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(54) **OUTDOOR UNIT OF AIR CONDITIONER**

AUSSENEINHEIT FÜR KLIMAANLAGE

UNITE EXTERIEURE D'UN CLIMATISEUR

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(56) References cited:
WO-A-01/51859
WO-A-03/016788
JP-A- 5 322 223
JP-A- 2000 275 372
JP-A- 2001 021 179
JP-A- 2002 243 210
JP-A- 2003 106 569
JP-A- 2003 214 659

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Description

Technical Field

[0001] The present invention relates to an outdoor unit of an air conditioning machine in which the inside of a casing is partitioned above and below with a horizontal partition plate, and the upper portion is made to be a heat exchange chamber while the lower portion is made to be a machine chamber, the machine chamber being provided with an electric component box which houses electric components or the like, and in particular, to a cooling structure in the electric component box.

Background Art

[0002] For example, Jpn. Pat. Appln. KOKAI Publication No. 2001-201108 discloses an example of an outdoor unit of a medium-size air conditioning machine which is intended for a medium-scale building. In the example, the inside of a casing is partitioned above and below with a horizontal partition plate, the upper portion is made to be a secondary side of a heat exchanger, and there is provided a heat exchange chamber in which an air blower is arranged so as to face the heat exchanger, while the lower portion is made to be a machine chamber in which a compressor and the like are arranged.

[0003] Then, it is a general configuration that the machine chamber is provided with an electric component box which houses electric components or the like. The electric components include wide-ranging variety of components such as, for example, a circuit board with a relatively less heating value, on which control electronic parts are mounted; a circuit board with a relatively greater heating value, such as an inverter circuit; and electric components with an extremely great heating value, such as a reactor.

[0004] WO 01 51859 describes an air conditioning outdoor unit which has a pair of opposite sides in the heat exchange chamber are inclined.

[0005] JP2002 275 372 relates to an outdoor unit for an air conditioner having an arrangement configured to improve the cooling efficiency of radiation plates, extend the life of electric appliances and allow great flexibility in the arrangement of electrical components.

Disclosure of Invention

[0006] In such an outdoor unit of an air conditioning machine, in particular, a machine chamber has substantially a hermetically sealed structure in order to prevent a noise of driving of a compressor from being leaked as much as possible. Therefore, there is scarcely air current in the machine chamber, which leads to a shortage in a cooling amount for the inside of the machine chamber. In particular, electric components generate heat in the electric component box, and if the heat remain on, a temperature in the electric component box is extremely increased, which could have adversely affected thermally on the electric components.

[0007] Thus, various cooling structures for the inside of the electric component box have been used. For example, there is a structure in which an attempt is made to lower a temperature in the machine chamber by forming an opening for outside air intake in a side plate configuring a casing which is a main body of the outdoor unit. There is also a structure in which an attempt is made to lower a temperature in the electric component box by forming an opening for outside air intake in a side plate of the electric component box in such a manner that the side plate of the electric component box is made to serve as the side plate of the case.

[0008] However, a drop in temperature of the respective portions can be obtained by forming an opening in the side plate of the case or by forming an opening in the side plate of the electric component box. When the outside air is taken in from these openings, on the other hand, water droplets such as rainwater or snow infiltrate into the inside thereof together with the outside air.

[0009] Terminals for making electrical connections to codes are provided in the compressor arranged in the machine chamber, and when the terminals get wet by water droplets, a short-circuit accident or the like could have been caused. Needless to say, when the electric components in the electric component box get wet by water droplets, an accident of the same kind could have been caused. Accordingly, an effective, and safe and secure cooling structure has been required in place of prior art.

[0010] The present invention has been achieved in consideration of the circumstances, and an object of the present invention is to provide an outdoor unit of an air conditioning machine with an effective and safe cooling structure in which a cooling efficiency for the inside of an electric component box arranged in a machine chamber and electric components to be housed therein is ensured, and infiltration of water droplets is securely blocked, which causes no short-circuit accident or the like.

[0011] The outdoor unit of the air conditioning machine according to the present invention has been achieved in order to satisfy the object. In a first aspect, the present invention provides an outdoor unit of an air conditioning system as recited in claim 1.

Brief Description of Drawings

[0012]

FIG. 1 is a schematic cross-sectional view of an outdoor unit of an air conditioning machine according to an example useful for understanding the present invention.

FIG. 2 is a schematic cross-sectional view of an electric component box and a peripheral portion thereof according to a second example useful for under-

standing the present invention.

FIG. 3 is an exploded perspective view of an electric component box according to a third example useful for understanding the present invention.

