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(54) **VENTILATION DEVICE**

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DISPOSITIF DE VENTILATION

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(73) Proprietor: **Mitsubishi Electric Corporation**
Chiyoda-ku
Tokyo 100-8310 (JP)

(72) Inventors:
• **IIDA, Satoshi**
Tokyo 100-8310 (JP)
• **HANAWA, Akihiro**
Tokyo 100-8310 (JP)

• **AOKI, Hiroki**
Tokyo 100-8310 (JP)
• **INOUCHI, Tomo**
Tokyo 100-8310 (JP)

(74) Representative: **Witte, Weller & Partner**
Patentanwälte mbB
Postfach 10 54 62
70047 Stuttgart (DE)

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Description

Citation List

Field

Patent Literature

[0001] The present invention relates to a ventilator including an electrical box.

5 **[0005]**

Background

Patent Literature 1: Japanese Patent No. 5143079

Patent Literature 2: JP 2004 037082 A

Patent Literature 3: JP H07 303584 A

[0002] A ventilator including blowers inside its main body is provided with a control board. The control board is mounted with electronic components that drive the blowers. The control board is housed in an electrical box that is made of metal and is provided inside the main body. Structure disclosed in Patent Literature 1 is such that an insulation sheet is provided between an electrical box and a control board for the purpose of ensuring insulation between the box and the control board.

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Summary

Technical Problem

[0003] Patent Literature 2, according to its abstract, states that, to provide an outdoor unit of an air conditioner having an electric part box for promoting miniaturization of the electric part box, improving cooling efficiency to an electric control part housed inside, checking intrusion of dust-dirt, reducing stress applied to a control board, and improving assembling and service workability, this outdoor unit is provided with a compressor, a heat exchanger, a unit body 1 oppositely arranged to this heat exchanger and housing an air blower and the electric part box 15 arranged in this unit body and housing the electric control part S for controlling driving of the compressor and the air blower. The electric part box is provided with the control board P mounted with the whole electric control part and a part box body 16 for installing and supporting this control board, positioning the control board in an upper part and housing the whole electric control part in the downward direction.

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[0006] The electrical box of the ventilator is composed of a case and a cover with a gap between the case and the cover. Inside the main body of the ventilator, air convection and a pressure change are caused when the blowers are driven, so that dust can enter the electrical box from the gap between the case and the cover. The dust easily enters the electrical box particularly when the ventilator is used in a harsh environment that is dusty.

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[0007] If the dust entering the electrical box accumulates on the control board and the electronic components mounted on the control board, the dust deposit may cause a short circuit between the electronic components and thus may cause the ventilator to malfunction. The control board is covered by the insulation sheet disclosed in Patent Literature 1 at its face that is not mounted with the electronic components, so that the insulation sheet cannot prevent dust from accumulating on the electronic components.

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[0008] The present invention has been made in view of the above, and an object of the present invention is to obtain a ventilator that does not cause dust to easily accumulate on a control board provided inside a main body as well as on electronic components mounted on the control board.

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Solution to Problem

[0009] According to the present disclosure, a ventilator as defined in independent claim 1 is provided. Further embodiments of the invention are defined in the dependent claims. Although the invention is only defined by the claims, the below embodiments, examples, and aspects are present for aiding in understanding the background and advantages of the invention.

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Advantageous Effect of Invention

[0004] Patent Literature 3, according to its abstract, states that, to provide an electric apparatus which can enhance the easiness in assembly works, perform inspection of a control circuit easily without causing a functional failure in the control circuit due to static electricity, and can enhance the fire retardancy of the body case at a low cost, an electric apparatus comprises a body case consisting of a combination of a plurality of cases made of plastics, a motor installed in the body case, a circuit board on which circuit-components to control the motor are mounted and which is set inside the body case, and a fire retardant electric insulation attached to the circuit board. The insulation includes a rear surface covering wall part enclosing approx. the whole rear surface of the board and peripheral covering wall parts formed by folding from the rear surface covering wall part in such a way as protruding onto the surface of the board while enclosing the edges of the board positioned as mating each other with the circuit components interposed in between.

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[0010] The ventilator according to the present invention does not cause dust to easily accumulate on the control board provided inside the main body as well as on the electronic component mounted on the control board.

Brief Description of Drawings

[0011]

FIG. 1 is a front view of a ventilator according to an embodiment of the present invention.
 FIG. 2 is an exploded perspective view of the ventilator according to the embodiment.
 FIG. 3 is a perspective view of an electrical box according to the embodiment.
 FIG. 4 is a perspective view illustrating the electrical box according to the embodiment, with a cover removed.
 FIG. 5 is a sectional view of the electrical box according to the embodiment.
 FIG. 6 is a perspective view of an insulation sheet according to the embodiment.
 FIG. 7 is a front view of the insulation sheet according to the embodiment.
 FIG. 8 is a left side view of the insulation sheet according to the embodiment.
 FIG. 9 is a right side view of the insulation sheet according to the embodiment.
 FIG. 10 is a top view of the insulation sheet according to the embodiment.
 FIG. 11 is a bottom view of the insulation sheet according to the embodiment.
 FIG. 12 is a rear view of the insulation sheet according to the embodiment.
 FIG. 13 is a sectional view of the electrical box when the ventilator according to the embodiment is installed vertically.

Description of Embodiment

[0012] With reference to the drawings, a detailed description is hereinafter provided of a ventilator according to an embodiment of the present invention. It is to be noted that this embodiment is not restrictive of the invention.

Embodiment.

[0013] FIG. 1 is a front view of the ventilator according to the embodiment of the present invention. FIG. 2 is an exploded perspective view of the ventilator according to the embodiment. The ventilator 1 is of a wall-mounted type that is mounted, for example, in a room wall. The ventilator 1 includes a front panel 10, a front casing 20, a back casing 30, an inner casing 40, blowers 50A and 50B, a heat exchanger 60, an electrical box 70, and a terminal block box 80.

