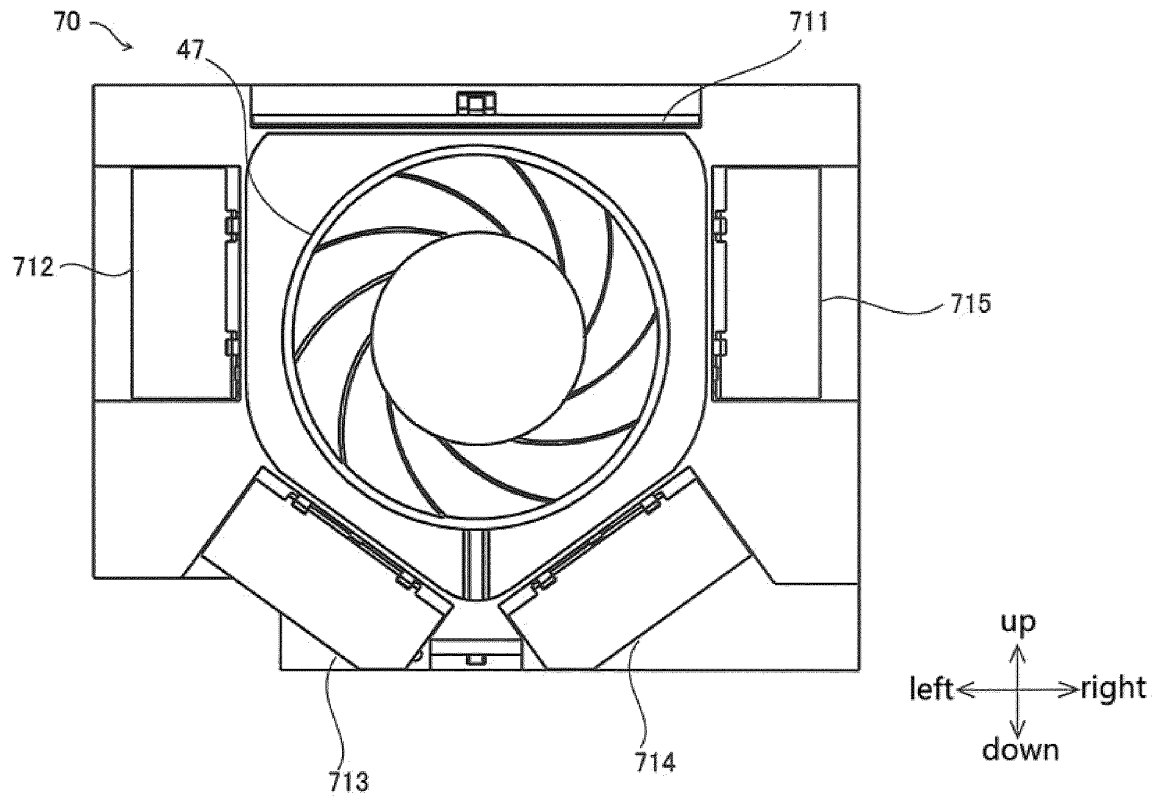


Fig. 12(A)

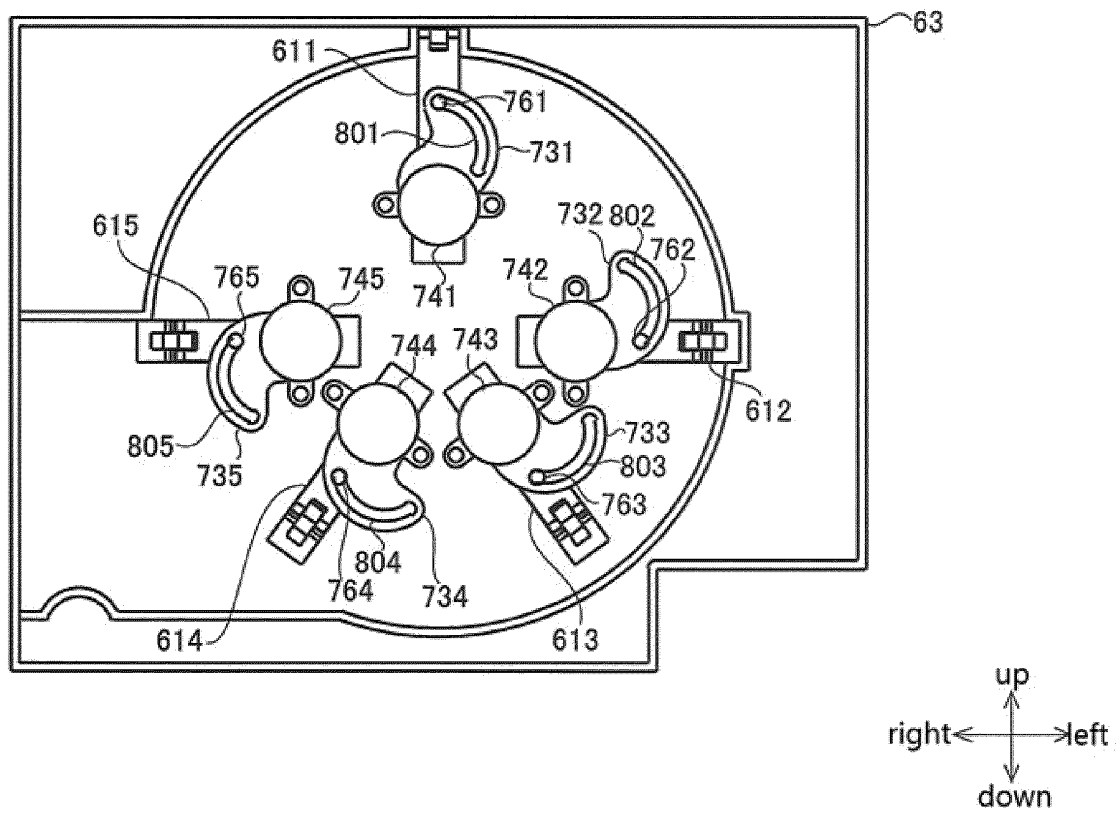


Fig. 12(B)

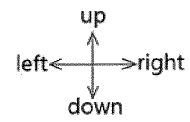
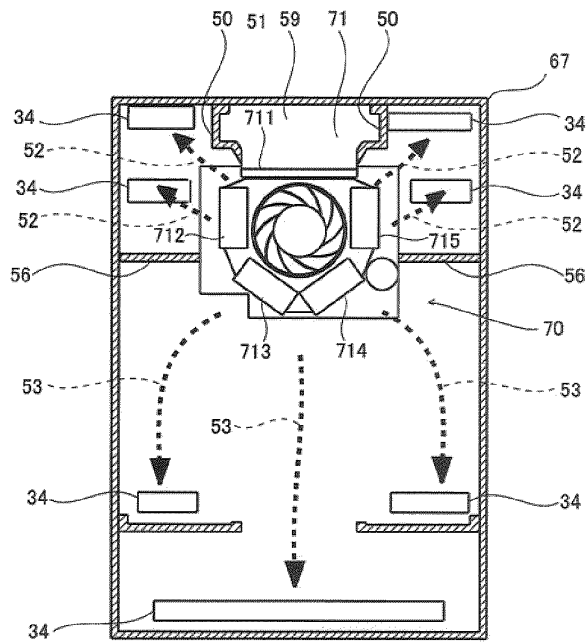


Fig. 13

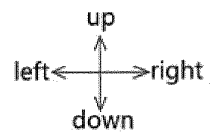
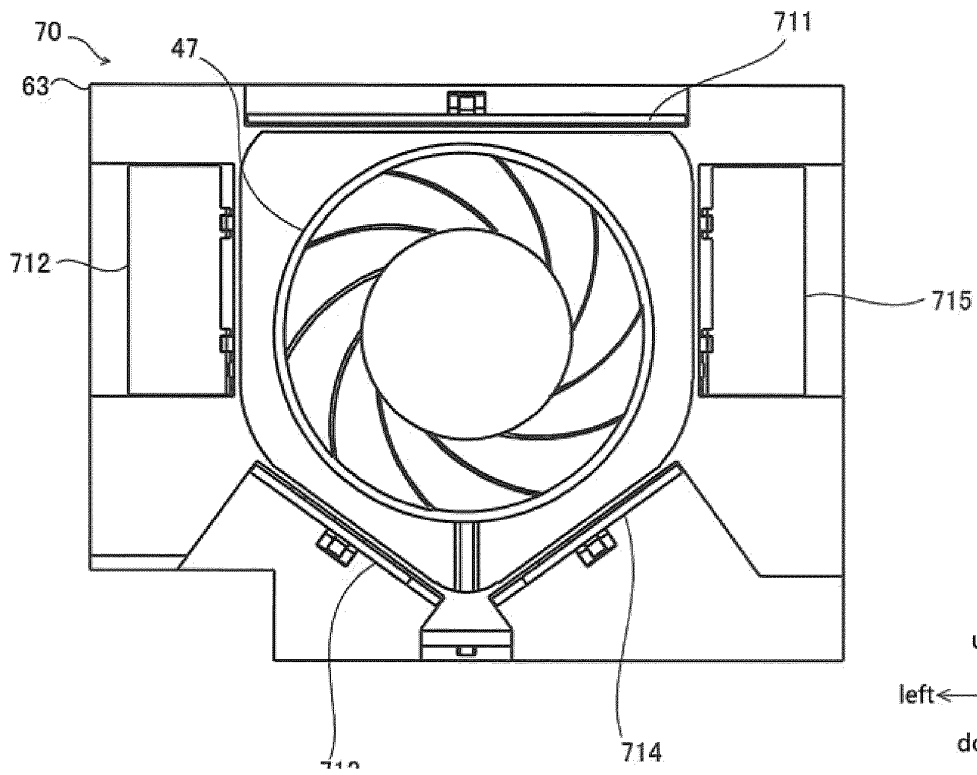