FIG. 4 is a partial cross-sectional view of an auxiliary electric component box according to the third example useful for understanding the present invention.

FIG. 5 is a perspective view of a double structure member according to the third example useful for understanding the present invention.

FIG. 6 is a schematic perspective view of a main electric component box according to a fourth example useful for understanding the present invention.

FIG. 7 is a perspective view of an assembled electric component box according to an embodiment.

Best Mode for Carrying Out the Invention

[0013] Hereinafter, a first example useful for understanding the invention will be described with reference to FIG. 1. FIG. 1 is a schematic cross-sectional view of an outdoor unit configuring an air conditioning machine.

[0014] A case 1 configuring a unit main body of the outdoor unit is provided with a horizontal partition plate 2 at a substantially intermediate portion thereof in the vertical direction, and the inside of the casing 1 is partitioned above and below with the horizontal partition plate 2. The inside of the casing above the horizontal partition plate 2 is called a heat exchange chamber 3, and the inside of the casing below the horizontal partition plate 2 is called a machine chamber 4.

[0015] Outdoor heat exchangers 5 are arranged so as to face at least one part of a side face (here, both of the left and right side portions) of the heat exchange chamber 3, and an outdoor air blower 6 is arranged in the center of the uppermost part of the heat exchange chamber 3. A ventilation flue is formed through which, after the outside air is led into the heat exchange chamber 3 so as to circulate through the outdoor heat exchangers 5, the air is discharged from the outdoor air blower 6 to the outdoor by an operation of the outdoor air blower 6.

[0016] In the machine chamber 4, a gas-liquid separator 7, a compressor 8, and unillustrated valves, pipings, and the like are arranged. The compressor 8 and the like are communicated with the outdoor heat exchangers 5 refrigerant pipes so as to configure a cooling cycle via, and moreover, the refrigerant pipes are extended to an indoor heat exchanger configuring an indoor unit (not shown).

[0017] In the machine chamber 4, an electric component box 9 which houses electric components C or the like is also arranged together with the compressor 8. As the electric components C housed in the electric component box 9, for example, an electric component (circuit board) C1 with a relatively less heating value on which control electronic parts are mounted is arranged to the upper portion side, and an electric component (circuit board) C2 with a relatively greater heating value, such as an inverter circuit, is arranged to the lower portion side. In addition thereto, an electric component with an extremely great heating value, such as a reactor (not shown), and the like are housed.

[0018] At the electric component C2 with a relatively greater heating value such as an inverter circuit, a heat sink 10 is attached integrally to the rear face side, and is projected from a side plate 9a configuring the electric component box 9. The heat sink 10 is composed of a plurality of cooling fins made of materials with excellent discharge characteristics, such as, for example, aluminum materials, and the cooling fins are provided in the vertical direction so as to have a predetermined space in the depth direction on paper.

[0019] Air introducing holes 11 are formed in a bottom plate 9b of the electric component box 9, and an outside air intake hole (not shown) is formed in a portion of a casing base plate 1a with the intention to be shifted from the position of the air introducing holes 11. Further, a cooling duct 12 is attached along the side plate 9a from which the heat sink 10 of the electric component box 9 is projected. The cooling duct 12 is formed in a cross-sectional U shape as seen in plan view. The open peripheral portion faces the side plate 9a of the electric component box, and a flange unit which is provided along the edge is attached and fixed to the side plate 9a of the electric component box.

[0020] The cooling duct 12 covers the heat sink 10 projected from the side plate 9a of the electric component box, and upper and lower end portions of the cooling duct 12 are fitted into openings 12a and 12b which are respectively formed in the horizontal partition plate 2 and the casing base plate 1a. Accordingly, the heat exchange chamber 3 is communicated with the outside of the casing base plate 1a via the cooling duct 12.

[0021] A vent hole 13 is formed at a portion facing the upper portion of the cooling duct 12 at the side plate 9a of the electric component box 9, and the inside of the electric component box 9 and the inside of the cooling duct 12 are communicated with each other via the vent hole 13. A mouth body 14 projected to the cooling duct 12 side is provided along the circumferential portion of the vent hole 13, and the tip of the mouth body 14 is covered with a hood member 15 so as to have a predetermined space.

[0022] Accordingly, the air introduced from the inside of the electric component box 9 to the vent hole 13 is guided to the mouth body 14 provided along the circumferential portion of the vent hole 13, and is led out of the electric component box 9. Then, the air circulates through the space between the tip of the mouth body 14 and the hood member 15, flows along the space between the hood member 15 and the electric component box side

plate 9a, and is finally led into the cooling duct 12.