[0014] The front panel 10, the front casing 20, and the back casing 30 compose a main body of the ventilator 1. The front panel 10 is detachably mounted to a front of the front casing 20. The front panel 10 includes, at its front, a room interior outlet 11 through which outside air is expelled from the main body. The front panel 10 includes, at

its top and bottom, room interior inlets 12 through which room air is drawn into the main body.

[0015] The front casing 20 includes a supply air opening 21 communicating with the room interior outlet 11, and an exhaust air opening 22 communicating with the room interior inlets 12.

[0016] The back casing 30 is mounted to a rear of the front casing 20. The back casing 30 includes an outside inlet 31 through which the outside air is drawn into the main body, and an outside outlet 32 through which the room air is expelled from the main body.

[0017] The inner casing 40 is mounted between the front casing 20 and the back casing 30. The inner casing 40 includes: a supply air passage 41 that lets the outside air flow from the outside inlet 31 toward the supply air opening 21; and an exhaust air passage 42 that lets the room air flow from the exhaust air opening 22 toward the outside outlet 32.

[0018] The inner casing 40 is mounted with the blowers 50A and 50B. The blower 50A is positioned to face the outside inlet 31 and creates the supply air flow through the supply air passage 41. The blower 50B is positioned to face the exhaust air opening 22 and creates the exhaust air flow through the exhaust air passage 42. The blower 50A includes a motor 51A and an impeller 52A. The blower 50B includes a motor 51B and an impeller 52B. The motors 51A and 51B are mounted to a motor mounting plate 53. The motor mounting plate 53 is mounted to the back casing 30 and the inner casing 40 so as to separate the exhaust air flow and the supply air flow.

[0019] The heat exchanger 60 causes heat exchange between the supply air flow and the exhaust air flow that flow through the supply air passage 41 and the exhaust air passage 42, respectively. The heat exchanger 60 is, for example, of rectangular-parallelepiped shape and has structure that only lets the air flow in a direction toward its opposite side. The heat exchanger 60 is held in the inner casing 40, and one of its two sides positioned respectively near the blowers 50A and 50B is where the supply air flow enters, while the other side is where the exhaust air flow enters. The heat exchanger 60 touches the inner casing 40 at its top and bottom, so that the supply air flow and the exhaust air flow are prevented from mixing.

[0020] The electrical box 70 is housed between the front casing 20 and the back casing 30. This means that the electrical box 70 is provided inside the main body.

[0021] FIG. 3 is a perspective view of the electrical box 70 according to the embodiment. FIG. 4 is a perspective view illustrating the electrical box 70 according to the embodiment, with a cover removed. FIG. 5 is a sectional view of the electrical box 70 according to the embodiment.

[0022] The electrical box 70 includes a case 71 having one side as an opening 71b, and the cover 72 covering the opening 71b of the case 71. A control board 73 is provided inside the electrical box 70. The control board

73 is fixed to the case 71 via spacers 88. A first face 73a of the control board 73 is mounted with a plurality of electronic components 74. The cover 72 covers the first face 73a of the control board 73 and the plurality of electronic components 74. The control board 73 is provided with a connector 89 connectable to lead wires (not illustrated). The control board 73 is connected to the motors 51A and 51B via the lead wires.

[0023] An insulation sheet 75 as an insulator is provided inside the electrical box 70. FIG. 6 is a perspective view of the insulation sheet 75 according to the embodiment. FIG. 7 is a front view of the insulation sheet 75 according to the embodiment. FIG. 8 is a left side view of the insulation sheet 75 according to the embodiment. FIG. 9 is a right side view of the insulation sheet 75 according to the embodiment. FIG. 10 is a top view of the insulation sheet 75 according to the embodiment. FIG. 11 is a bottom view of the insulation sheet 75 according to the embodiment. FIG. 12 is a rear view of the insulation sheet 75 according to the embodiment.

[0024] Conductive parts of the electronic components 74 need to be covered with a strong structure in order to be protected from contact with a person. For this reason, the electrical box 70 housing the control board 73 has its case 71 and cover 72 that are made of metal fixed to each other by a screw 65, thus protecting the conductive parts of the electronic components 74 from external contact.

[0025] Moreover, insulation needs to be ensured between the metal case 71 and the control board 73 fixed to the case 71. Increasing a distance between the case 71 and the control board 73 or placing an insulator is a means of ensuring the insulation between the case 71 and the control board 73. In order for the electrical box 70 to be prevented from getting large as a result of the increased distance between the case 71 and the control board 73, placing the insulator is what is often chosen between these means.

[0026] In the embodiment, as illustrated in FIGS. 5 and 6, the insulation sheet 75 includes a first area 75A between the case 71 and a second face 73b that is a rear face of the control board 73 with respect to the first face 73a. The first area 75A covers the second face 73b of the control board 73.

[0027] The insulation sheet 75 also includes a second area 75B covering the first face 73a of the control board 73. It is to be noted that the second area 75B covers a region, avoiding the connector 89. The insulation sheet 75 also includes third areas 75E, 75F, 75G, and 75H that are formed by bending ends of the first area 75A toward the second area 75B, and a third area 75D that is formed by bending an end of the second area 75B toward the first area 75A. The third area 75D is positioned inwardly of the connector 89. The third area 75E is positioned outwardly of the control board 73.

[0028] The insulation sheet 75 also includes a fourth area 75C connecting the first area 75A and the second area 75B. A sheet projection 76 is formed where the second area 75B and the fourth area 75C join, projecting

toward an inner wall of the case 71. As illustrated in FIG. 4, the sheet projection 76 abuts a case projection 71a formed on the inner wall of the case 71. When the sheet projection 76 abuts the case projection 71a, the insulation sheet 75 is positioned inside the electrical box 70. In this way, a clearance is ensured, for example, between the inner wall of the case 71 and the fourth area 75C to facilitate passage of the lead wire 95. In other words, ease of work can be improved when the wires are routed inside the electrical box 70.