Fig. 14(A)

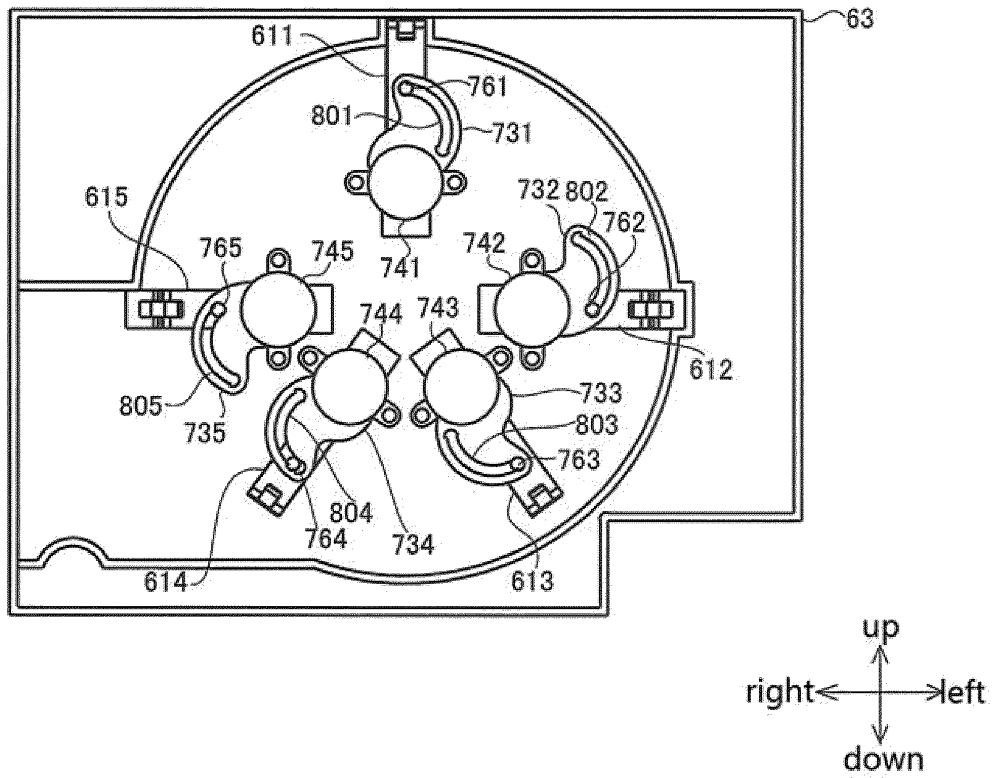


Fig. 14(B)

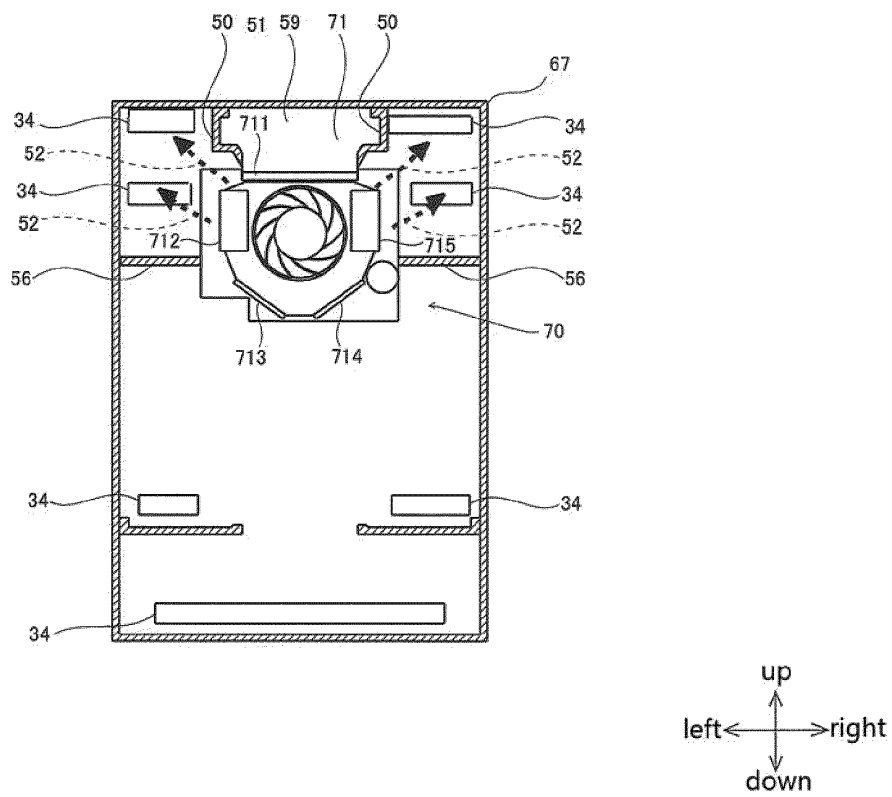


Fig. 15

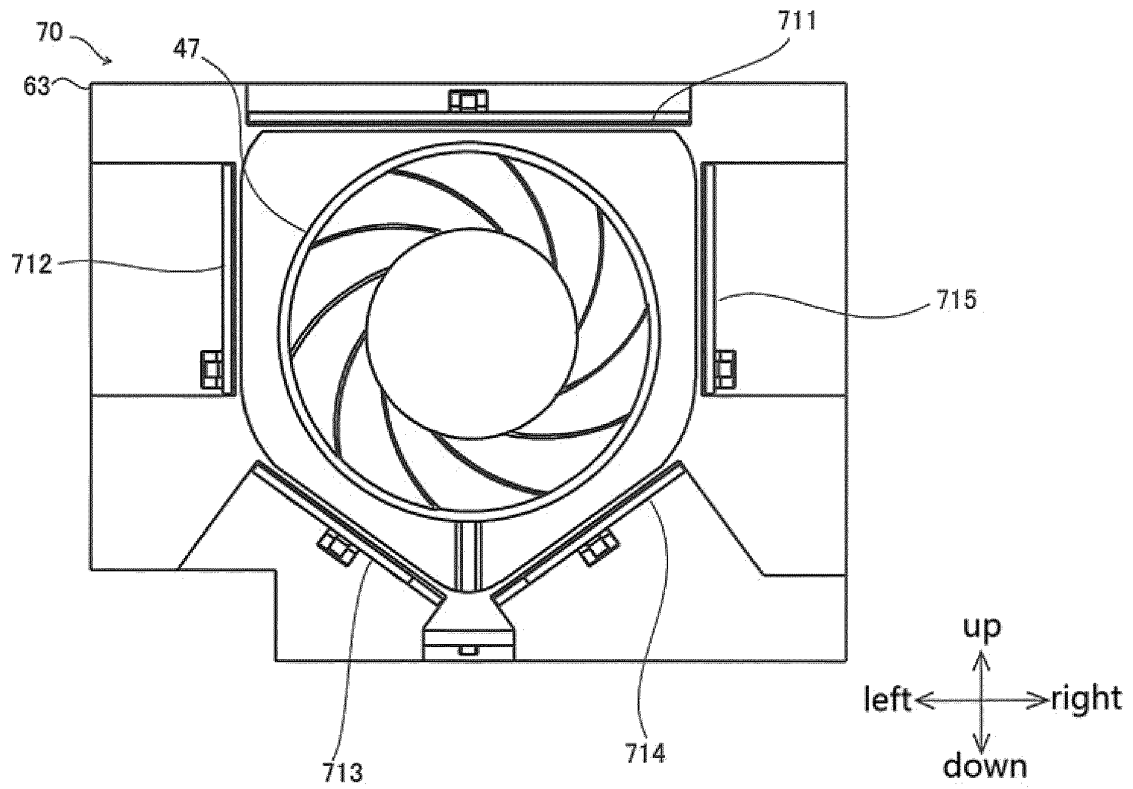


Fig. 16(A)