[0023] The outdoor unit of an air conditioning machine is configured in this way. When a driving command signal is inputted, the compressor 8 is driven so that a cooling medium is led into the outdoor heat exchangers 5, valves, the gas-liquid separator 7, and the indoor heart exchanger in the indoor unit, which achieves a cooling cycle operation. At the same time, the outdoor air blower 6 is driven to suck the outside air into the hear exchange chamber 3. The outside air circulates the outdoor heat exchangers 5 to exchange heat, and moreover, the air is discharged to the outside via the outdoor air blower 6.

[0024] A blowing effect of the outdoor air blower 6 allows the heat exchange chamber 3 to be at a negative pressure, and the influence reaches the cooling duct 12 communicated with the heat exchange chamber 3, so that the inside of the cooling duct 12 is also made to be at a negative pressure. The outside air at the outside of the casing base plate 1a is sucked from the casing base plate opening 12b of the cooling duct 12, and circulates in the cooling duct 12 to be led out of the opening 12a formed in the horizontal partition plate 2 to the heat exchange chamber 3.

[0025] The outside air contacts the heat sink 10 in midflow of circulating in the duct 12 to exchange heat each other. Heat transferred to the heat sink 10 from the electric component C2 with a great heating value, such as an inverter circuit, is radiated to the outside air circulating in the cooling duct 12, and the electric component C2 is cooled down together with the heat sink 10. The heat of the electric component C2 is hardly radiated to the inside of the electric component box 9 and the inside of the machine chamber 4, which suppresses temperature rise thereof.

[0026] Because the cooling duct 12 is attached along the side plate 9a of the electric component box 9, the outside air circulating in the cooling duct 12 is led along the electric component box side plate 9a. Accordingly, a part (the side plate 9a) of the electric component box 9 which faces the cooling duct 12 is cooled down by the outside air.

[0027] Moreover, when the inside of the cooling duct 12 is made to be at a negative pressure by driving the outdoor air blower 6, the inside of the electric component box 9 communicated with the cooling duct 12 via the vent hole 13 is also made to be at a negative pressure. Under the effect, the air in the machine chamber 4 is led into the electric component box 9 from the air introducing holes 11 formed in the bottom plate 9b of the electric component box 9. The air in the machine chamber 4 is the outside air which is led via an outside air intake hole (not shown) formed in the casing base plate 1a, and in reality, the fresh and low temperature outside air is led into the electric component box 9.

[0028] The outside air led into the electric component box 9 from the air introducing holes 11 of the electric component box bottom plate 9b directly contacts the electric components C2 and C1 housed in the electric component box 9, and cools the components down. The outside air whose temperature has been raised by cooling-down is led out of the vent hole 13 formed at the upper portion of the electric component box 9, and is guided by the mouth body 14 and the hood member 15 to be led into the cooling duct 12.

[0029] As described above, the air after cooling down the heat sink 10 is circulating in the cooling duct 12, and the air led via the vent hole 13 flows into the cooling duct 12. The confluent air is led into the heat exchange chamber 3, and is further discharged to the outside by the effect of the outdoor air blower 6.

[0030] In this way, the heat sink 10 attached to the electric component C2 with a great heating value such as an inverter circuit is projected to the inside of the cooling duct 12, and is cooled down by the outside air circulating therein. The electric component box side plate 9a facing the cooling duct 12 is cooled down by the outside air circulating in the cooling duct 12. The electric components C2 and C1 in the electric component box 9 are directly cooled down by the cooled air led from the air introducing holes 11 of the electric component box bottom plate 9b into the inside of the box 9.

[0031] The outside air after respectively cooling down the heat sink 10, the electric component box side plate 9a, and the electric components C2 and C1 is discharged to the outside via the heat exchange chamber 4, and the fresh and low temperature outside air is always led into the heat sink 10, the electric component box side plate 9a, and the electric components C2 and C1. Accordingly, it is possible to securely suppress a rise in internal temperature of the electric component box 9, which achieves effective cooling for the electric components C2 and C1, and a great improvement in a cooling efficiency can be obtained.

[0032] Further, the outside air at the outside of the casing base plate 1a is led into the cooling duct 12. For this reason, there are less water droplets reaching the casing base plate opening 12b of the cooling duct 12 from a space between the casing base plate 1a and a case installation plane G no matter how it rains heavily, and it is still more hard to think of that there are water droplets infiltrating in the cooling duct 12 from here.