[0029] In the embodiment, a U-shaped cut is made in the fourth area 75C, and a part surrounded by this cut is raised to become the sheet projection 76.

[0030] With the insulation sheet 75 including the first area 75A, the second area 75B, the third areas 75D, 75E, 75F, 75G, and 75H, and the fourth area 75C, accumulation of dust on the control board 73 and the electronic components 74 is suppressed.

[0031] In the example illustrated in FIG. 1, for example, a posture of the ventilator 1 is such that a longitudinal direction of the main body is aligned with a horizontal direction. This posture is simply referred to as horizontal installation. When the ventilator 1 is disposed horizontally, the electrical box 70 is disposed in a posture illustrated in FIG. 5. Dust mostly comes down from above when accumulating on the control board 73 and the electronic components 74. With the ventilator 1 being installed horizontally, an upper side of the control board 73 and an upper side of the electronic components 74 are covered by the third areas 75D and 75E. Therefore, the dust coming down from above inside the electrical box 70 is prevented by the third areas 75D and 75E from reaching the control board 73 and the electronic components 74. With the ventilator 1 being installed horizontally, accumulation of the dust on the control board 73 and the electronic components 74 is thus suppressed by the third areas 75D and 75E.

[0032] A description is provided next of a case where a posture of the ventilator 1 disposed is such that the longitudinal direction of the main body is aligned with a vertical direction. This posture is simply referred to as vertical installation. FIG. 13 is a sectional view of the electrical box 70 when the ventilator 1 according to the embodiment is installed vertically. In this case, an upper side of the first face 73a of the control board 73 and the electronic components 74 is covered by the second area 75B. Therefore, dust coming down from above inside the electrical box 70 is prevented by the second area 75B from reaching the first face 73a of the control board 73 and the electronic components 74. With the ventilator 1 being installed vertically, accumulation of the dust on the control board 73 and the electronic components 74 is thus suppressed by the second area 75B.

[0033] As described above, the ventilator 1 according to the embodiment can suppress accumulation of dust on the control board 73 and the electronic components 74 even when its installation posture is changed. It is to be noted that not only when the ventilator 1 is installed

horizontally or vertically, but also when the ventilator 1 is installed in other various postures, the insulation sheet 75 is partly positioned above the control board 73 and the electronic components 74, thus being capable of suppressing accumulation of dust on the control board 73 and the electronic components 74.

[0034] Because the plurality of installation postures are possible with the ventilator 1, when mounted, for example, in a wall with a smaller width than a longitudinal dimension of the main body, the ventilator 1 can be installed vertically. Because the posture of the ventilator 1 is thus selectable according to an installation place for the ventilator 1 and a position of a window or a beam that is provided in the installation place for the ventilator 1, architectural design flexibility improves. The wider range of posture options facilitates improvement of design of an environment in which the ventilator 1 is installed.

Reference Signs List

[0035] 1 ventilator; 10 front panel; 11 room interior outlet; 12 room interior inlet; 20 front casing; 21 supply air opening; 22 exhaust air opening; 30 back casing; 31 outside inlet; 32 outside outlet; 40 inner casing; 41 supply air passage; 42 exhaust air passage; 50A, 50B blower; 51A, 51B motor; 52A, 52B impeller; 53 motor mounting plate; 60 heat exchanger; 70 electrical box; 71 case; 71a case projection; 71b opening; 72 cover; 73 control board; 73a first face; 73b second face; 74 electronic component; 75 insulation sheet; 75A first area; 75B second area; 75C fourth area; 75D, 75E, 75F, 75G, 75H third area; 76 sheet projection; 80 terminal block box; 88 spacer; 89 connector.

Claims

1. A ventilator (1) comprising:

a main body (10, 20, 30);
 a blower (50A, 50B) provided inside the main body (10, 20, 30);
 an electrical box (70) provided inside the main body (10, 20, 30);
 a control board (73) fixed inside the electrical box (70);
 an electronic component (74) mounted to a first face (73a) of the control board (73); and
 an insulation sheet (75) provided inside the electrical box (70), **characterized in that** the insulation sheet (75) includes a first area (75A) between the electrical box (70) and a second face (73b) that is a rear face of the control board (73) with respect to the first face (73a), and a second area (75B) covering the first face (73a),
 the insulation sheet (75) further includes a projection (76) projecting toward an inner wall of the

electrical box (70) and abutting the inner wall, the insulation sheet (75) further includes a fourth area (75C) connecting an end of the first area (75A) and an end of the second area (75B), and the projection (76) is provided where the fourth area (75C) and at least one of the first area (75A) and the second area (75B) join.

2. The ventilator (1) according to claim 1, wherein the insulation sheet (75) further includes a third area (75D, 75E, 75F, 75G, 75H) formed of at least one of an end of the first area (75A) and an end of the second area (75B) that is bent toward the area on an opposite side.

Patentansprüche

1. Ventilator (1), der aufweist:

einen Hauptkörper (10, 20, 30);
 ein Gebläse (50A, 50B), das innerhalb des Hauptkörpers (10, 20, 30) vorgesehen ist;
 ein elektrischer Kasten (70), der innerhalb des Hauptkörpers (10, 20, 30) vorgesehen ist;
 eine Steuerplatine (73), die innerhalb des elektrischen Kastens (70) befestigt ist;
 eine elektronische Komponente (74), die an einer ersten Seite (73a) der Steuerplatine (73) montiert ist; und
 eine Isolierplatte (75), die innerhalb des elektrischen Kastens (70) vorgesehen ist, **dadurch gekennzeichnet, dass** die Isolierplatte (75) eine erste Fläche (75A) zwischen dem elektrischen Kasten (70) und einer zweiten Seite (73b), die die Rückseite der Steuerplatine (73) in Bezug auf die erste Seite (73a) ist, und eine zweite Fläche (75B) umfasst, die die erste Seite (73a) abdeckt,
 die Isolierplatte (75) ferner einen Vorsprung (76) umfasst, der in Richtung einer Innenwand des elektrischen Kastens (70) vorsteht und an die Innenwand anstößt,
 die Isolierplatte (75) ferner eine vierte Fläche (75C) umfasst, die ein Ende der ersten Fläche (75A) und ein Ende der zweiten Fläche (75B) verbindet, und
 der Vorsprung (76) vorgesehen ist, wo die vierte Fläche (75C) sowie die erste Fläche (75A) und/oder die zweite Fläche (75B) verbunden sind.