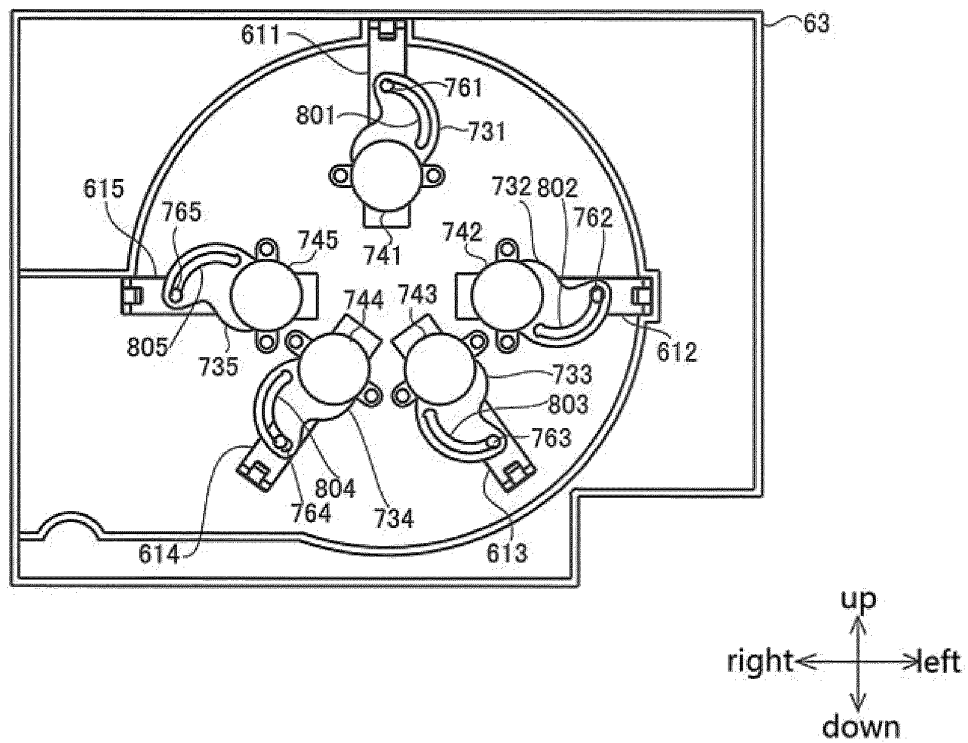


Fig. 16(B)

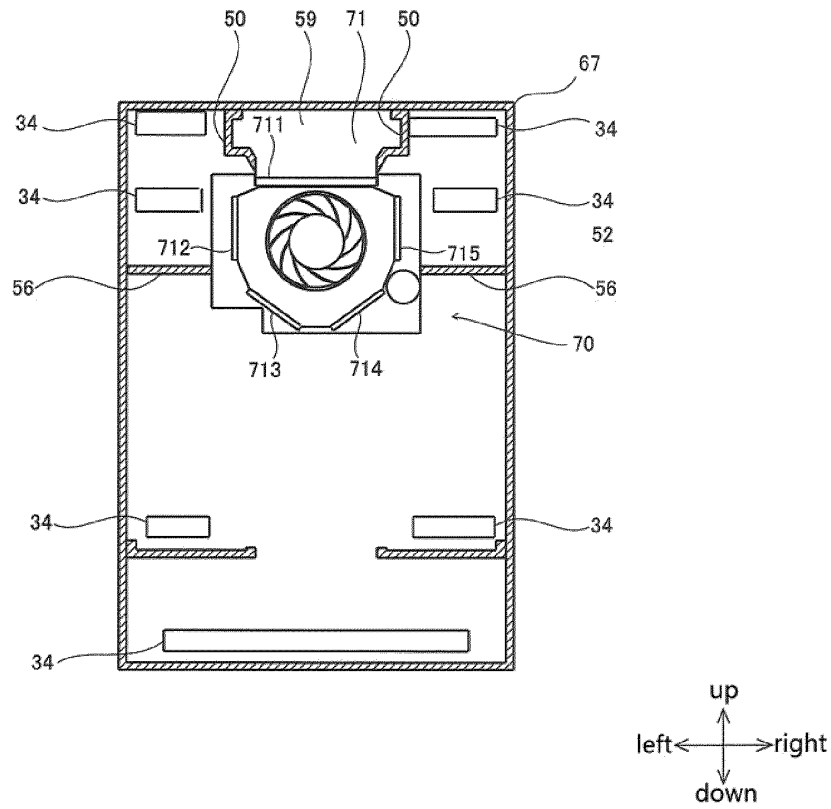


Fig. 17

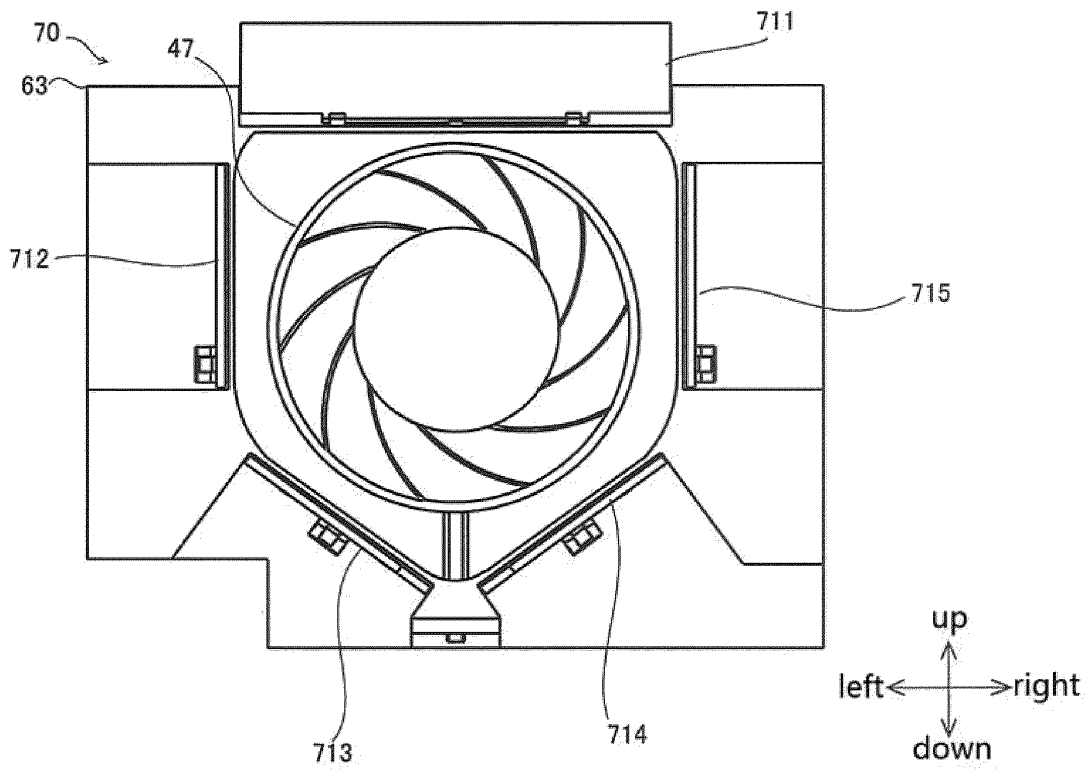


Fig. 18(A)

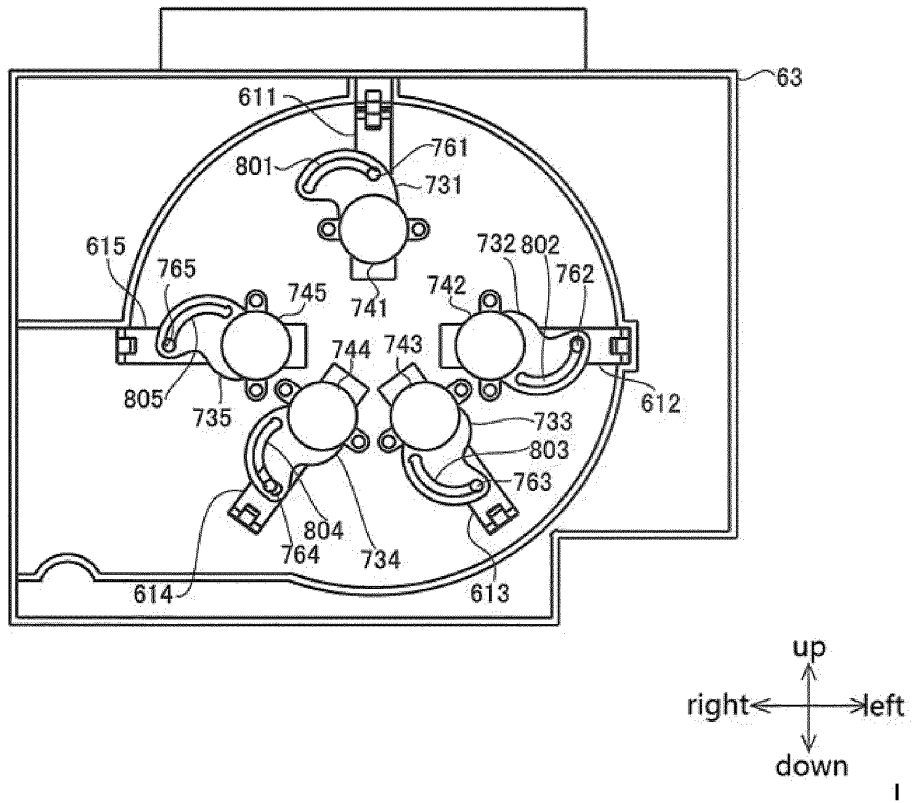


Fig. 18(B)

