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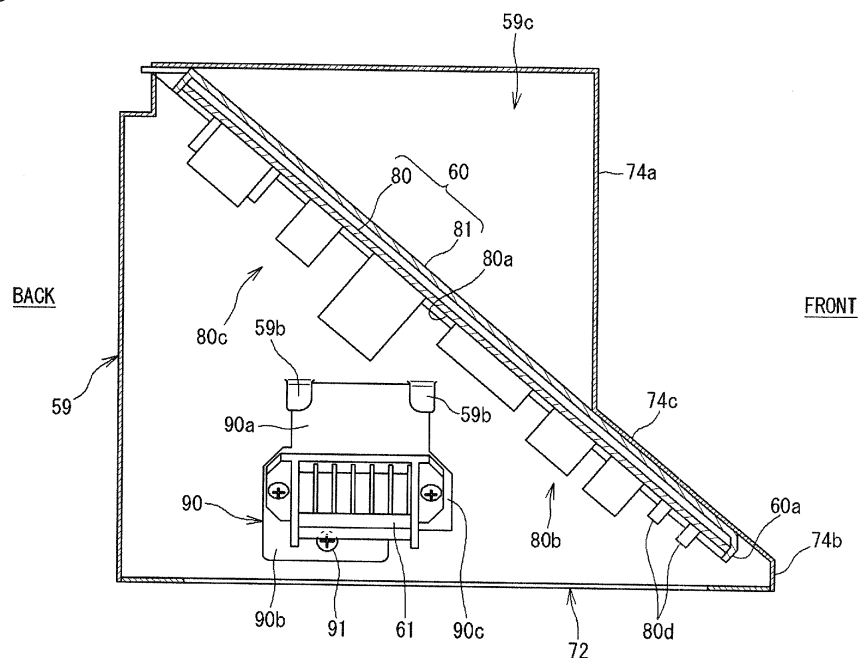
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(54) **INTERNAL UNIT FOR AIR CONDITIONER**

(57) There is provided an indoor unit for an air conditioning device enabling thinning of a body case. The indoor unit is an indoor unit for an air conditioning device in which a fan (19) and an electric component box (59) are provided inside a body case (31) installed in a ceiling (30), and a control board (60) to control electric parts including the fan (19) is contained in this electric compo-

nent box (59), wherein an opening (72) for maintenance is provided in a lower surface of the electric component box (59), and the control board (60) is arranged at a slant with respect to a vertical direction so that a mounting surface (80a) in the control board (60) is arranged obliquely downward.

FIG. 9



Description

TECHNICAL FIELD

[0001] The present invention relates to an indoor unit for an air conditioning device.

BACKGROUND ART

[0002] In Patent Literature 1 mentioned below, there has been disclosed an air conditioning device including a ceiling embedded type indoor unit contained inside a ceiling. This indoor unit includes a decorative panel in a lower surface of a box-shaped body case, and in this decorative panel, an inlet port and an outlet port of air are provided. An inside of the body case is divided into a machine chamber and a heat exchange chamber by a partition plate, in the machine chamber, a fan unit is arranged, and in the heat exchange chamber, a heat exchanger, a drain pan, a drain pump and the like are arranged. Air sucked from the inlet port by the fan unit is blown from the outlet port after being subjected to heat exchange with the heat exchanger to adjust indoor temperature and humidity.

[0003] Moreover, in the machine chamber inside the body case, there is provided an electric component box containing a control board that controls electric parts such as the fan unit and the drain pump, a terminal block and the like.

CITATION LIST

[PATENT LITERATURE]

[0004] Patent Literature 1: Japanese Unexamined Patent Publication No. 2006-97995

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] Since the body case in the ceiling embedded type indoor unit is arranged in a narrow space inside the ceiling, it is desired to make the body case as thin as possible. Moreover, not only the thinning of the ceiling embedded type, but also the thinning of an indoor unit installed on a ceiling lower surface is desired.

[0006] In the indoor unit described in Patent Literature 1, the control board and the terminal block inside the electric component box are arranged side by side, and the control board is arranged in a state where long sides thereof are lateral (horizontal). This can make a height dimension of the electric component box small, thereby contributing to the thinning of the body case.

[0007] However, in the above-described arrangement, since a lateral dimension of the electric component box becomes larger, the electric component box cannot help being arranged between the fan unit and a back wall of

the body case in a front-back direction with a longitudinal direction of the electric component box set along a longitudinal direction of the body case. Although this enables the thinning of the body case, there is a disadvantage that a depth dimension (in the front-back direction) becomes larger.

[0008] An object of the present invention is to provide an indoor unit for an air conditioning device that can make a height dimension of an electric component box small to achieve thinning of a body case without arranging long sides of a control board horizontally.

SOLUTION TO PROBLEM

[0009] The present invention is an indoor unit for an air conditioning device in which a fan and an electric component box are provided inside a body case installed in a ceiling, and a control board to control electric parts including the fan is contained in this electric component box, wherein an opening for maintenance is provided in a lower surface of the electric component box, and the control board is arranged at a slant with respect to a vertical direction so that a mounting surface in the control board is arranged obliquely downward.

[0010] According to this configuration, a height dimension of the control board can be made as small as possible without arranging long sides of the control board laterally (horizontally). This can also make small a height dimension of the electric component box containing this control board, which enables thinning of the body case. Moreover, since the long sides of the control board need not be lateral, a lateral dimension of the electric component box can also be made small, which increases a freedom degree of an arrangement location of the electric component box. Furthermore, since the mounting surface of the control board is arranged obliquely downward, inspection and the like of the control board can be easily performed through the opening.

[0011] A longitudinal dimension of the control board may be larger than a height dimension of the body case.

[0012] Even when the longitudinal dimension of the control board is larger than the height dimension of the body case in this manner, the slant arrangement of the control board with respect to the vertical direction allows the control board to be appropriately contained in the body case in a state where the long sides of the control board are arranged longitudinally (in a direction crossing the horizontal).

[0013] It is preferable that a terminal block is contained detachably inside the electric component box, and that this terminal block is arranged so as to overlap a planar region of the control board within a range of a height of the control board.

[0014] The above-described configuration enables the control board and the terminal block to be arranged compactly, and the electric component box to be downsized.

[0015] It is preferable that a weak current circuit is provided on a lower side in the mounting surface of the con-

trol board, and that a strong current circuit is provided on an upper side therein.

[0016] Generally, since in many cases, electric parts each having a lower operating voltage (weak current parts) have high maintenance frequency, and electric parts each having a high operating voltage (strong current parts) have lower maintenance frequency, the weak current circuit controlling the weak current part is mounted on the lower side close to the opening for maintenance, which can enhance maintenance performance.

[0017] It is preferable that the control board is fixed to the electric component box by a screw in at least one side, and is locked to the electric component box in at least other two sides.

[0018] The above-described configuration can prevent the control board from floating up with respect to the electric component box, when vibration in a direction perpendicular to a plate surface of the control board is applied.

ADVANTAGEOUS EFFECTS OF INVENTION

[0019] According to the present invention, the height dimension of the electric component box can be made small without arranging the long sides of the control board laterally, and the thinning of the body case in which this electric component box is provided can be achieved.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

[FIG. 1] FIG. 1 is a configuration view of an air conditioning device in one embodiment of the present invention.

[FIG. 2] FIG. 2 is a side cross-sectional view showing an indoor unit for the air conditioning device (a cross-sectional view viewed from arrow of A-A in FIG. 3).

[FIG. 3] FIG. 3 is an explanatory plan view of the indoor unit.

[FIG. 4] FIG. 4 is a front view of the indoor unit.

[FIG. 5] FIG. 5 is a bottom view of the indoor unit.

[FIG. 6] FIG. 6 is a side cross-sectional view (a cross-sectional view viewed from arrow of B-B in FIG. 3) of the indoor unit.

[FIG. 7] FIG. 7 is a side view of an electric component unit.

[FIG. 8] FIG. 8 is a bottom view of the electric component unit.

[FIG. 9] FIG. 9 is a side cross-sectional view of the electric component unit.

[FIG. 10] FIG. 10 is a cross-sectional view showing an attachment structure of a terminal block.

[FIG. 11] FIG. 11 is a perspective view showing an attachment structure on a lower side of the control board.

[FIG. 12] FIG. 12 is a perspective view showing an attachment structure on an upper side of the control board.

DESCRIPTION OF EMBODIMENTS

[0021] Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0022] FIG. 1 is a configuration view of an air conditioning device according to one embodiment of the present invention. This air conditioning device 10 includes an indoor unit (a utilization-side unit) 11 and an outdoor unit (a heat source-side unit) 12.

[0023] In the outdoor unit 12, a compressor 14, a four way valve 18, an outdoor heat exchanger 15, an outdoor expansion valve 16 and the like are provided, and these are connected by a refrigerant pipe 25. Moreover, in the outdoor unit 12, an outdoor fan 20 is provided.

[0024] At terminal portions of an inside refrigerant circuit of the outdoor unit 12, a gas side stop valve 22 and a liquid side stop valve 23 are provided. The gas side stop valve 22 is arranged on a four way valve 18 side, and the liquid side stop valve 23 is arranged on an outdoor expansion valve 16 side.