2. Ventilator (1) nach Anspruch 1, wobei die Isolierplatte (75) ferner eine dritte Fläche (75D, 75E, 75F, 75G, 75H) umfasst, die aus einem Ende der ersten Fläche (75A) und/oder einem Ende der zweiten Fläche (75B), die in Richtung der Fläche gebogen ist, auf einer gegenüberliegenden Seite gebildet ist.

Revendications

1. Ventilateur (1) comprenant :

un corps principal (10, 20, 30) ; 5
 une soufflante (50A, 50B) située à l'intérieur du
 corps principal (10, 20, 30) ;
 un boîtier électrique (70) situé à l'intérieur du
 corps principal (10, 20, 30) ;
 un tableau de commande (73) fixé à l'intérieur 10
 du boîtier électrique (70) ;
 un composant électronique (74) monté sur une
 première face (73a) du tableau de commande
 (73) ; et
 une feuille d'isolation (75) située à l'intérieur du 15
 boîtier électrique (70), **caractérisé en ce que**
 la feuille d'isolation (75) comporte une première
 zone (75A) entre le boîtier électrique (70) et une
 seconde face (73b) qui est une face arrière du
 tableau de commande (73) par rapport à la 20
 première face (73a), et une deuxième zone
 (75B) couvrant la première face (73a),
 la feuille d'isolation (75) comporte en outre une
 saillie (76) faisant saillie vers une paroi inté- 25
 rieure du boîtier électrique (70) et venant en
 butée contre la paroi intérieure,
 la feuille isolante (75) comporte en outre une
 quatrième zone (75C) reliant une extrémité de la
 première zone (75A) et une extrémité de la 30
 deuxième zone (75B), et
 la saillie (76) est située à l'endroit où la qua-
 trième zone (75C) et au moins l'une parmi la
 première zone (75A) et la deuxième zone (75B)
 se rejoignent.

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2. Ventilateur (1) selon la revendication 1, dans lequel la feuille d'isolation (75) comporte en outre une troisième zone (75D, 75E, 75F, 75G, 75H) formée d'au moins l'une parmi une extrémité de la première zone (75A) et une extrémité de la deuxième zone 40 (75B) qui est pliée vers la zone d'un côté opposé.