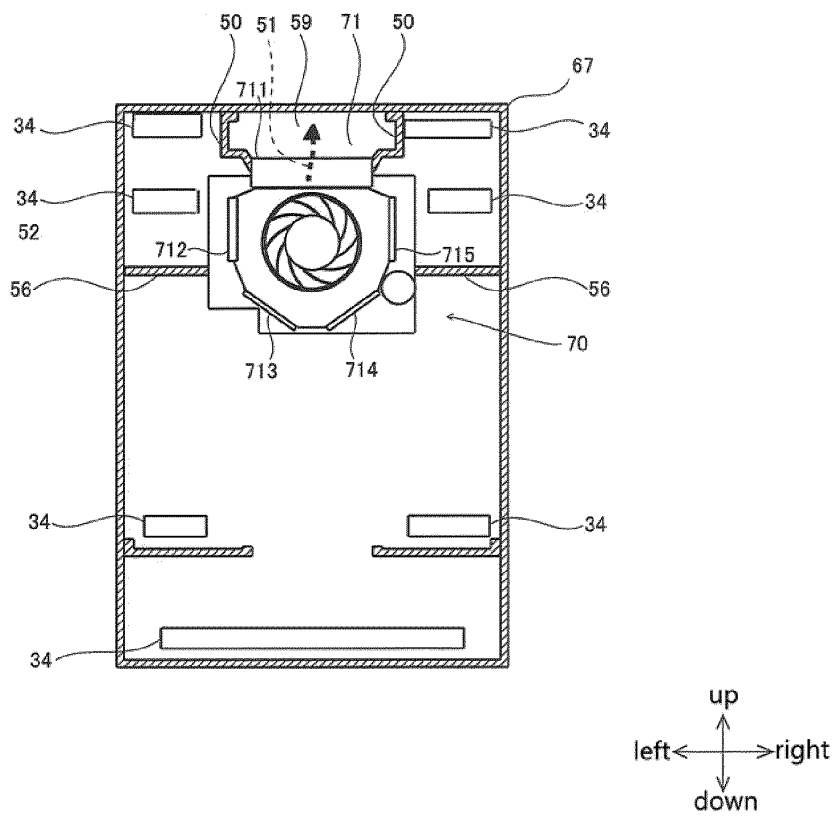


Fig. 19

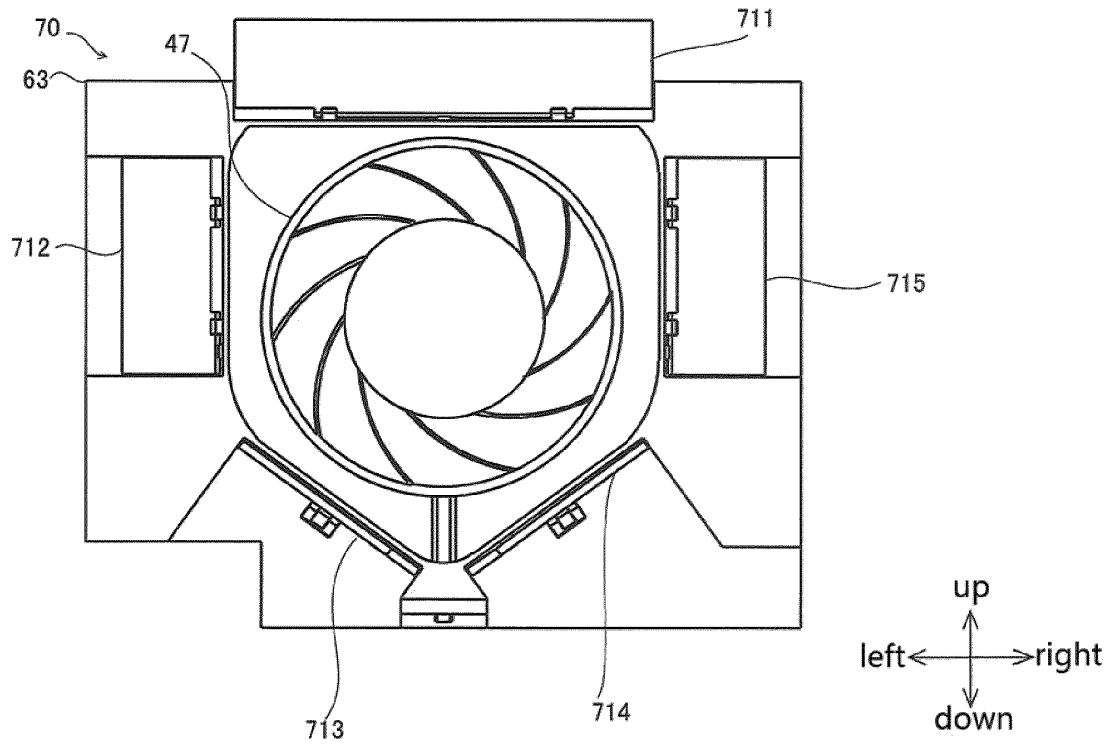


Fig. 20(A)

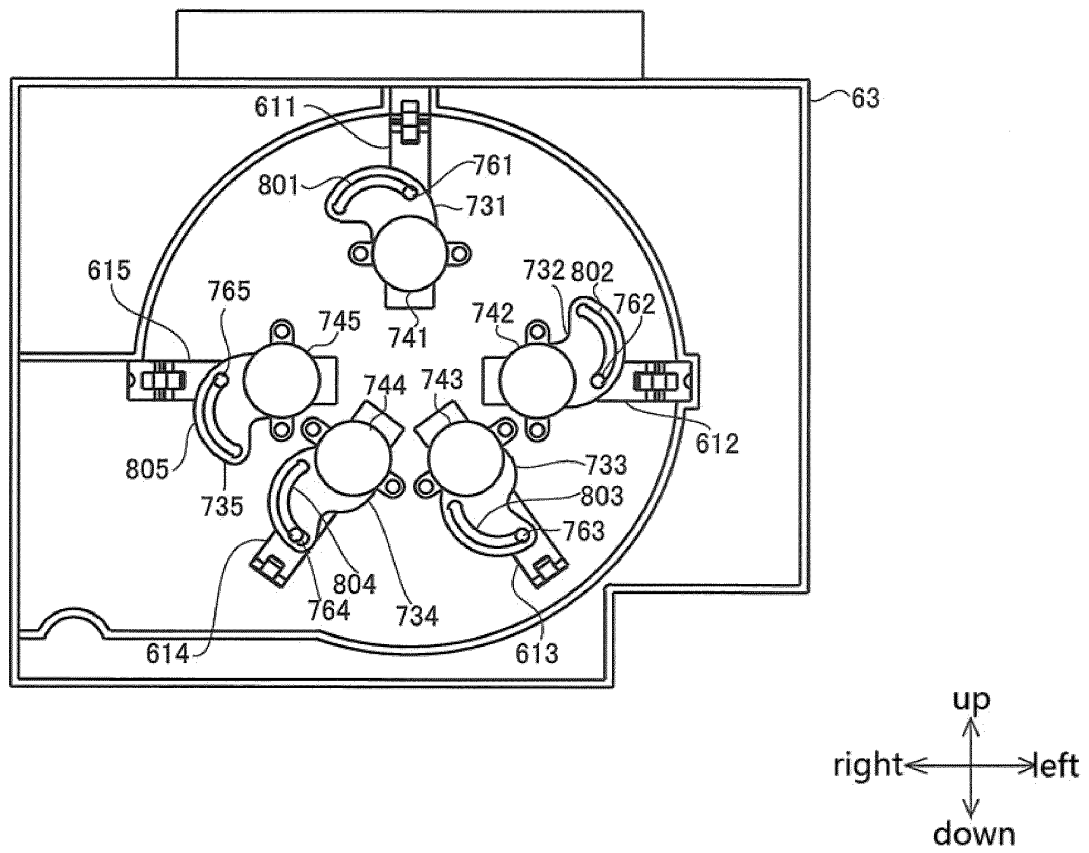


Fig. 20(B)