[0025] In the indoor unit 11, an indoor expansion valve 28, an indoor heat exchanger 13 and the like are provided. The gas side stop valve 22 and the indoor heat exchanger 13 are connected by a gas side refrigerant communication pipe 24, and the liquid side stop valve 23 and the indoor expansion valve 28 are connected by a liquid side refrigerant communication pipe 26.

[0026] In the air conditioning device 10 having the above-described configuration, when cooling operation is performed, the four way valve 18 is held in a state indicated by solid line in FIG. 1. As indicated by solid arrow, a high-temperature, high-pressure gassy refrigerant discharged from the compressor 14 flows into the outdoor heat exchanger 15 via the four way valve 18, and exchanges heat with outdoor air by activation of the outdoor fan 20 to be condensed/liquefied. The liquefied refrigerant passes through the outdoor expansion valve 16 in an almost fully open state, and flows into the indoor unit 11 through the liquid side refrigerant communication pipe 26. In the indoor unit 11, the refrigerant is decompressed to a predetermined low pressure by the indoor expansion valve 28, and further exchanges heat with the indoor air in the indoor heat exchanger 13 to evaporate. The indoor air cooled by the evaporation of the refrigerant is blown into a room by an indoor fan 19 to cool the room. Moreover, the refrigerant, which has evaporated in the indoor heat exchanger 13, returns to the outdoor unit 12 through the gas side refrigerant communication pipe 24, and is sucked into the compressor 14 via the four way valve 18.

[0027] On the other hand, when heating operating is performed, the four way valve 18 is held in a state indicated by dashed line in FIG. 1. As indicated by dotted arrow, the high-temperature, high-pressure gassy refrigerant discharged from the compressor 14 flows into the indoor heat exchanger 13 of the indoor unit 11 via the four way valve 18, and exchanges heat with the indoor air to be condensed/liquefied. The indoor air heated by

the condensation of the refrigerant is blown into the room by the indoor fan 19 to heat the room. The refrigerant liquefied in the indoor heat exchanger 13 returns to the outdoor unit 12 from the indoor expansion valve 28 in an almost fully open state through the liquid side refrigerant communication pipe 26. The refrigerant, which has returned to the outdoor unit 12, is decompressed to a predetermined low pressure in the outdoor expansion valve 16, and exchanges heat with the outdoor air in the outdoor heat exchanger 15 to evaporate. The refrigerant, which has evaporated in the outdoor heat exchanger 15, is sucked into the compressor 14 via the four way valve 18.

[0028] FIG. 2 is a side cross-sectional view (a cross-sectional view viewed from arrow of A-A in FIG. 3) showing the indoor unit 11 of the air conditioning device 10, FIG. 3 is a plane cross-sectional view of the indoor unit 11, FIG. 4 is a front view of the indoor unit 11, and FIG. 5 is a bottom view of the indoor unit 11.

[0029] The indoor unit 11 is a ceiling embedded type indoor unit installed in an indoor ceiling space or the like, and includes a body case 31, a decorative panel 32, the indoor fan 19, and the indoor heat exchanger 13, a drain pan 33 and the like.

[0030] The body case 31 is made up of a square upper wall portion 35 in plan view, and four circumferential wall portions extending downward from four sides of this upper wall portion 35 (a front wall portion 36, a back wall portion 37, a left wall portion 38, and a right wall portion 39) to be formed into a box shape open downward. The decorative panel 32 is attached to an opening portion at a lower end in the body case 31. As shown in FIG. 4, the body case 31 is hung through hanging bolts 40 from a lower surface of an upper floor above a ceiling 30, or the like, and the decorative panel 32 is arranged along a lower surface of the ceiling 30.

[0031] As shown in FIGS. 2 and 3, an inside of the body case 31 is divided into a fan chamber 43 and a heat exchange chamber 44 by a partition plate 42. In the present description, a fan chamber 43 side is a back side, and a heat exchange chamber 44 side is a front side.

[0032] The decorative panel 32 includes an inlet port 45 below the fan chamber 43, and an outlet port 46 on the front side below the heat exchange chamber 44. A grid-shaped grill 47 is attached to the inlet port 45, and in the outlet port 46, a wind guide plate 48 that adjusts a blowing direction of the air is provided swingably.

[0033] As shown in FIG. 3, in the fan chamber 43, the two indoor fans 19 are spaced in a right-left direction. An electric motor 50 is arranged between the two indoor fans 19, and both the indoor fans 19 are driven by this electric motor 50. The indoor fans 19 of the present embodiment are each a sirocco fan made up of a substantially cylindrical casing 19a and an impeller 19b provided inside this casing 19a, as shown in FIG. 2. In a side surface of the casing 19a, an inlet port 19a1 is formed, and an outlet port 19a2 is projected forward in a front portion of the casing 19a. The outlet port 19a2 is inserted into an open-

ing formed in the partition plate 42 in a sealed state.

[0034] When the indoor fans 19 are activated, the indoor air is taken into the fan chamber 43 from the inlet port 45, and is sucked into the inlet ports 19a1 of the casings 19a, and then, is blown into the heat exchange chamber 44 from the outlet ports 19a2. Accordingly, a space inside the fan chamber 43 is a suction space into which the air is sucked by the indoor fans 19, and a space of the heat exchange chamber 44 is a blowing space into which the air is blown by the indoor fans 19.

[0035] In the heat exchange chamber 44, the indoor heat exchanger 13 is arranged. The indoor heat exchanger 13 is, for example, a cross fin type fin-and-tube heat exchanger including a number of fins arranged side by side at predetermined intervals in the right-left direction, and heat transfer tubes provided so as to penetrate these fins. This indoor heat exchanger 13 is arranged at a slant so that an upper portion thereof is located in the front side (on the outlet port 46 side; a downstream side of an air flow) and a lower portion thereof is located on the back side (the indoor fan 19 side; an upstream side of the air flow). The air blown from the indoor fans 19 into the heat exchange chamber 44 is subjected to heat exchange with the indoor heat exchanger 13, and is then blown from the outlet port 46 into the room. The drain pan 33 is provided below the indoor heat exchanger 13, so that dew generated in the indoor heat exchanger 13 is received by the drain pan 33.

[0036] The drain pan 33 is formed of a material having high adiabaticity such as expanded polystyrene and the like, and functions as a heat insulator as well. Moreover, as shown in FIGS. 1 and 3, in inner surfaces of the upper wall portion 35, the front wall portion 36, and the left and the right wall portions 38, 39 of the body case 31 in the heat exchange chamber 44, heat insulators 54 to 57 respectively made of expanded polystyrene or the like are provided.

[0037] FIG. 6 is a side cross-sectional view (a cross-sectional view viewed from arrow of B-B in FIG. 3) of the indoor unit. As shown in FIGS. 3 and 6, an electric component unit 58 is arranged in a right end portion of the fan chamber 43. This electric component unit 58 is made up of an electric component box 59, and a control board 60, a terminal block 61 and the like which are contained in this electric component box 59. Moreover, in a right end portion of the heat exchange chamber 44, a piping group 62 of a flow divider, a header and the like connected to the indoor heat exchanger 13, and electric parts such as a drain pump 63, the indoor expansion valve 28, a thermistor and the like are arranged. Electric wiring 64 of these electric parts are connected to the electric component unit 58 through the partition plate 42 from the heat exchange chamber 44.

[0038] As shown in FIG. 6, the drain pump 63 discharges the dew stored in the drain pan 33 outside by activating a built-in motor (actuator). The drain pump 63 is attached and fixed to the upper wall portion 35 of the body case 31 through a mount (an attachment member) 66. More-

over, a float sensor 65 is also attached to the mount 66. The drain pump 63 and the float sensor 65 are assembled as one unit by a coupling frame 67.

[0039] The mount 66 is formed into a U shape in side view by front and back leg plates 69 and a sole plate 70 connecting lower end portions of both the leg plates 69. At an upper end portion of each of the leg plates 69, a fixing piece 71 bent substantially at a right angle is provided, and this fixing piece 71 is fixed to the upper wall portion 35.

[0040] In the coupling frame 67, the electric wiring 64 of the indoor expansion valve 28, guide claws 68 that guide the electric wiring of the thermistor, and the like are formed integrally. The electric wiring 64 is supported by these guide claws 68 so as to prevent the electric wiring 64 from hanging down on a drain pan 33 side.

[0041] FIG. 7 is a side view of the electric component unit, FIG. 8 is a bottom view of the electric component unit, and FIG. 9 is a side cross-sectional view of the electric component unit. In FIGS. 7 and 8, "front" and "back" are indicated, corresponding to the descriptions of "front" and "back" indicated in FIGS. 2 to 6.

[0042] The electric component box 59 of the electric component unit 58 is formed with an opening 72 for maintenance in a lower surface and one side surface (side surface on the fan 19 side) thereof. This opening 72 is closed by a lid body 73 bent into a substantial L shape. This lid body 73 is attached detachably by screws (not shown) to be screwed into female screw holes 59a provided in the lower surface of the electric component box 59.