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FIG.1

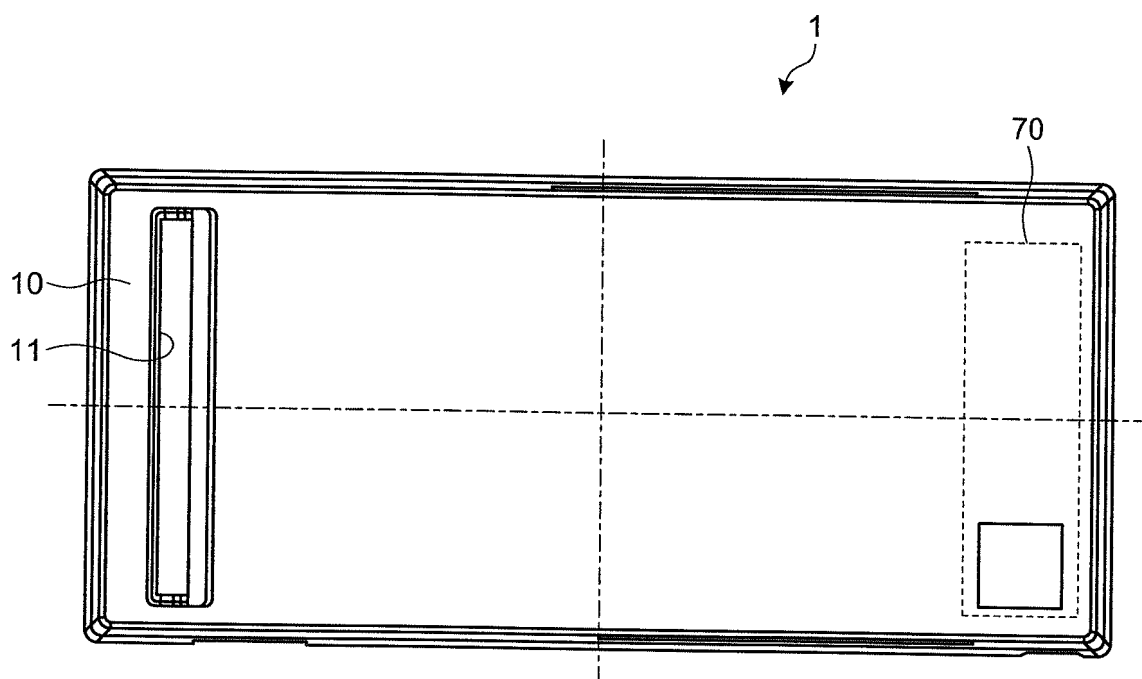


FIG.2

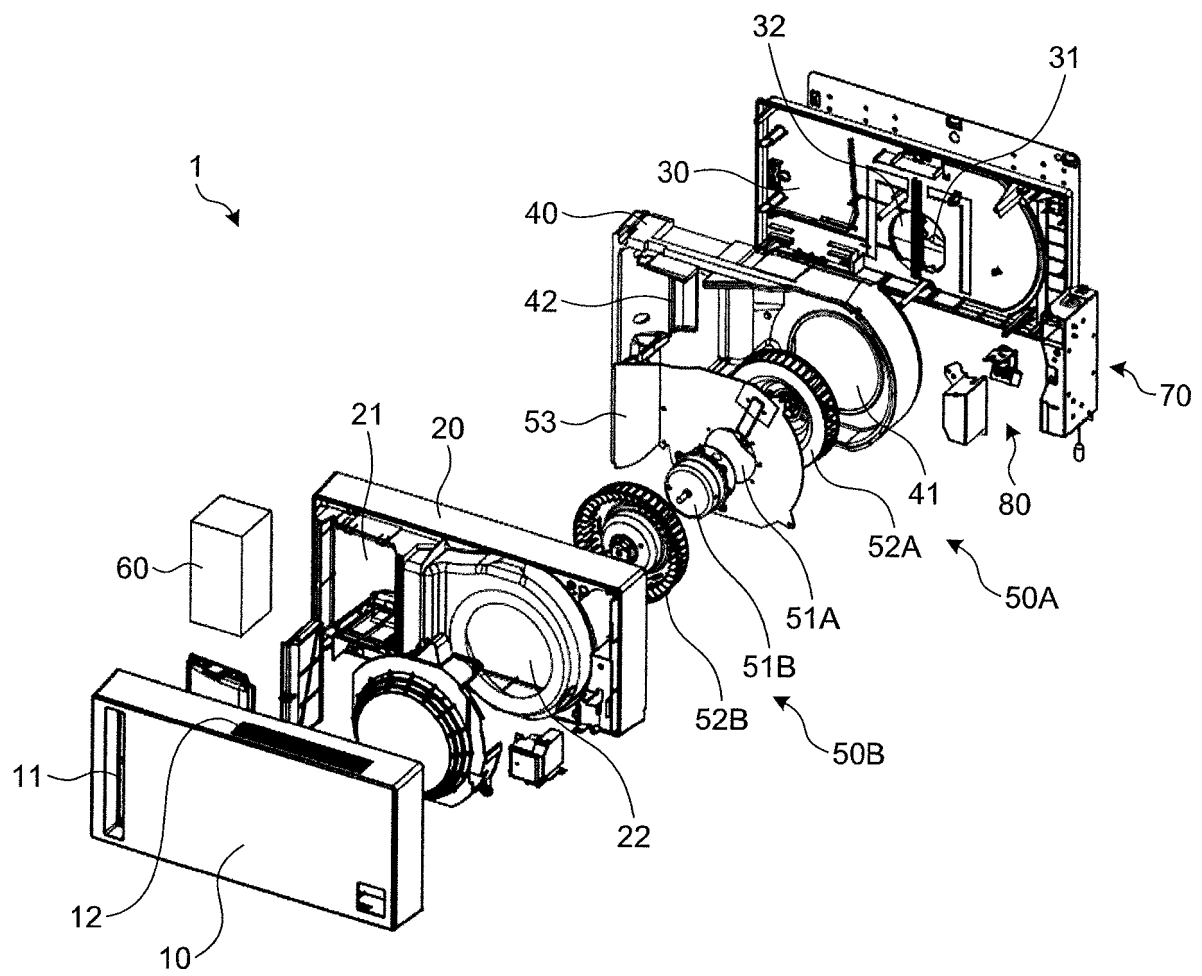


FIG.3

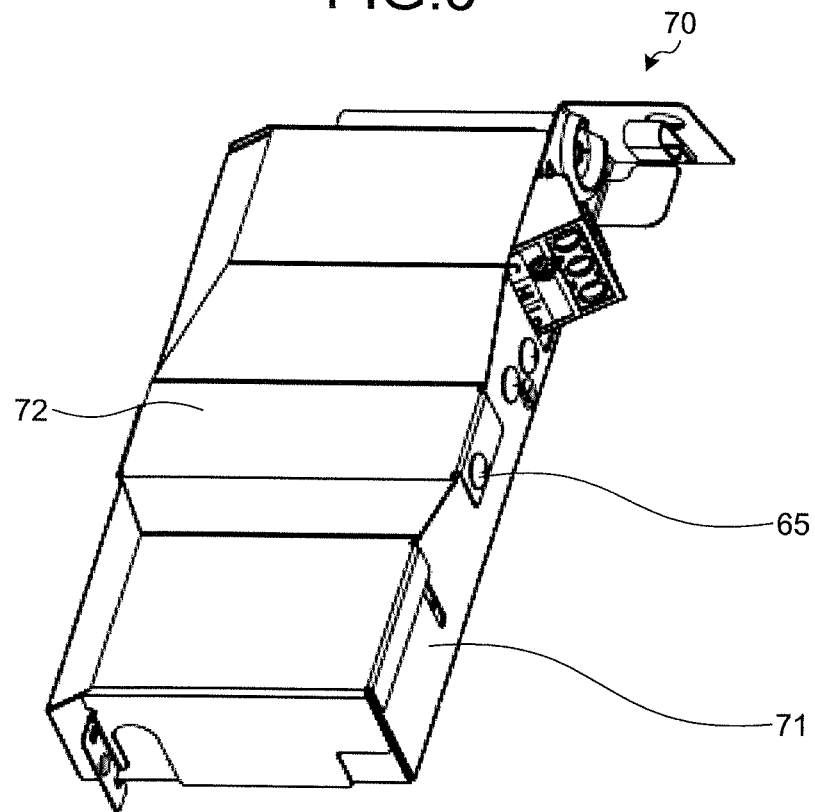