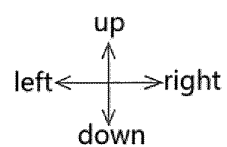
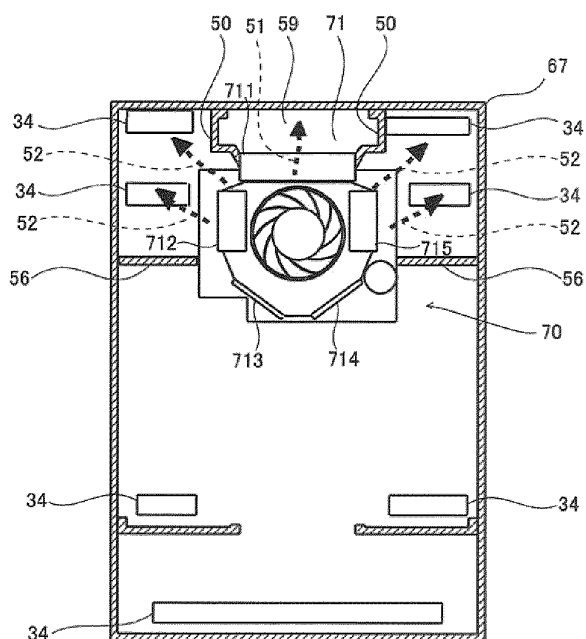


Fig. 21

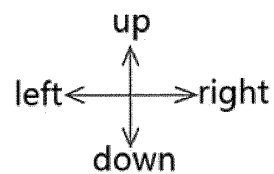
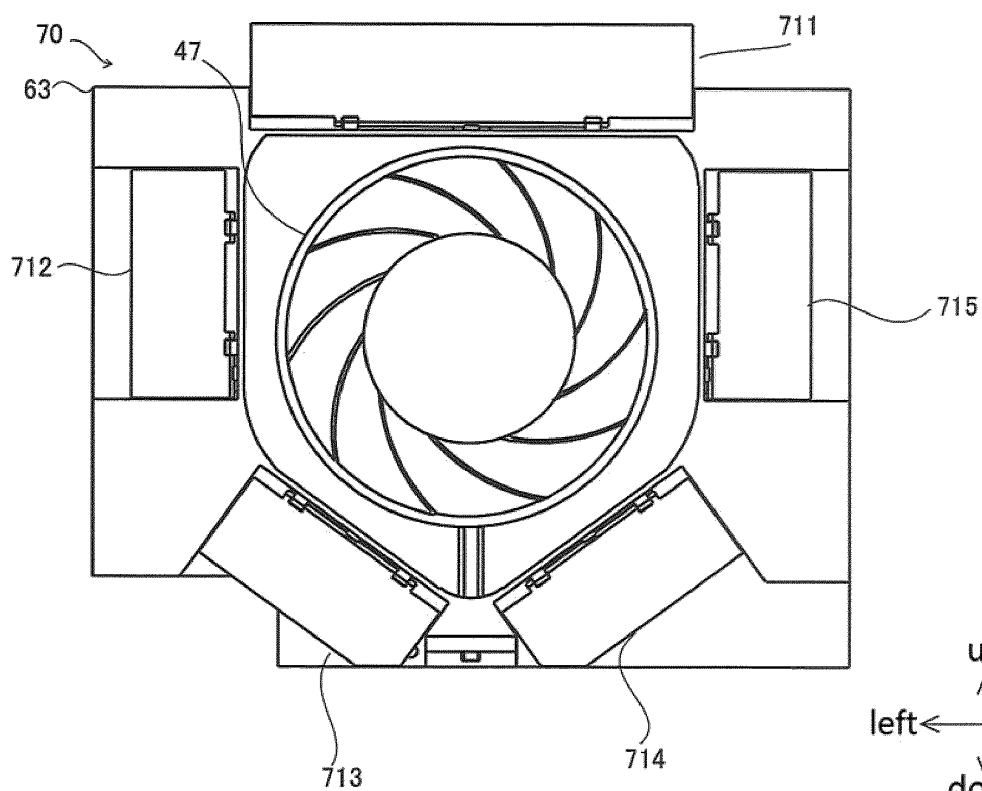


Fig. 22(A)

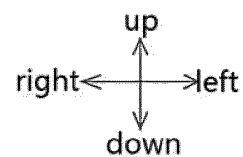
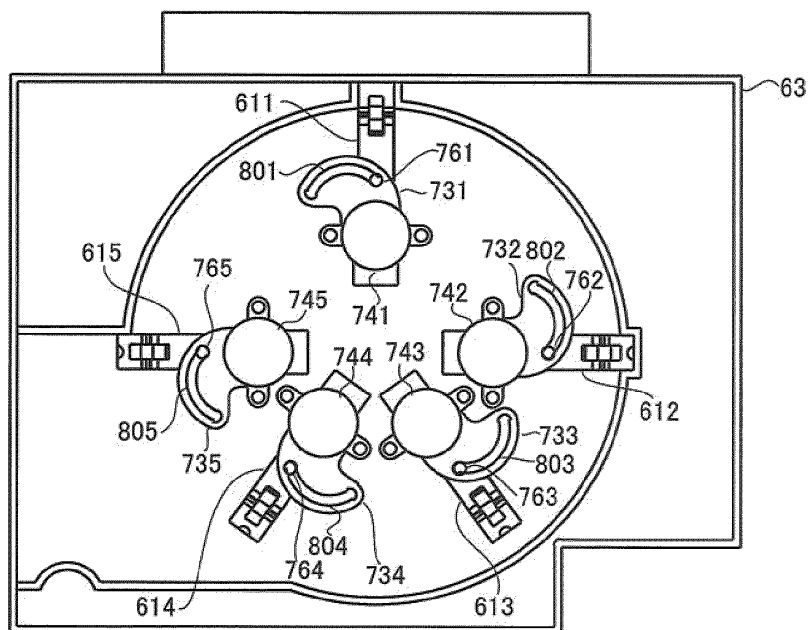


Fig. 22(B)

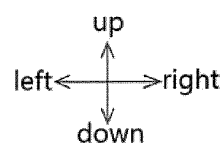
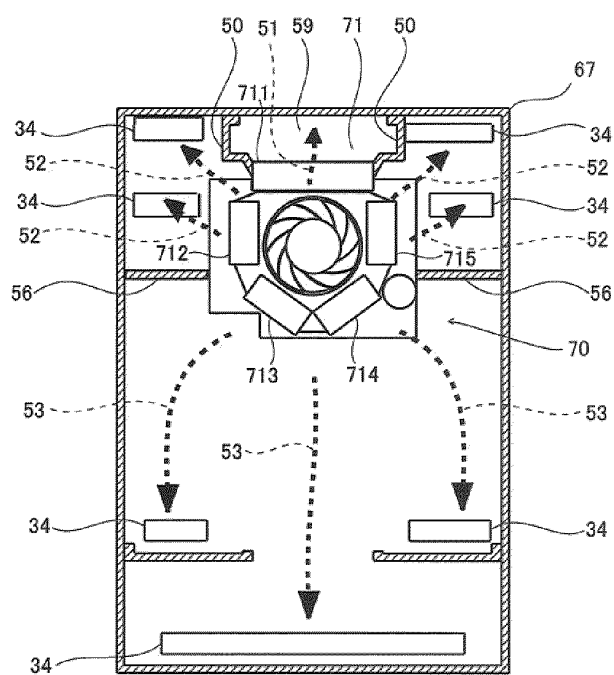


Fig. 23

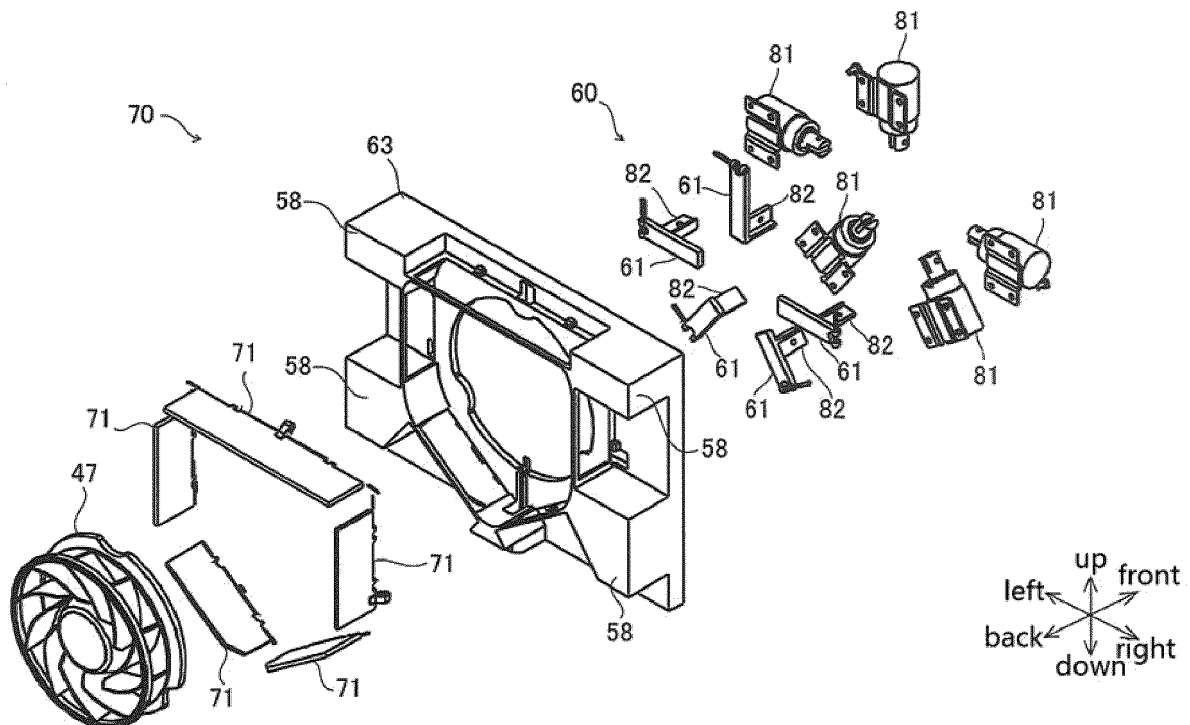


Fig. 24(A)