[0043] As shown in FIG. 6 as well, the electric component box 59 is arranged so that an upper portion 74a side of a front wall 74 opposed to the partition plate 42 is arranged substantially parallel to, behind, and at a distance from the partition plate 42, and a lower portion 74b side is arranged substantially parallel to, and at a position close to the partition plate 42. An inclined portion 74c, which is inclined so that a front thereof descends, is provided between the upper portion 74a and the lower portion 74b of the front wall 74. This shape of the front wall 74 allows a recess 75 recessed backward to be formed in front of the electric component box 59.

[0044] As shown in FIGS. 7 to 9, inside the electric component box 59, the control board 60 and the terminal block 61 are provided. The control board 60 is to control operation of the electric parts inside the indoor unit 11, for example, the fans 19 (the motor 50), the drain pump 63, the float sensor 65, the indoor expansion valve 28 and the like (refer to FIGS. 3 and 5), to which the electric wiring of the respective electric parts are connected. To the terminal block 61, electric wiring drawn into the indoor unit 11 from the outside is connected.

[0045] The control board 60 is a unit component made up of a board body 80 making up a substantive electric circuit, and a case 81 protecting this board body 80. The board body 80 is made of a printed board that is provided with circuit wiring made of a conductor on a rectangular

insulating plate made of a synthetic resin to mount various electric parts, and the like. The case 81 is made of a rectangular thin tray made of an insulator such as a synthetic resin and the like, and covering a back surface and outer circumferential surfaces excluding a mounting surface (front surface) 80a of the board body 80.

[0046] The control board 60 is attached to the electric component box 59 in a posture inclined with respect to a vertical direction (upper-lower direction). Specifically, the control board 60 is arranged so that short sides 60a of the rectangle extend along a right-left horizontal direction, and long sides 60b are oblique to the front-back direction and the upper-lower direction. Moreover, the mounting surface 80a of the board body 80 is directed obliquely backward and downward. The control board 60 is arranged on an almost diagonal line connecting a back upper corner portion and a front lower corner portion of the electric component box 59. A back surface (upper surface) of the control board 60 is arranged along a lower surface of the inclined portion 74c in the electric component box 59. An inclination angle of the control board 60 can be set to, for example, 30° to 50° with respect to a horizontal plane, and preferably, about 40°.

[0047] FIG. 11 is a perspective view showing an attachment structure on a lower side of the control board 60, and FIG. 12 is a perspective view showing an attachment structure on an upper side of the control board 60.

[0048] In the case 81 of the control board 60, a plurality of locking pieces 82, 83 are provided. Specifically, on a lower side of one side of the case 81, the side locking piece 82 bent into a substantial L shape is provided. Moreover, the two upper locking pieces 83 are provided in an upper side of the case 81. In response to this, in the inclined portion 74c in the electric component box 59, a side locking hole 84 in which the side locking piece 82 can be locked is formed, and in a back end portion in the upper portion of the electric component box 59, upper locking holes 85 in which the upper locking pieces 83 can be locked are formed.

[0049] The side locking hole 84 is formed to be longer in the front-back direction than the side locking piece 82, so that the side locking piece 82 can be moved back and forth in a state locked in the side locking hole 84. Accordingly, the control board 60 can be slid obliquely upward along the inclined portion 74c in the state where the side locking piece 82 is locked in the side locking hole 84 to lock the upper locking pieces 83 in the upper locking holes 85. Moreover, on the other side of the case 81 on the opposite side of the side locking piece 82, an attachment piece 86 formed with a screw insertion hole 86a is protruded, and in the inclined portion 74c of the electric component box 59, a female screw hole 87 is formed. A screw 88 inserted into the screw insertion hole 86a is screwed into the female screw hole 87 in a state where the respective locking pieces 82, 83 of the case 81 are locked in the respective locking holes 84, 85 of the electric component box 59, by which the control board 60 is attached to the electric component box 59.

[0050] In this manner, the two sides of the control board 60 are locked to the electric component box 59, and the other side is fixed to the electric component box 59 by the screw 88, by which the three sides excluding a lower side are supported by the electric component box 59. This allows the control board 60 to be supported stably with respect to a direction perpendicular to the control board 60, thereby preventing the control board 60 from floating up from the electric component box 59 due to vibration or the like. Moreover, detachment of the one screw 88 enables the control board 60 to be easily detached from the electric component box 59.

[0051] As described above, in the present embodiment since the control board 60 is inclined with respect to the vertical direction, a height dimension of the electric component box 59 can be made smaller as compared with a case where the control board 60 is arranged parallel to the vertical direction, so that thinning of the body case 31 containing this electric component box 59 can be achieved.

[0052] Moreover, in the present embodiment, as compared with a case where the control board 60 is arranged perpendicular to the vertical direction (arranged in the front-back horizontal direction), a width in the front-back direction of the electric component box 59 can be made smaller. Furthermore, in the control board 60, since the short sides 60a are arranged in the right-left direction, a width in the right-left direction of the electric component box 59 can also be made smaller.

[0053] Accordingly, in the present embodiment, upper-lower, front-back, and right-left dimensions of the electric component box 59 can be made smaller with balance, and a freedom degree of the arrangement of the electric component box 59 can be increased. Specifically, in the present embodiment, the electric component box 59 can be preferably contained in an empty space 31a (refer to FIG. 3) formed in an end portion in the right-left direction of the fan chamber 43. The above-described arrangement of the electric component box 59 prevents a dimension in the front-back direction (depth) of the body case 31 from increasing.

[0054] Since in the control board 60, the mounting surface 80a of the board body 80 is arranged obliquely backward and downward, inspection and manipulation (attachment/detachment of the electric wiring and the like) can be easily performed through the opening 72 for maintenance in the lower surface of the electric component box 59.

[0055] As shown in FIG. 9, in the board body 80 in the control board 60, a weak current circuit 80b to drive and control the electric parts activated at a low voltage (e.g., lower than 50 V (20 V or the like)) is provided on a lower side close to the opening 72 of the electric component box 59, and a strong current circuit 80c to drive and control the electric parts activated at a high voltage (e.g., 50 V or higher (200 V or the like)) is provided on an upper side of the board body 80. For example, the drain pump 63, the indoor expansion valve 28 and the like are driven

and controlled by the weak current circuit 80b, and the fans 19 are driven and controlled by the strong current circuit 80c. Moreover, the electric wiring (signal lines) of the float sensor 65, the thermistor, a remote controller, and the like is also connected to the weak current circuit 80b.

[0056] A plurality of connection ports (connectors) 80d are provided at a lowermost portion of the mounting surface 80a, and to these connection ports 80d, the electric wiring of the drain pump 63, the float sensor 65, the thermistor, the indoor expansion valve 28 and the like inside the heat exchange chamber 44 is detachably connected. Moreover, on a side surface of the electric component box 59, a plurality of cable entrances 59d to draw electric wiring are provided.

[0057] Generally, in many cases, weak current parts such as instruments each having a low operating voltage such as the indoor expansion valve 28 and the like, and a sensor and the like have higher frequency of maintenance such as part exchange and the like, while strong current parts each having a high operating voltage such as the fans 19 and the like have the lower frequency of the maintenance as compared with the weak current parts. Therefore, as in the present embodiment, the weak current circuit 80b that drives and controls the weak current parts is mounted on the lower side of the mounting surface 80a, which is close to the opening 72 for maintenance, so that maintenance performance can be enhanced. On the other hand, since the strong current circuit 80c is provided on the upper side of the mounting surface 80a, worker's hand, a foreign substance or the like can be prevented from contacting the strong current circuit 80c during the maintenance of the weak current circuit 80b.

[0058] Moreover, as shown in FIG. 9, inside the electric component box 59, a reverse side (upper side) of the weak current circuit 80b in the control board 60 is supported in contact with the inclined portion 74c, while on a reverse side (upper side) of the strong current circuit 80c, a space 59c is provided. This makes it difficult to enclose heat generated in the strong current circuit 80c inside the electric component box 59, which can reduce thermal effects on the control board 60.

[0059] FIG. 10 is a cross-sectional view showing an attachment structure of the terminal block 61.

[0060] As shown in FIGS. 7, 9, 10, the terminal block 61 is attached to one side wall of the electric component box 59 through an attachment bracket 90. The attachment bracket 90 is made up of an upper leg portion 90a, a lower leg portion 90b, and a base plate portion 90c provided between both the leg portions. The upper leg portion 90a is locked in latch portions 59b formed by cutting and raising portions of the side wall of the electric component box 59. In the lower leg portion 90b, a screw insertion hole 90d is formed, and a screw 91 inserted into this screw insertion hole 90d is screwed into a female screw hole 59c formed in the side wall of the electric component box 59 to thereby fix the lower leg portion

90b. The base plate portion 90c is arranged obliquely downward in the right-left direction, and the terminal block 61 is fixed to a surface thereof by screws or the like.

[0061] The terminal block 61 is arranged within a range of a height of the control board 60, as shown in FIG. 7, and is arranged within a range in the front-back direction and in the right-left direction (within a planar region) of the control board 60, as shown in FIG. 8. Accordingly, the control board 60 and the terminal block 61 can be arranged inside the electric component box 59 compactly.