FIG.4

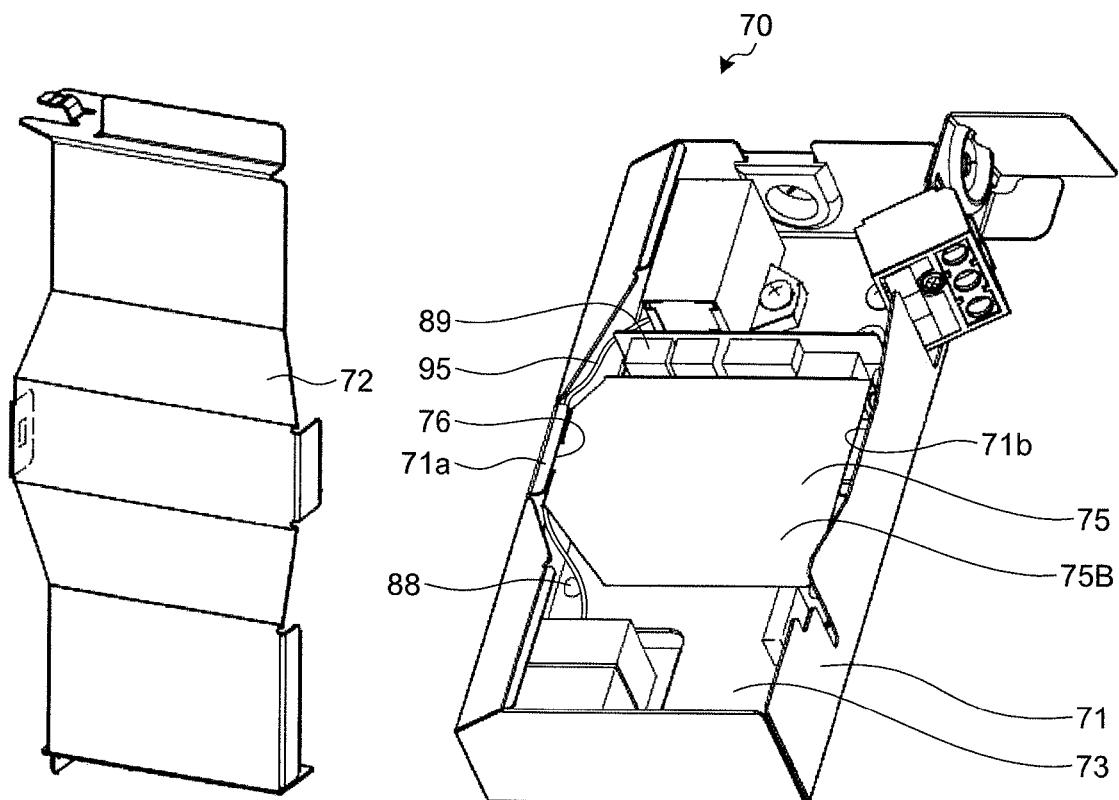


FIG.5

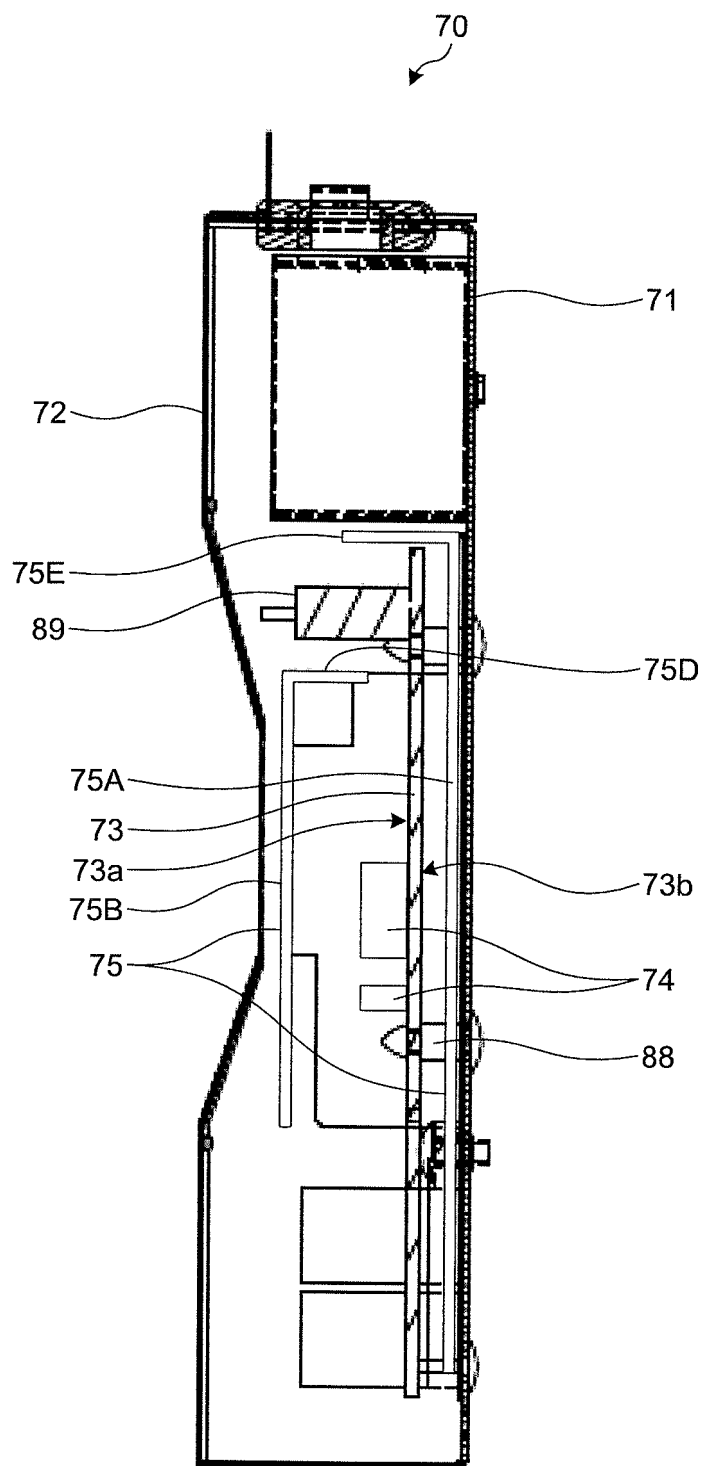


FIG.6

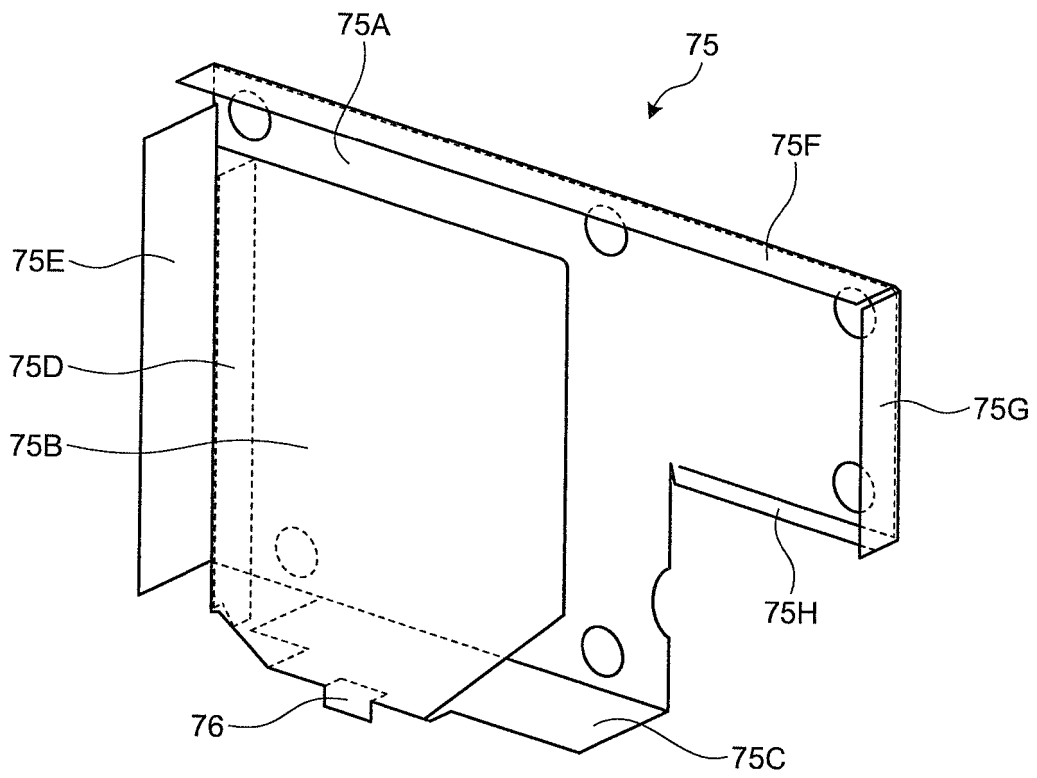


FIG.7

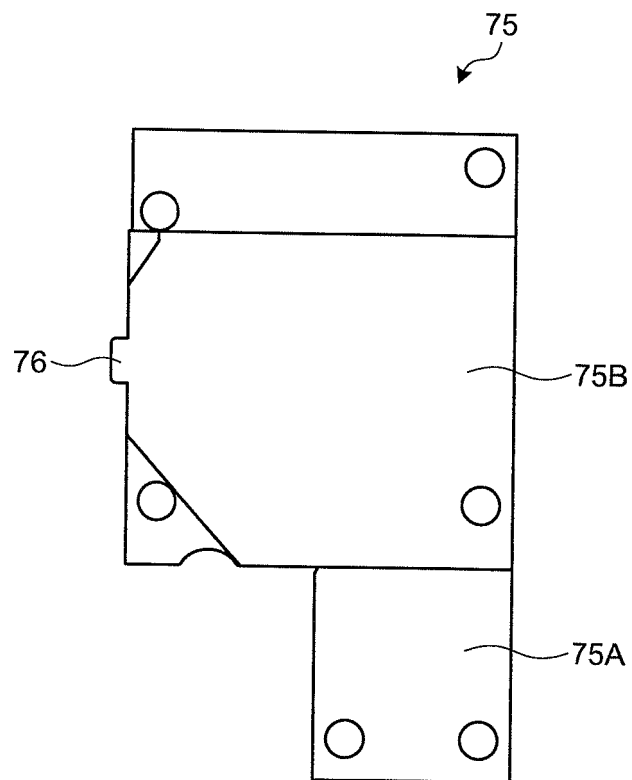