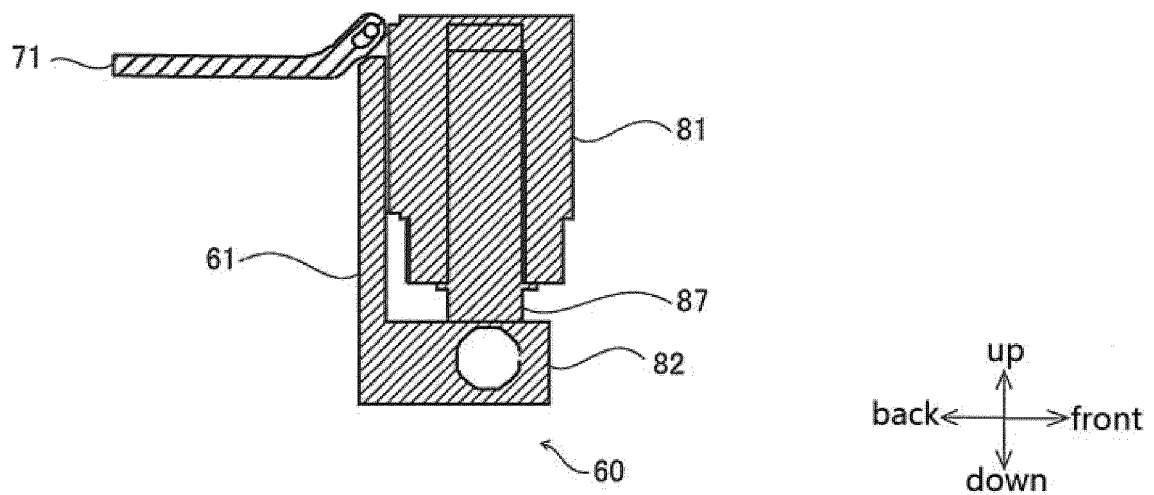


Fig. 24(B)

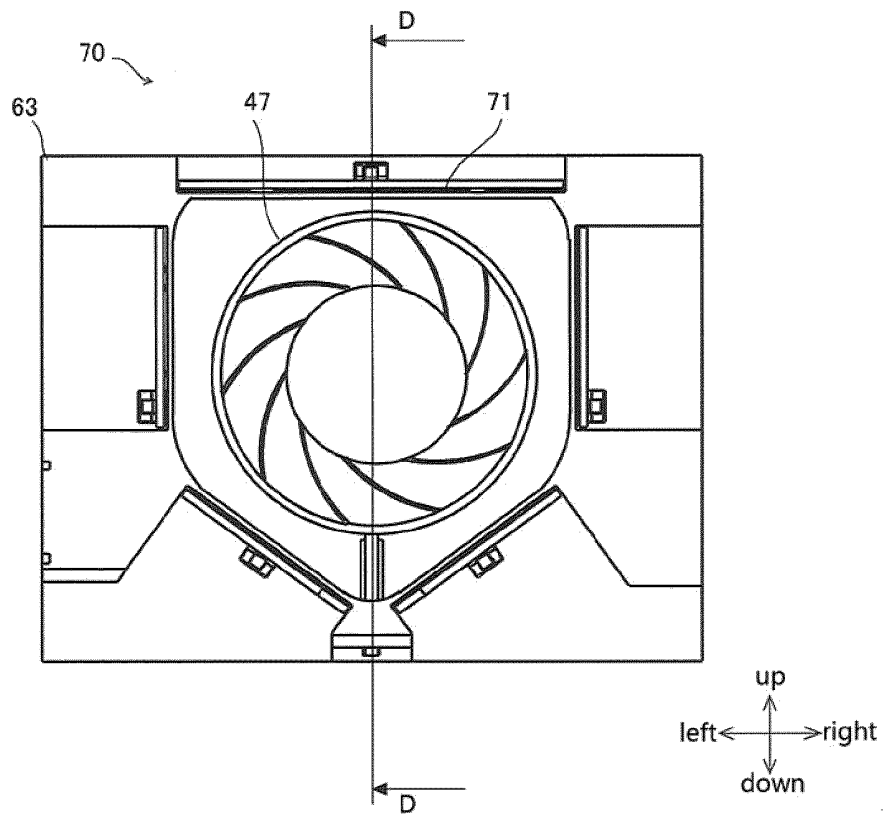


Fig. 25(A)

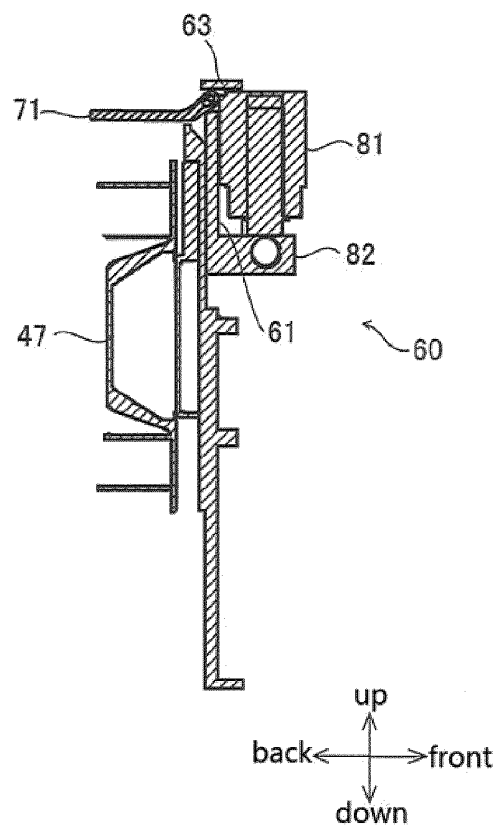


Fig. 25(B)

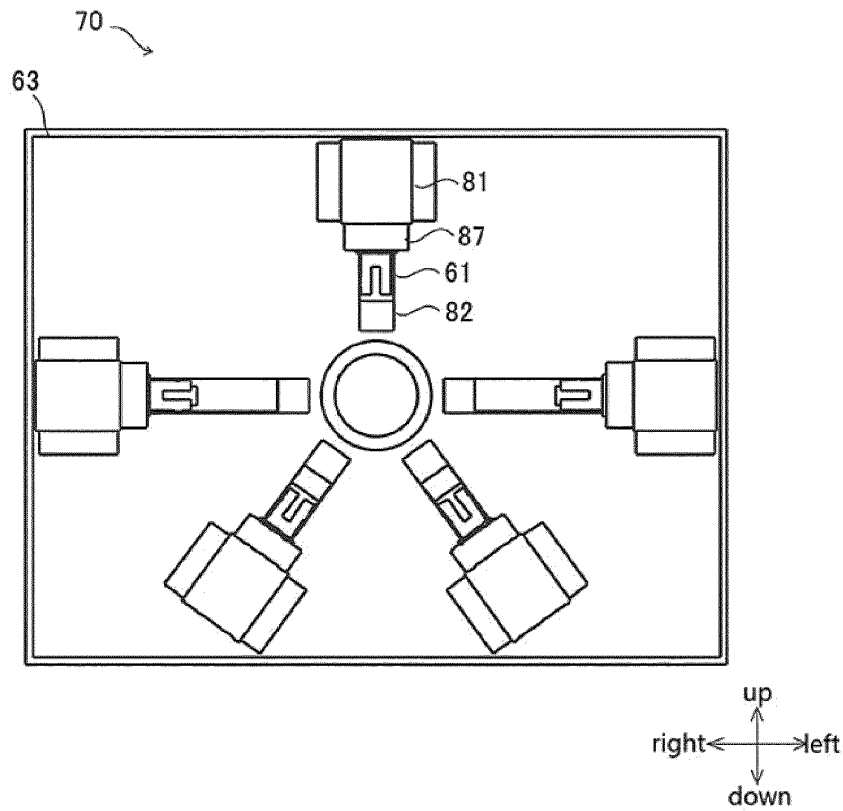


Fig. 25(C)