[0062] Moreover, the terminal block 61 can be detached from the electric component box 59 together with the attachment bracket 90 by detaching the screw 91. Therefore, when the maintenance of the control board 60 is performed, detaching the terminal block 61 together with the attachment bracket 90 can prevent the terminal block 61 from being impeditive. Moreover, with the attachment bracket 90, since only the lower leg portion 90b is fixed by the screw 91, and the upper leg portion 90a is only locked to the electric component box 59, the attachment bracket 90 can be detached from the electric component box 59 easily and quickly.

[0063] The present invention is not limited to the above-described embodiment, but can be modified within the scope of the invention described in claims as needed.

[0064] For example, the control board 60 inside the electric component box 59 does not include the case 81, but may be made up of only the board body 80. Moreover, while in the control board 60, the mounting surface 80a is arranged obliquely backward and downward, it may be arranged obliquely forward and downward, or obliquely rightward or leftward, and downward. The control board 60 may be fixed to the electric component box 59 by two or more screws.

[0065] The whole of the terminal block 61 need not be arranged within the planar region of the control board 60, but at least a part of the terminal block 61 only needs to be arranged (overlapped) in the relevant planar region.

[0066] The present invention can be applied not only to the ceiling embedded type indoor unit 11 but also to a hanging type indoor unit.

REFERENCE SIGNS LIST

[0067]

10: AIR CONDITIONING DEVICE
 11: INDOOR UNIT
 19: INDOOR FAN
 28: INDOOR EXPANSION VALVE
 30: CEILING
 31: BODY CASE
 50: MOTOR OF FAN
 58: ELECTRIC COMPONENT UNIT
 59: ELECTRIC COMPONENT BOX
 60: CONTROL BOARD

61: TERMINAL BLOCK
 64: ELECTRIC WIRING
 65: FLOAT SENSOR
 72: OPENING FOR MAINTENANCE
 80: BOARD BODY
 80a: MOUNTING SURFACE
 80b: WEAK CURRENT CIRCUIT
 80c: STRONG CURRENT CIRCUIT
 81: CASE
 82: SIDE LOCKING PIECE
 83: UPPER LOCKING PIECE
 84: SIDE LOCKING HOLE
 85: UPPER LOCKING HOLE

Claims

1. An indoor unit for an air conditioning device in which a fan (19) and an electric component box (59) are provided inside a body case (31) installed in a ceiling (30), and a control board (60) to control electric parts including the fan (19) is contained in the electric component box (59), wherein an opening (72) for maintenance is provided in a lower surface of the electric component box (59), and the control board (60) is arranged at a slant with respect to a vertical direction so that a mounting surface (80a) in the control board (60) is arranged obliquely downward.
2. The indoor unit for an air conditioning device according to claim 1, wherein a longitudinal dimension of the control board (60) is larger than a height dimension of the body case.
3. The indoor unit for an air conditioning device according to claim 1 or claim 2, wherein a terminal block (61) is contained detachably inside the electric component box (59), and the terminal block (61) is arranged so as to overlap a planar region of the control board (60) within a range of a height of the control board (60).
4. The indoor unit for an air conditioning device according to any one of claims 1 to 3, wherein a weak current circuit (80b) is provided on a lower side in the mounting surface (80a) of the control board (60), and a strong current circuit (80c) is provided on an upper side therein.
5. The indoor unit for an air conditioning device according to any one of claims 1 to 4, wherein the control board (60) is fixed to the electric component box (59) by a screw in at least one side, and is locked to the electric component box (59) in at least other two sides.

FIG. 1

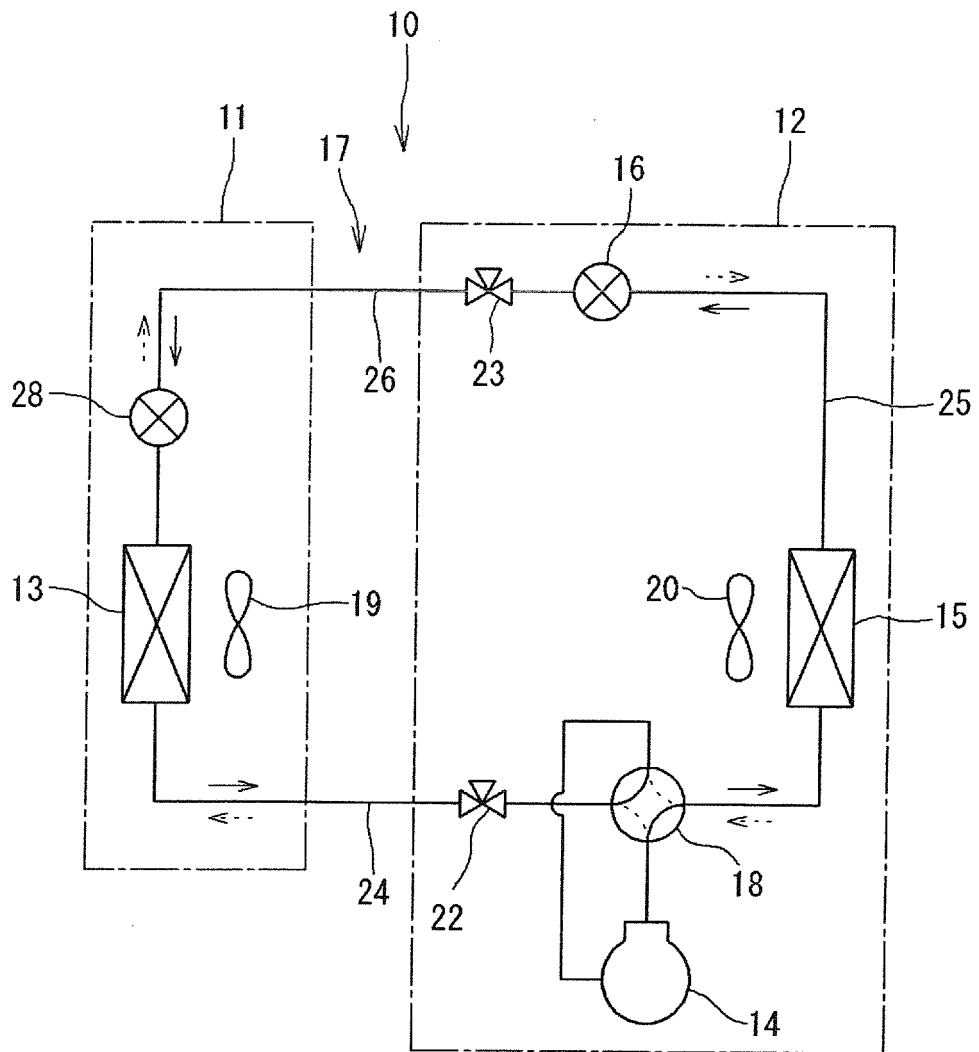
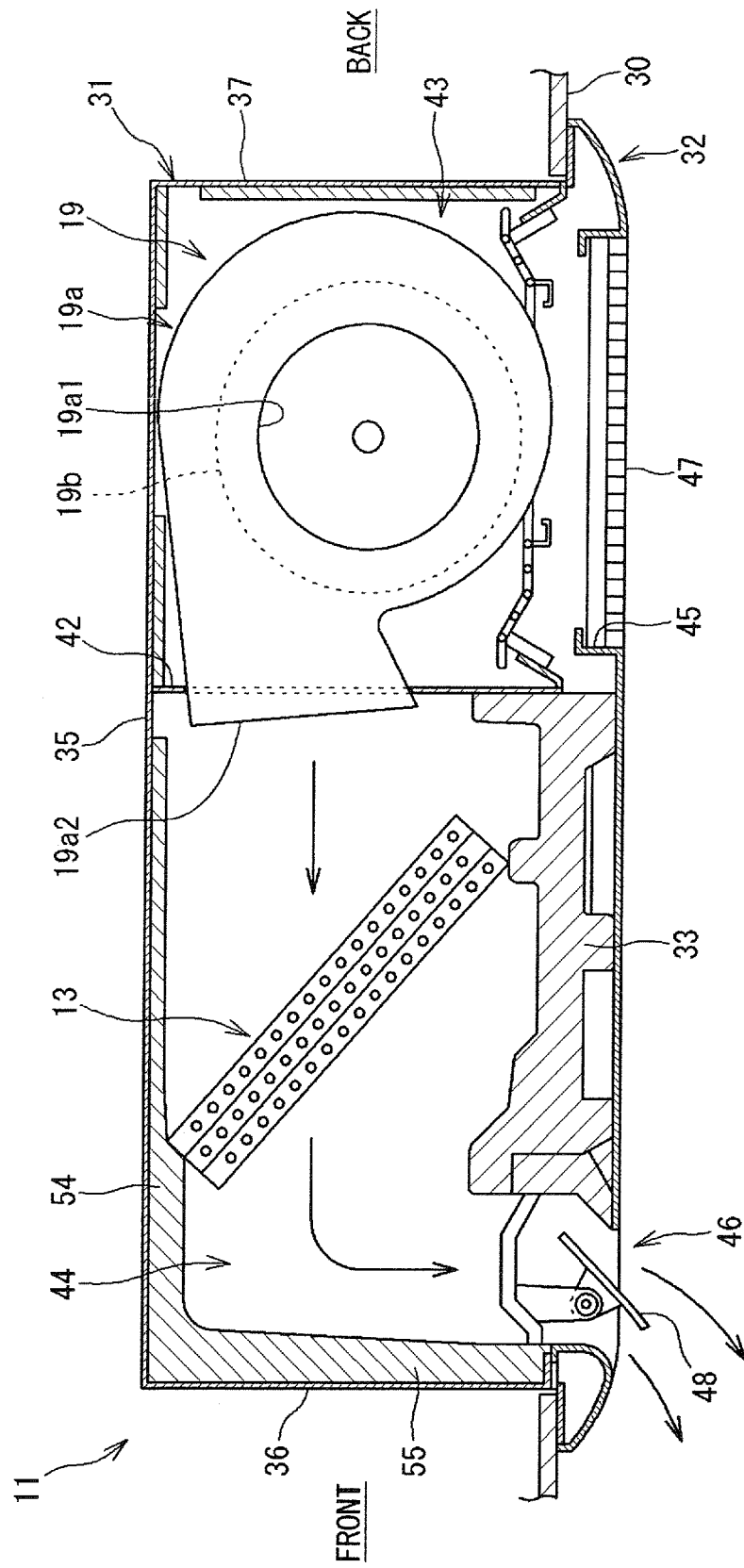