FIG.8

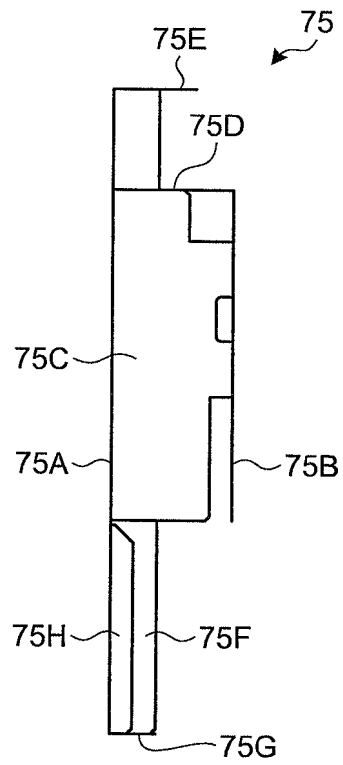


FIG.9

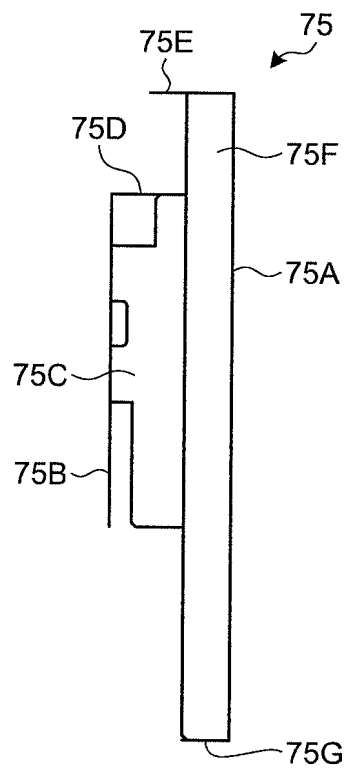


FIG.10

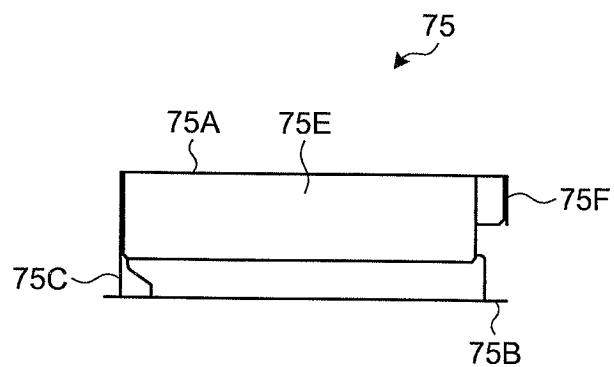


FIG.11

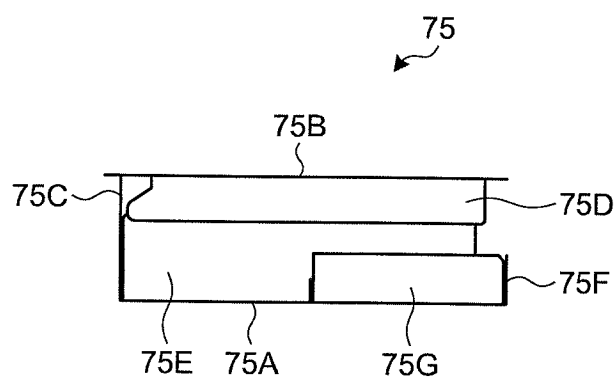