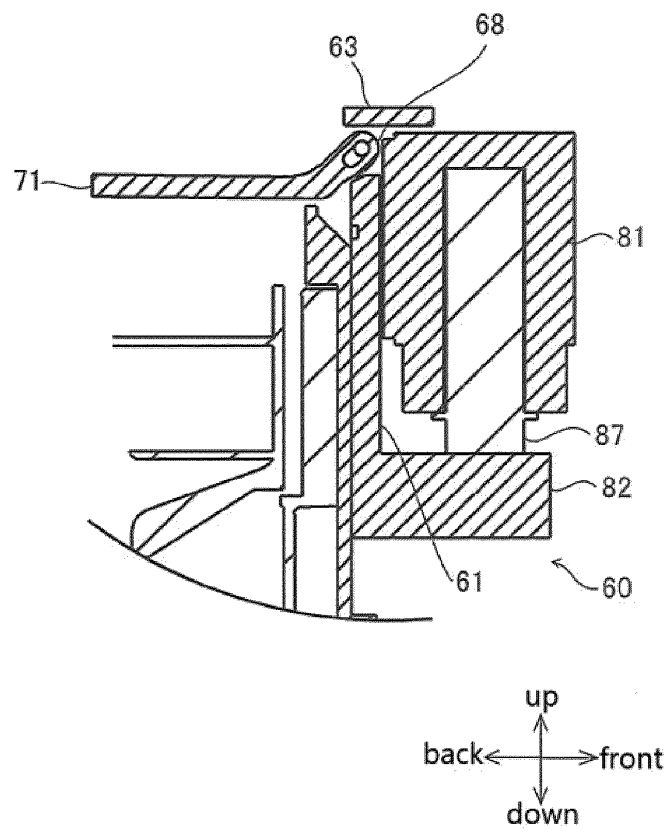


Fig. 25(D)

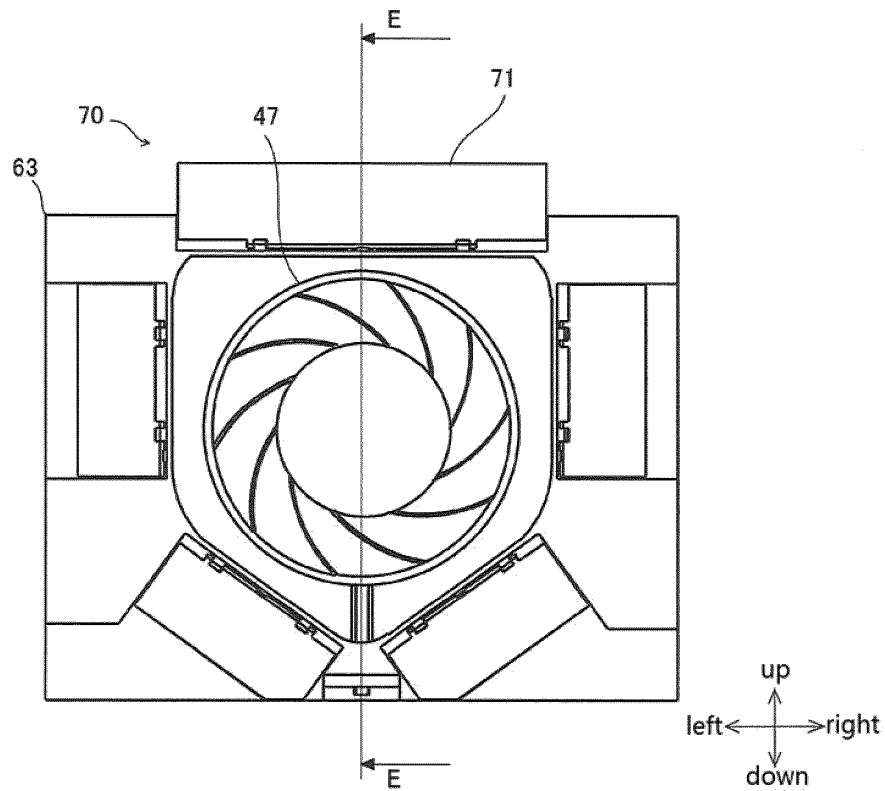


Fig. 26(A)

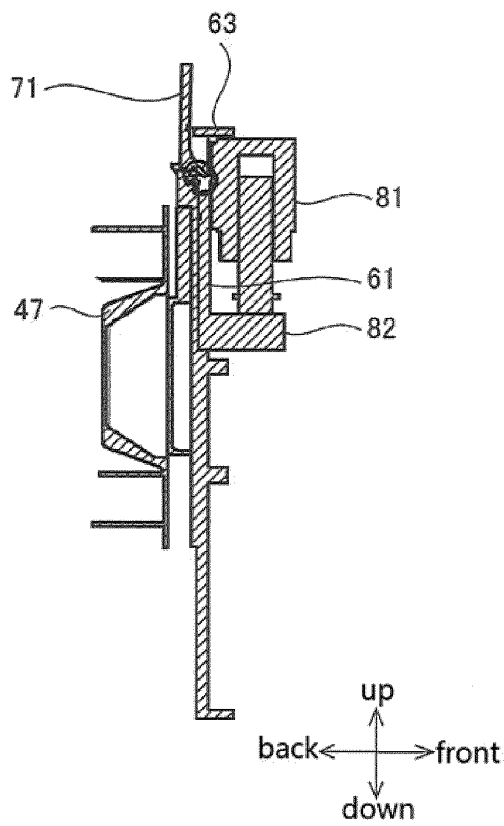


Fig. 26(B)

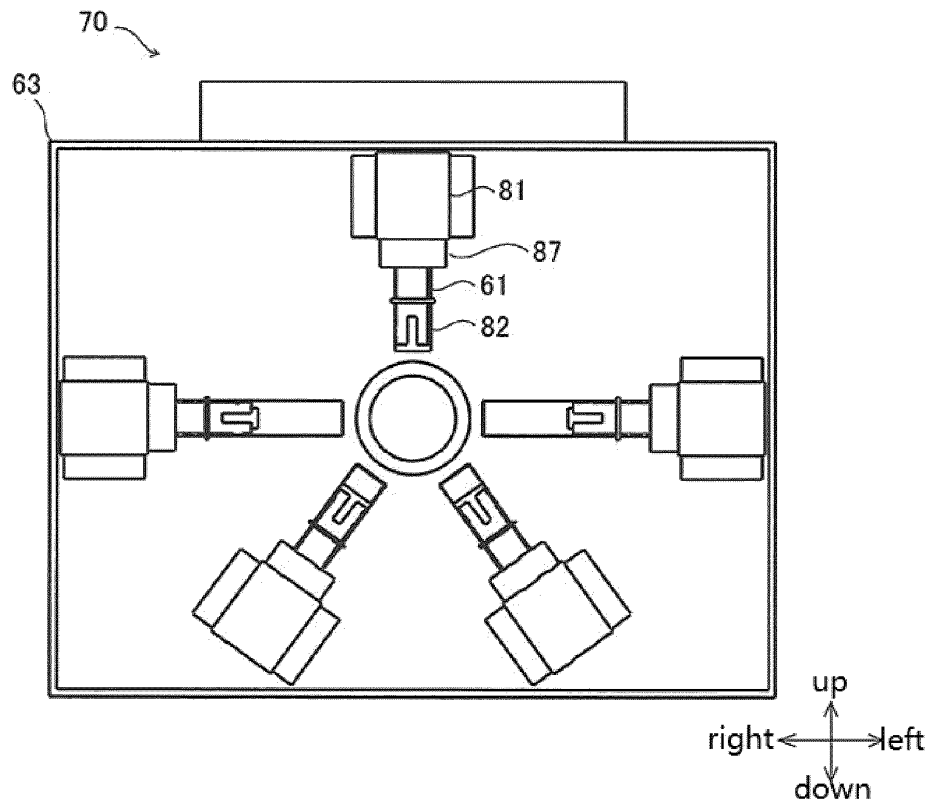


Fig. 26(C)