FIG. 2



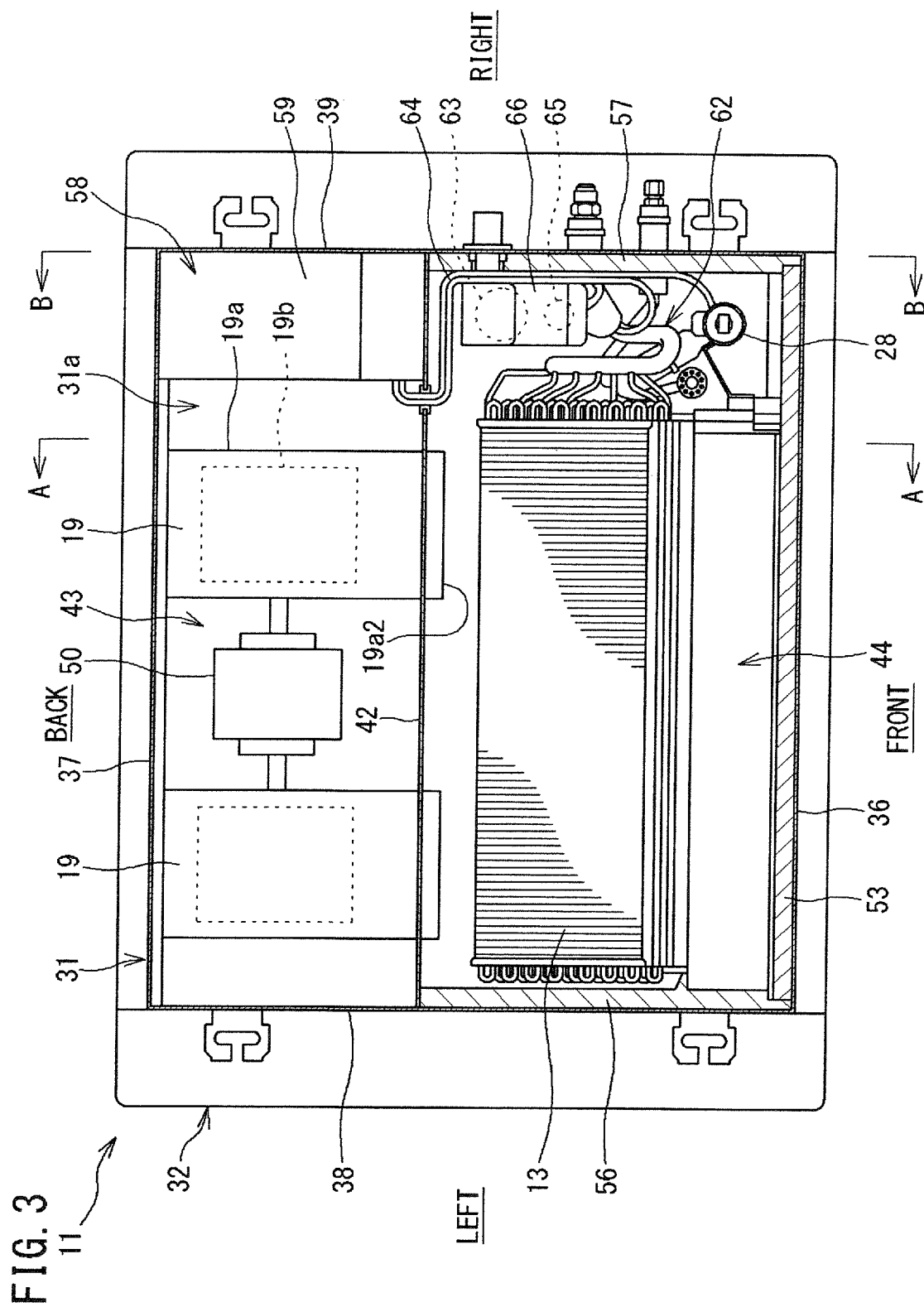
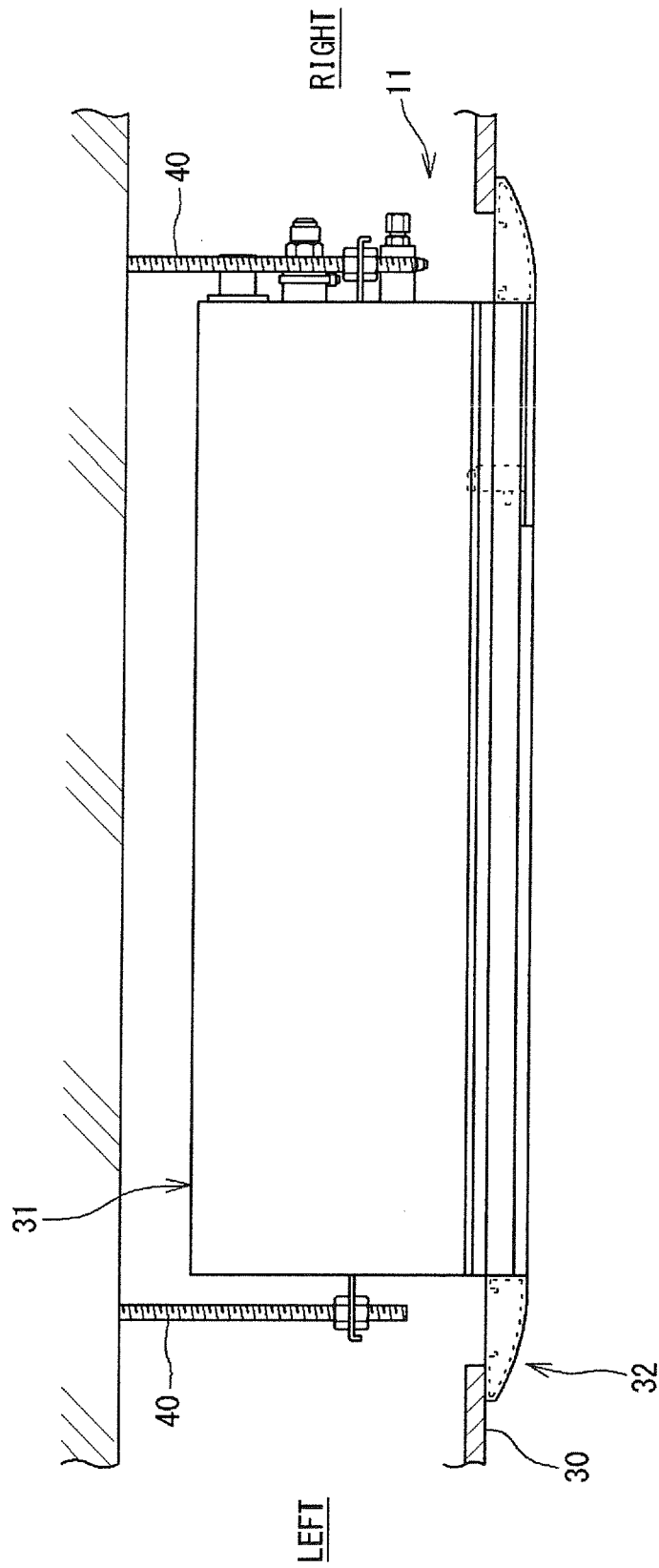