FIG.12

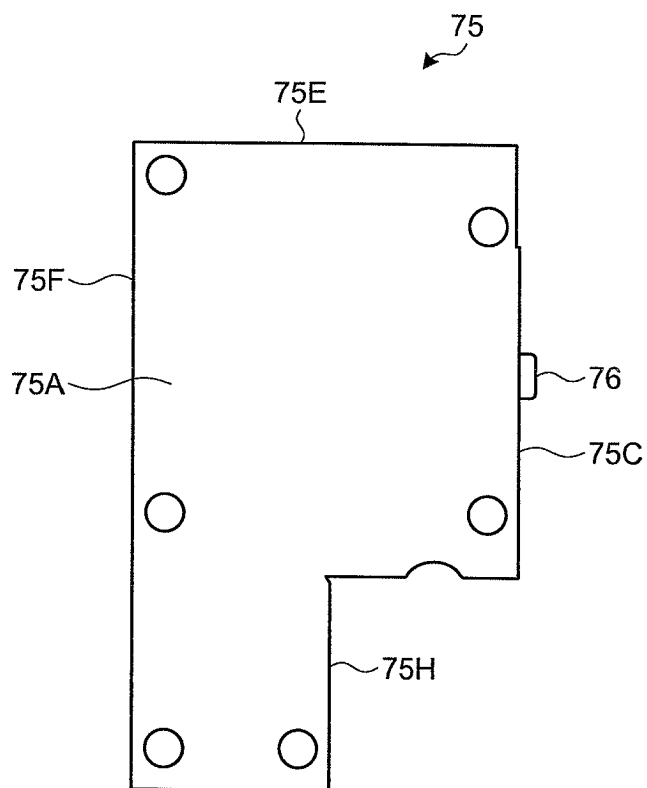
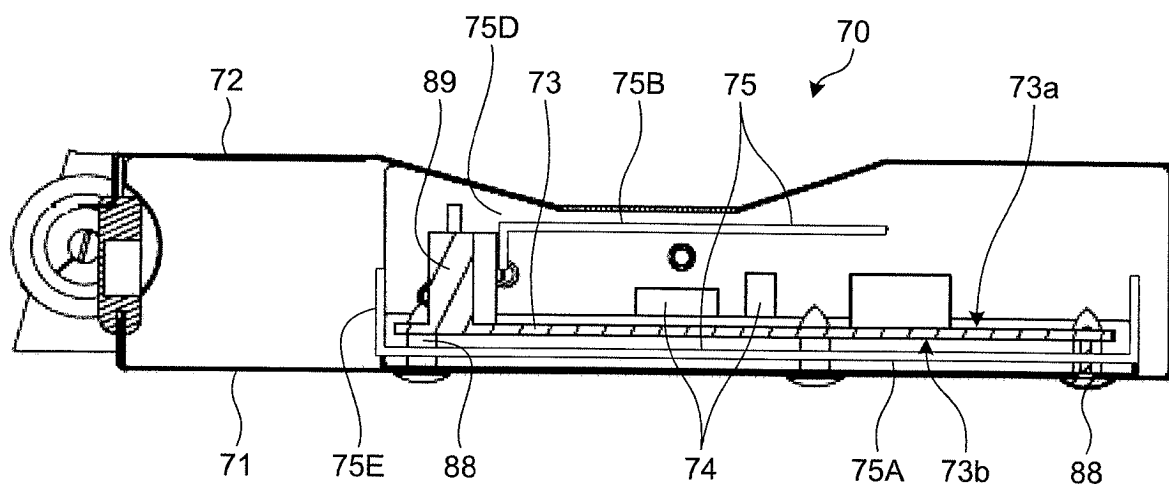


FIG.13



REFERENCES CITED IN THE DESCRIPTION

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