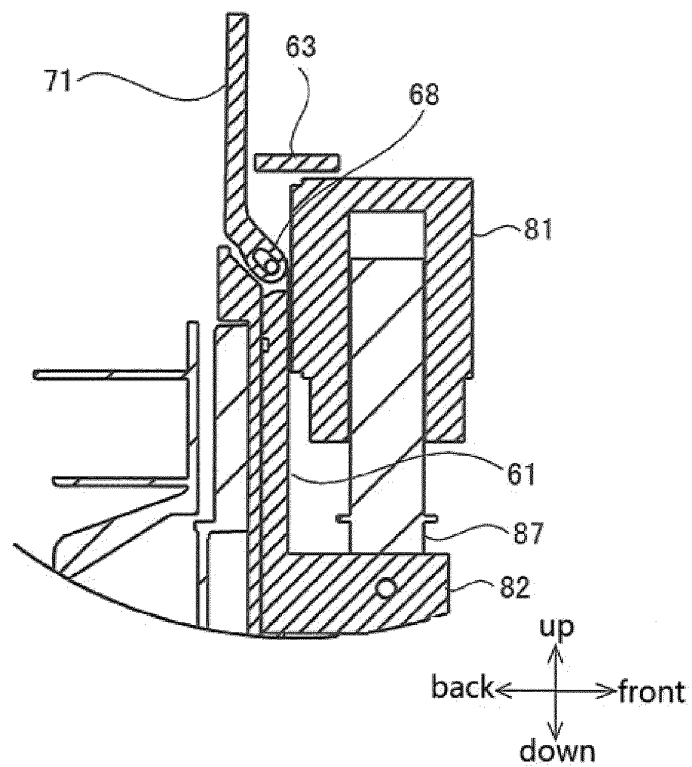


Fig. 26(D)

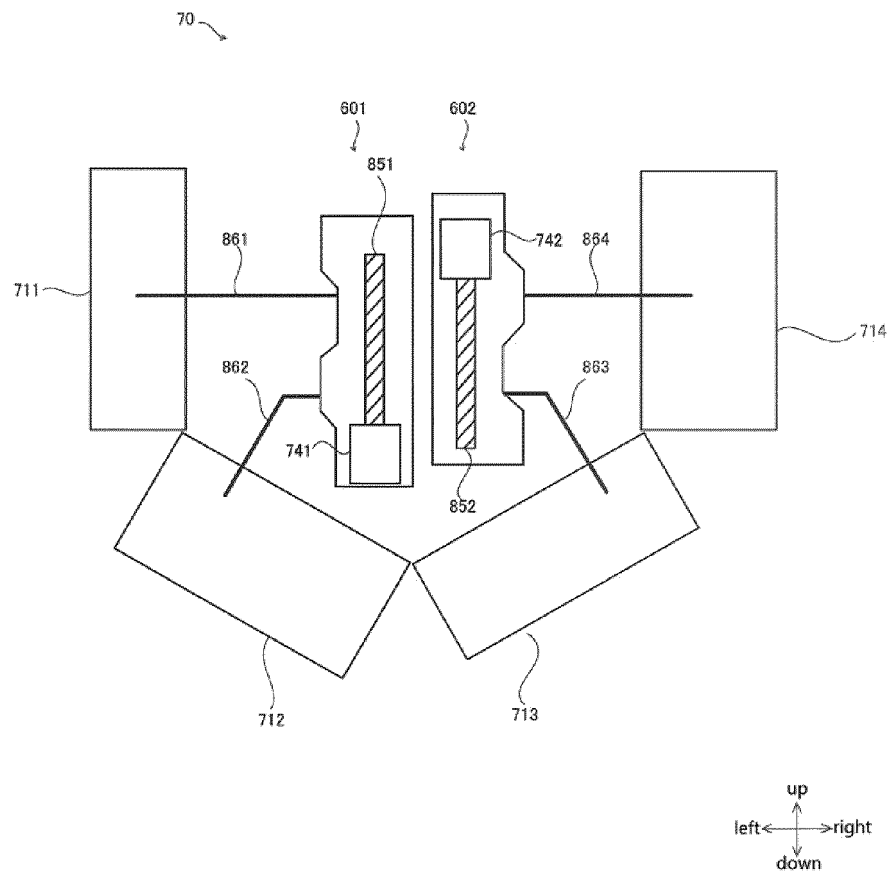


Fig. 27

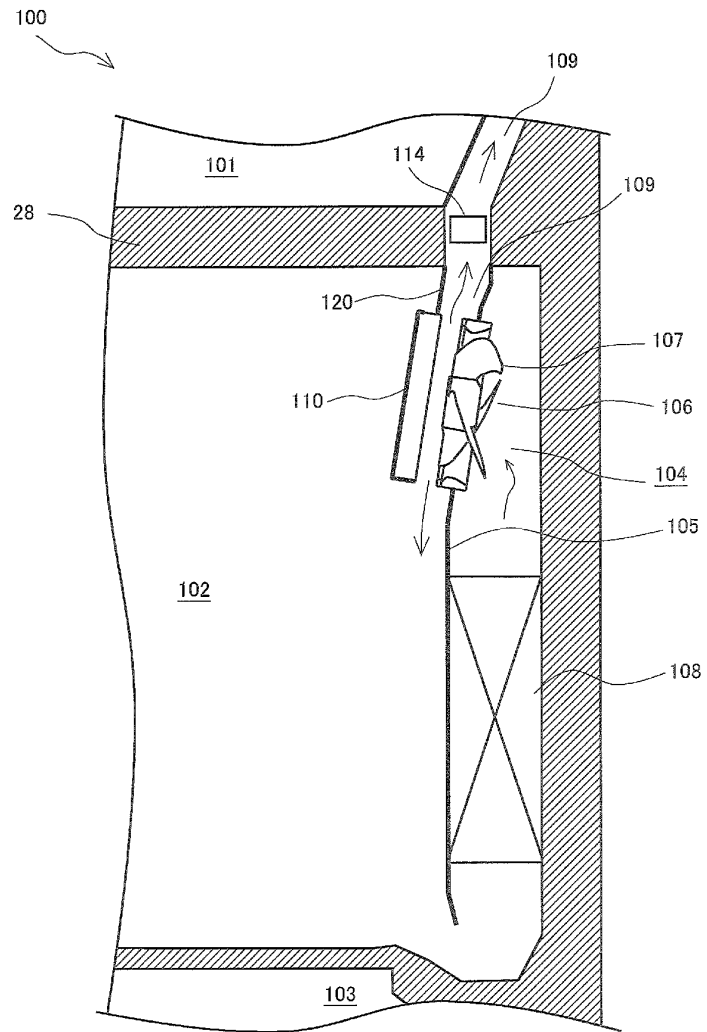


Fig. 28

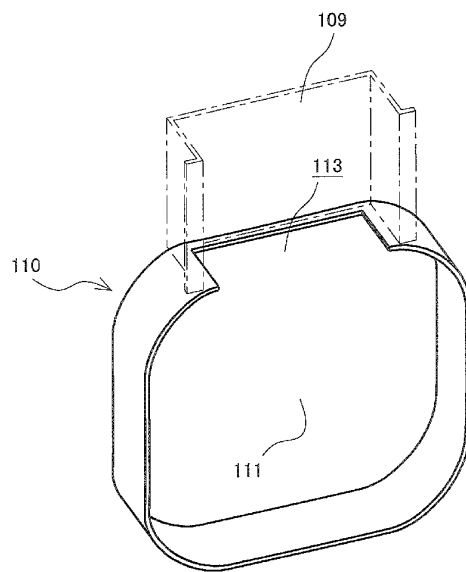


Fig. 29

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/089802

A. CLASSIFICATION OF SUBJECT MATTER

F25D 17/06(2006.01)i; F25D 11/02(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25D17 F25D11

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, CNKI, DWPI, SIPOABS; 风机, 风扇, 送风, 出风, 风门, 挡板, 档板, 盖, 传动, 驱动, fan, supply+, air, outlet, baffle, damper, door, cover, transmit+, transmission, driv+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 108302874 A (QINGDAO HAIER CO., LTD.) 20 July 2018 (2018-07-20) description, paragraphs [0062]-[0097], and figures 1-17	1-5
X	CN 108050751 A (QINGDAO HAIER CO., LTD.) 18 May 2018 (2018-05-18) description, paragraphs [0049]-[0079], and figures 1-15	1-5
X	CN 108253692 A (QINGDAO HAIER CO., LTD.) 06 July 2018 (2018-07-06) description, paragraphs [0048]-[0083], and figures 1-16	1-5
A	CN 108548355 A (QINGDAO HAIER CO., LTD.) 18 September 2018 (2018-09-18) entire document	1-5
A	WO 2015043418 A1 (HAIER ASIA INT. CO., LTD. et al.) 02 April 2015 (2015-04-02) entire document	1-5
A	JP 2007155146 A (NIDEC SANKYO CORP.) 21 June 2007 (2007-06-21) entire document	1-5
A	US 2017227276 A1 (PEARSON, J.E. et al.) 10 August 2017 (2017-08-10) entire document	1-5

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

24 June 2020

Date of mailing of the international search report

14 July 2020

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing
100088
China

Facsimile No. (86-10)62019451

Authorized officer

Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/089802

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				CN	108302874	B	21 April 2020	
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				EP	3051240	B1	25 April 2018	
				AU	2014328077	B2	28 July 2016	
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				JP	6254404	B2	27 December 2017	
				EP	3051240	A4	28 September 2016	
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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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