FIG. 4



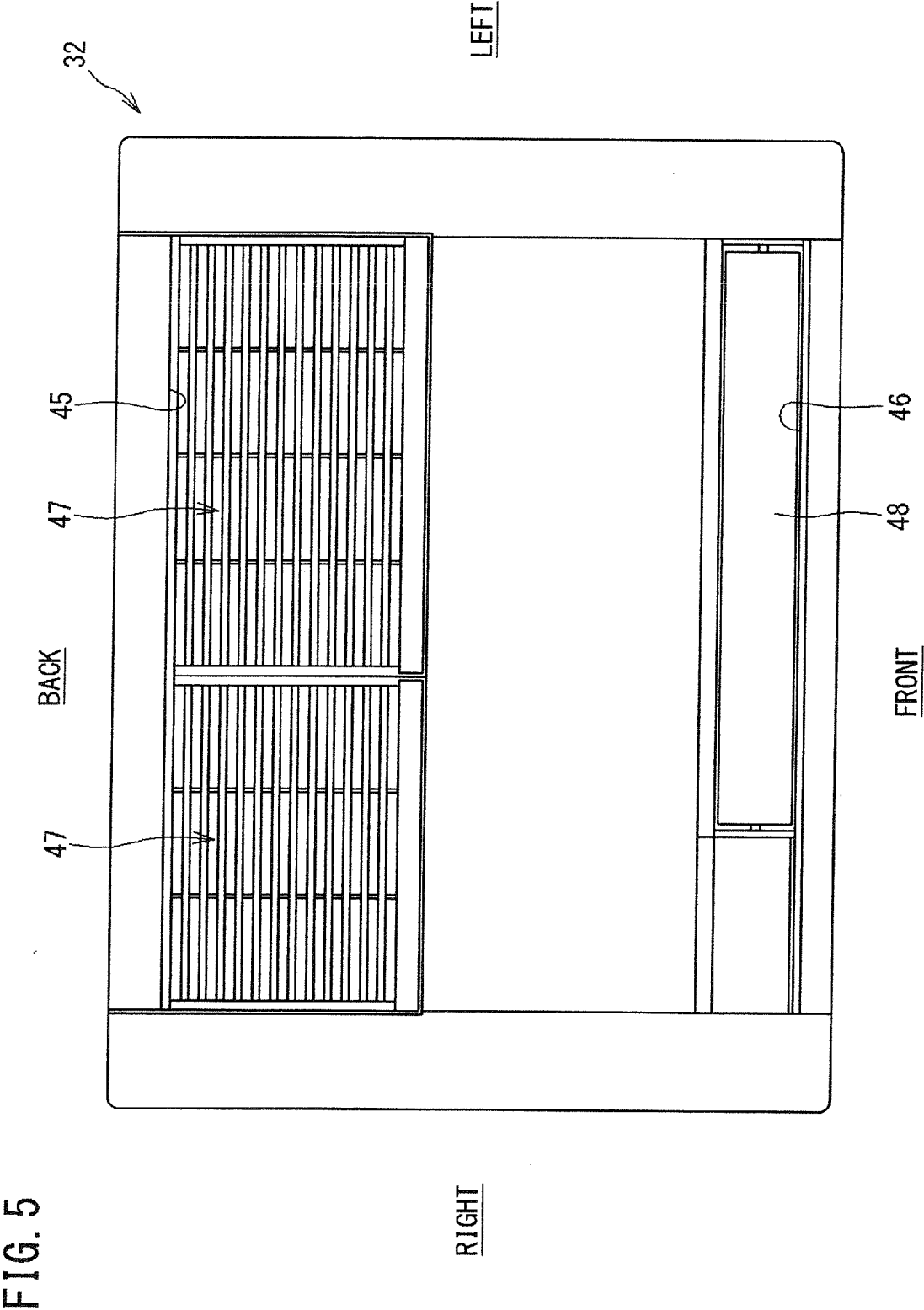


FIG. 6

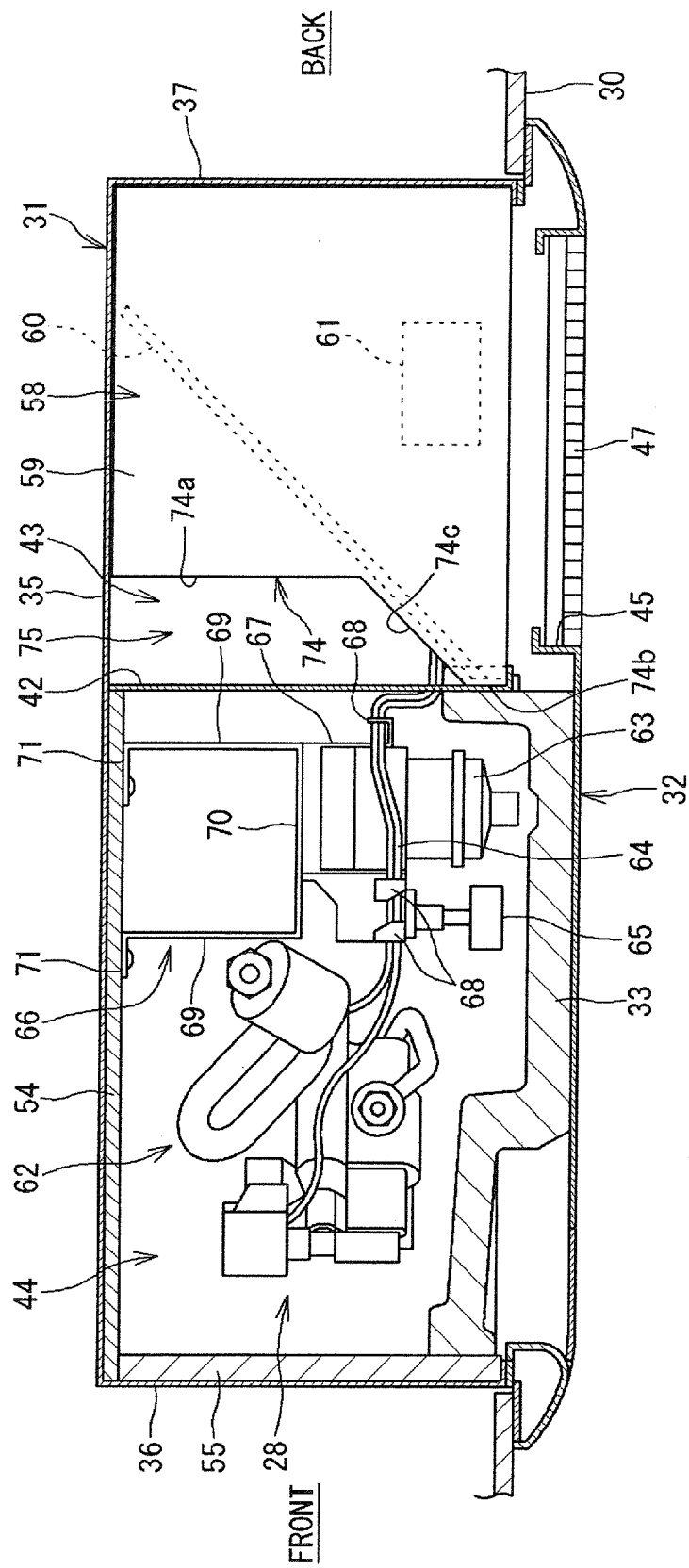
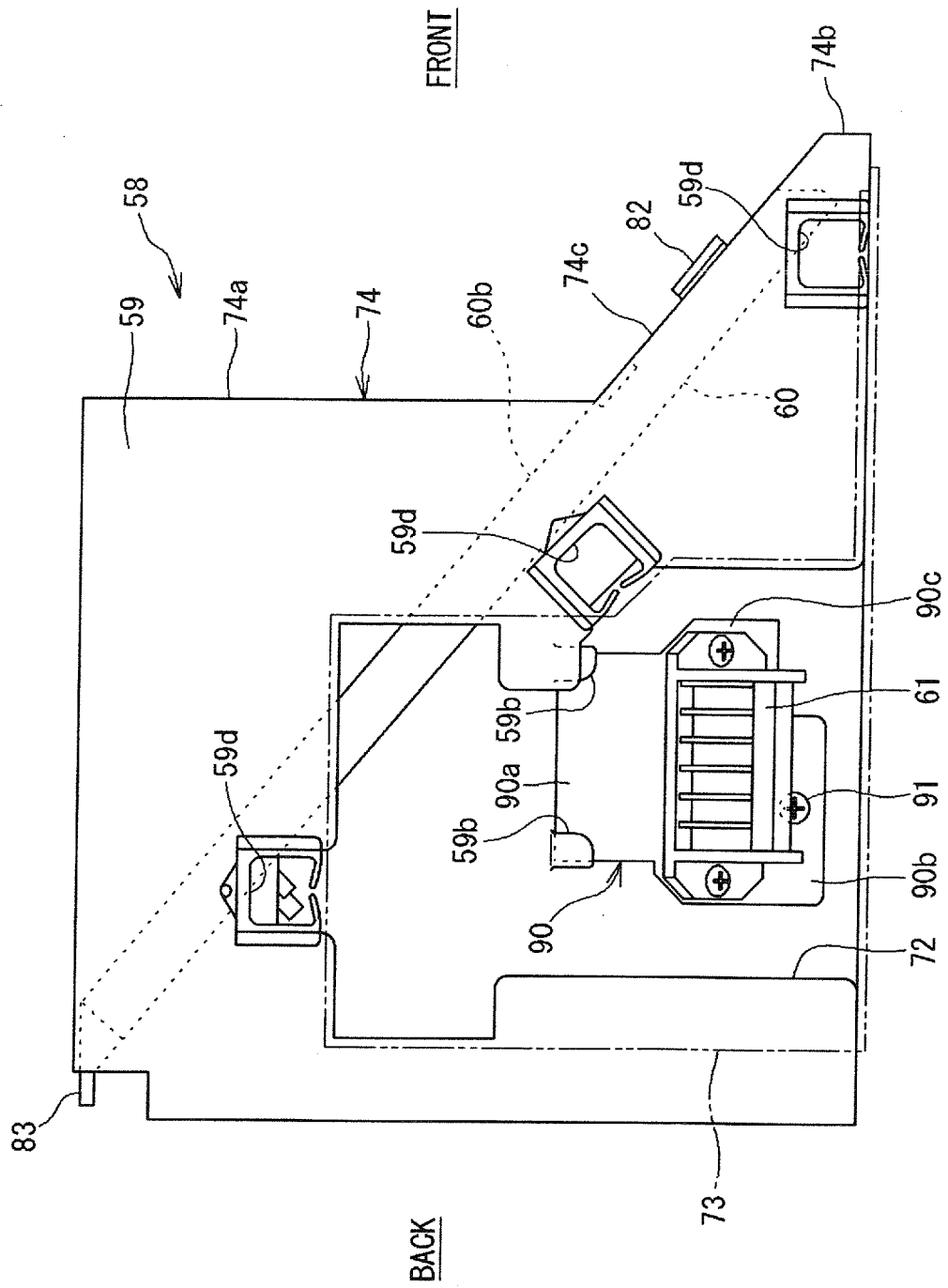


FIG. 7



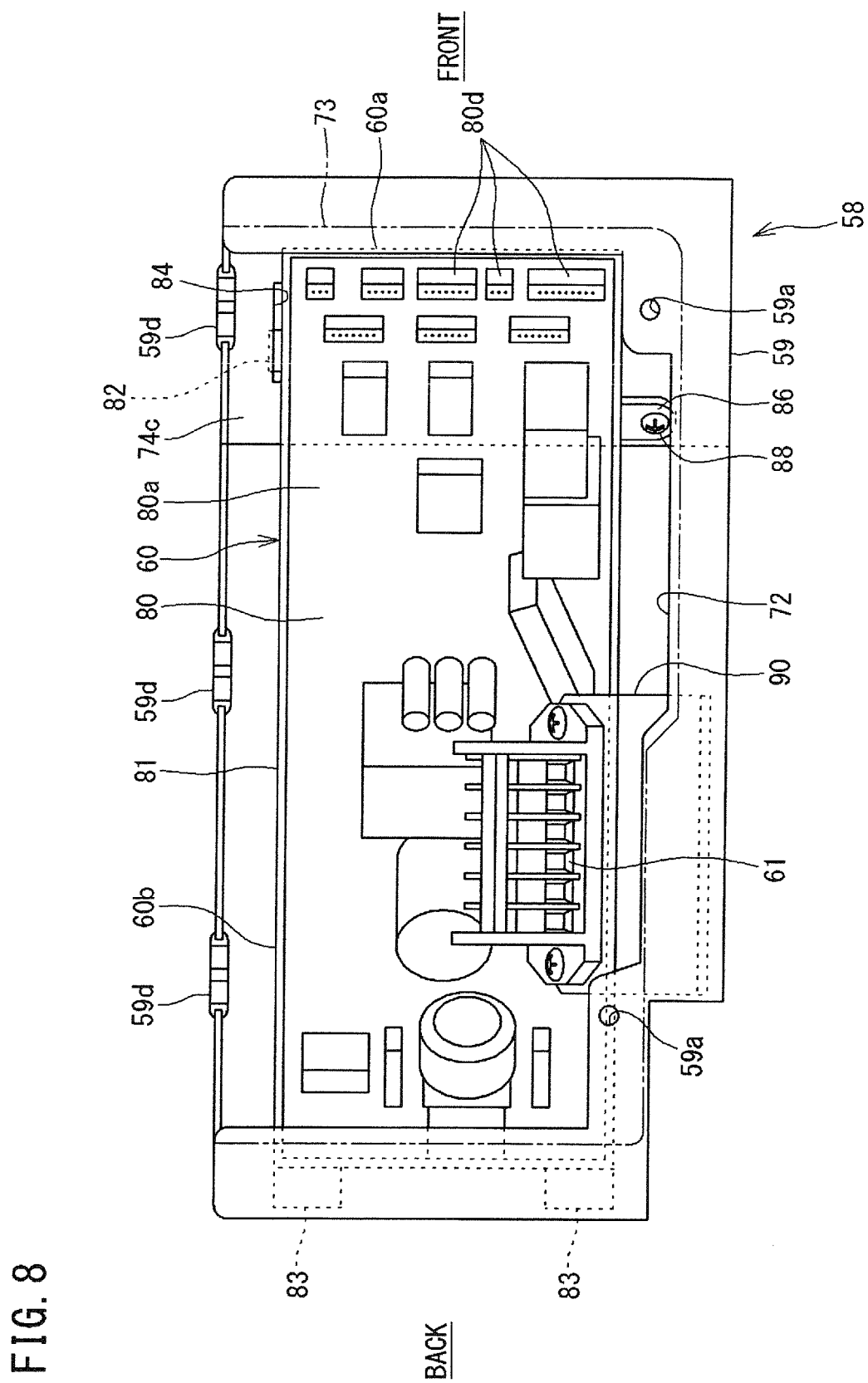


FIG. 9

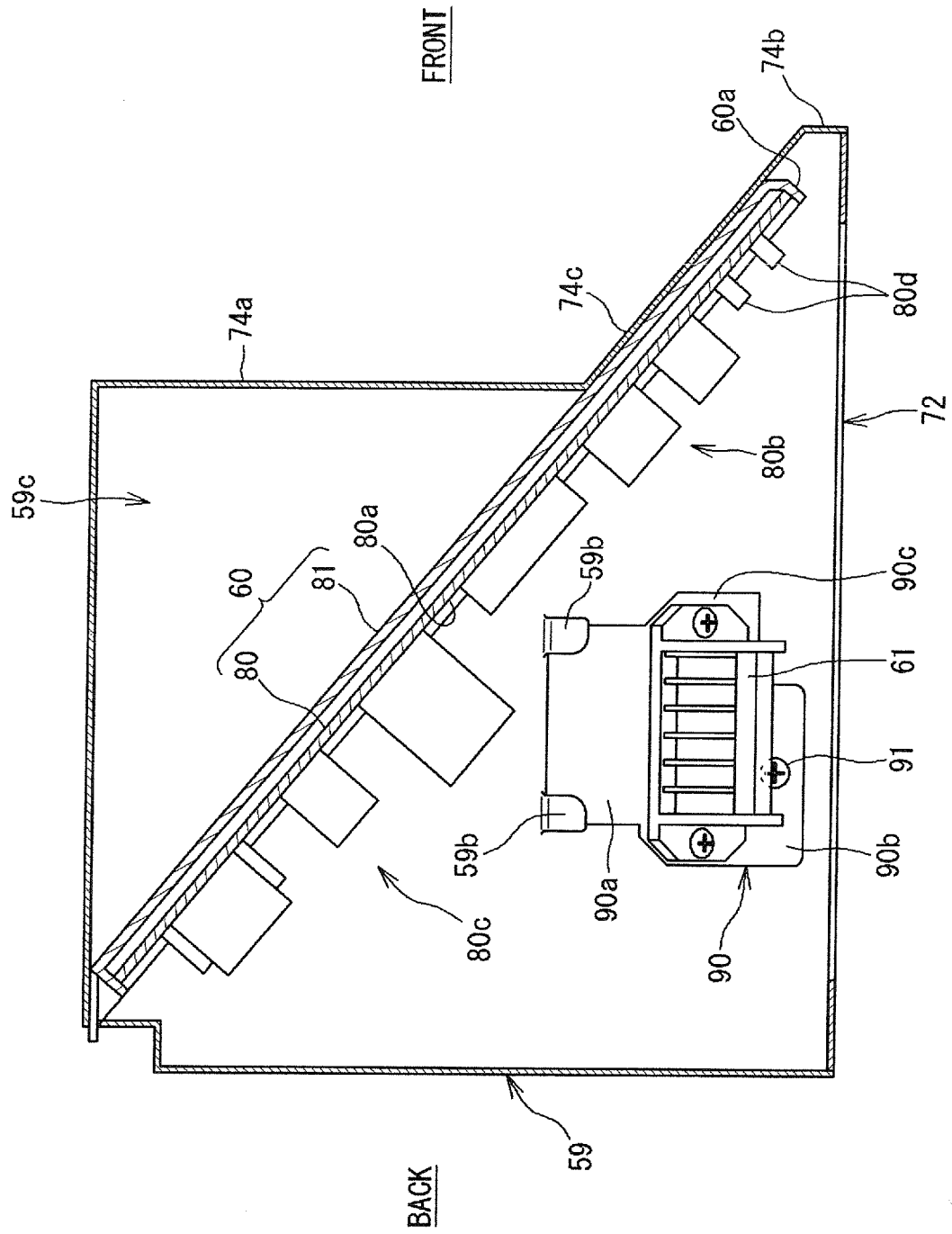


FIG. 10

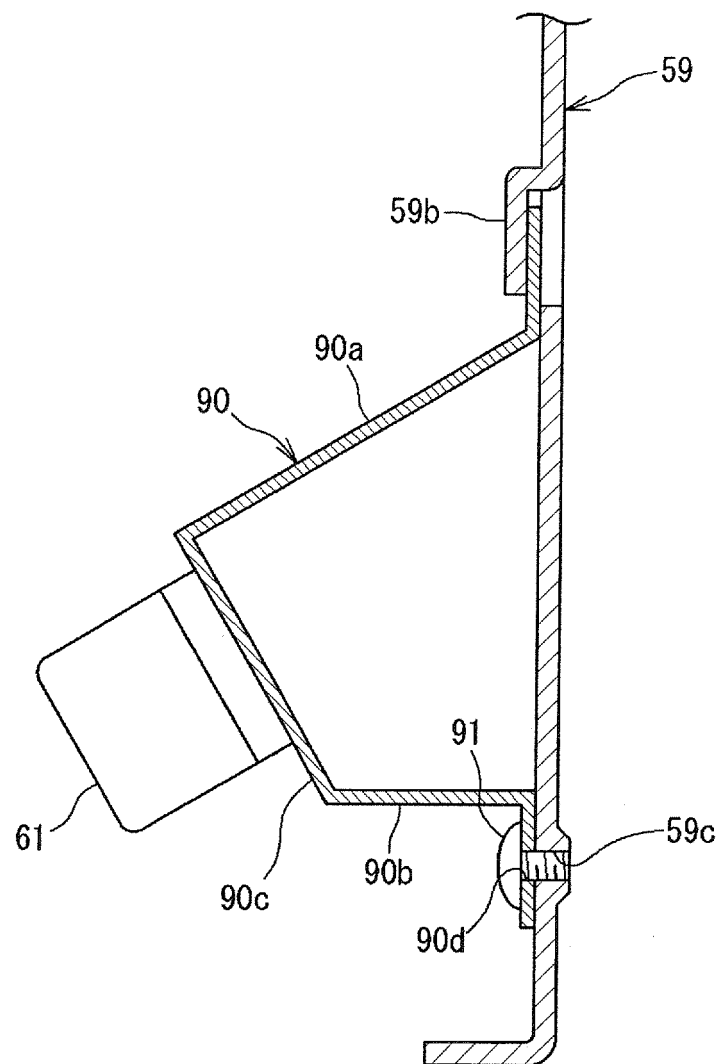


FIG. 11

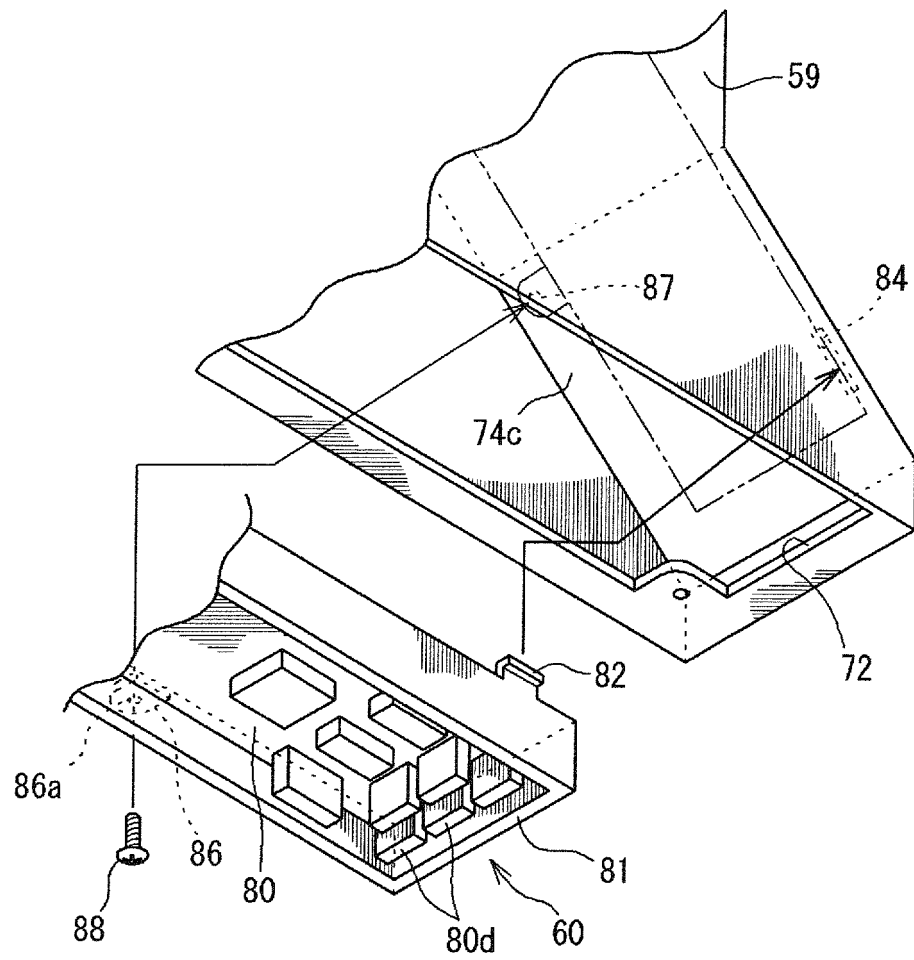
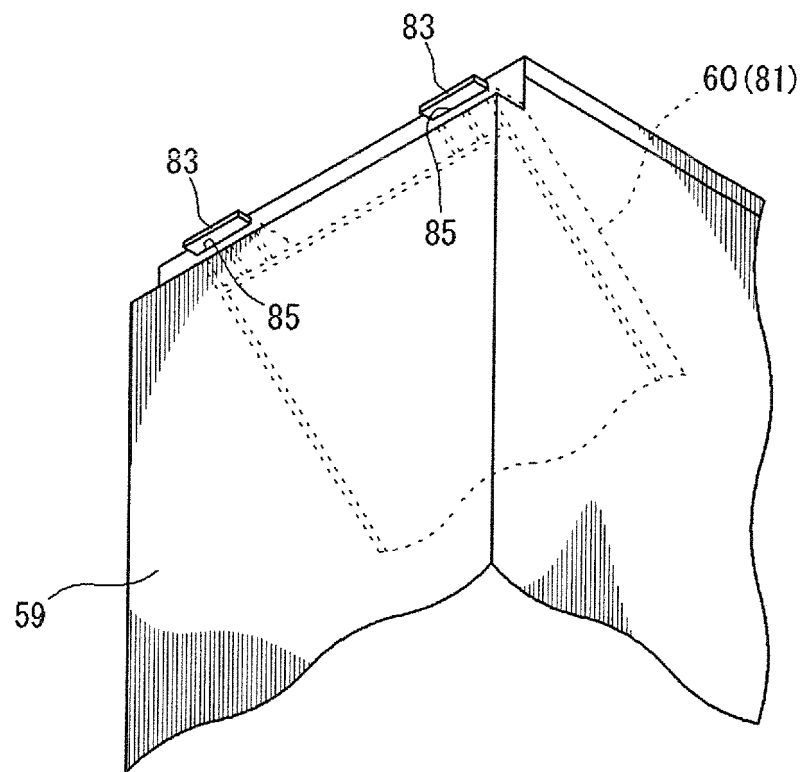


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/054882

A. CLASSIFICATION OF SUBJECT MATTER
F24F13/20 (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)
F24F13/20Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2011-102655 A (Fujitsu General Ltd.),	1, 5
Y	26 May 2011 (26.05.2011),	2
A	paragraphs [0011] to [0024]; fig. 3 to 8 (Family: none)	3, 4
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 181077/1984 (Laid-open No. 96591/1986) (Toa Tokushu Denki Kabushiki Kaisha), 21 June 1986 (21.06.1986), page 1, lines 6 to 11; fig. 1, 2 (Family: none)	2

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

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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
02 May, 2013 (02.05.13)Date of mailing of the international search report
14 May, 2013 (14.05.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/054882

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 7-22763 A (Nohmi Bosai Ltd.), 24 January 1995 (24.01.1995), paragraph [0012]; fig. 1 to 3 (Family: none)	2
A	JP 2006-343083 A (Toshiba Carrier Corp.), 21 December 2006 (21.12.2006), paragraphs [0020] to [0028]; fig. 3, 4 & CN 200965303 Y	1-5
A	JP 2011-58778 A (Sharp Corp.), 24 March 2011 (24.03.2011), paragraph [0036]; fig. 8 (Family: none)	1, 3
A	JP 2000-249364 A (Sanyo Electric Co., Ltd.), 12 September 2000 (12.09.2000), paragraph [0032]; fig. 5 (Family: none)	1
A	JP 2009-299993 A (Daikin Industries, Ltd.), 24 December 2009 (24.12.2009), paragraphs [0022], [0023]; fig. 2 (Family: none)	4
A	JP 2010-270978 A (Mitsubishi Electric Corp.), 02 December 2010 (02.12.2010), paragraph [0030]; fig. 6, 9 (Family: none)	4

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006097995 A [0004]