[0033] Suppose the case in which water droplets such as rainwater or the like infiltrate in the cooling duct 12 so as to be mixed in the outside air. Most of the water droplets are in collision with the heat sink 10 immediately after going into the cooling duct 12, and thus cannot infiltrate further into the inside. Even if the droplets pass through the heat sink 10, the water droplets are led out as are to the heat exchange chamber 3 from the upper end opening 12a of the cooling duct formed in the horizontal partition plate 2. The outdoor heat exchangers 5 arranged in the heat exchange chamber 3 are configured so as to be trouble-free even if rainwater is poured onto the exchangers themselves. As a consequence, there is no trouble even if there are water droplets infiltrating from the cooling duct 12 into the heat exchange chamber 3.

[0034] According to circumstances, it can be thought of that some of water droplets passing through the heat sink 10 infiltrate into the space between the hood member 15 and the electric component side plate 9a above the cooling duct 12. However, the water droplets infiltrating into the space with the hood member 15 collide against the mouth body 14 provided to be projected along the circumferential portion of the vent hole 13 immediately thereafter, and is restrained from further infiltrating. The mouth body 14 has a function as a so-called baffle plate, which leads to an amount to nothing of water droplets reaching the vent hole 13. Needless to say, there are no water droplets infiltrating into the electric component box 9 from the vent hole 13 under a negative pressure condition.

[0035] The outside air is led from the air introducing holes 11 of the electric component box bottom plane plate 9b as well. However, as described above, the air introducing holes 11 are formed at positions so as to be distant from the outside air intake hole formed in the casing base plate 1a. If water droplets infiltrate into the inside of the casing from the outside air intake hole, there is no water droplets reaching the air introducing holes 11 from the outside air intake hole, and the water droplets never infiltrate from the air introducing holes 11 into the electric component box 9. Therefore, a short-circuit accident of the electric components C1 and C2 can be securely restrained.

(Second Example useful for understanding the present invention)

[0036] Next, a second example, useful for understanding the present invention will be described with reference to FIG. 2. Because the entire configuration of an outdoor unit is basically the same as that described above in FIG. 1, additional description thereof will be omitted by applying the drawing thereto. FIG. 2 is an enlarged schematic cross-sectional view of an electric component box 9 and a peripheral portion thereof.

[0037] The electric component box 9 which houses electric components C1 and C2 or the like is arranged in a machine chamber 4. A heat sink 10 is provided to be projected integrally to the electric component C2 with a great heating value, and is projected from an electric component box side plate 9a. Air introducing holes 11 are formed in an electric component box bottom plate 9b, and a cooling duct 12 is attached along the side plate 9a from which the heat sink 10 is projected.

[0038] The cooling duct 12 covers the heat sink 10, and the upper and lower end portions of the cooling duct 12 are fitted into openings 12a and 12b of a horizontal partition plate 2 and a casing base plate 1a. A vent hole 13 is formed in the upper portion of the electric component box side plate 9a, and a mouth body 14 is provided along the circumferential portion of the vent hole 13. The tip of the mouth body 14 is covered with a hood member 15 so as to have a predetermined space. The above descriptions are completely the same as the configuration described above in FIG. 1.

[0039] Here, there is the feature that there is provided a partition plate 20 which partitions the side plate 9a of the electric component box 9 in which the vent hole 13 is formed and the inside of the electric component box 9, and that the partition plate 20 is provided with a plurality of guide holes 21 which allow the inside of the electric component box 9 and the vent hole 13 to be communicated with each other. Many of the guide holes 21 are formed at portions in the vicinity of the electric component C2 with a great heating value, such as an inverter circuit.

[0040] The partition plate 20 is provided in the electric component box 9 so as to be substantially parallel to the side plate 9a with a predetermined space from the side plate 9a. An upper end portion 20a of the partition plate 20 is bent at a portion above the vent hole 13, and the bent edge is fixed to the side plate 9a. A lower end portion 20b of the partition plate 20 is bent at a portion in the vicinity of the electric component box bottom plate 9b, and the bent edge is fixed to the side plate 9a. Moreover, both of the left and right side portions of the partition plate 20 are respectively bent, and the bent edges are fixed to the side plate 9a.

[0041] Some of the electric components C1 and C2 may be directly attached to the partition plate 20, or may be attached so as to pass through the partition plate 20. Accordingly, the partition plate 20 forms a substantially enclosed space D with respect to the side plate 9a.

[0042] The inside of the electric component box 9 is communicated with the substantially enclosed space D formed between the partition plate 20 and the side plate 9a via the guide holes 21. Further, the substantially enclosed space D and the inside of the cooling duct 12 are communicated with each other via the vent hole 13, and consequently, the inside of the electric component box 9 is communicated with the inside of the cooling duct 12 via the substantially enclosed space D.

[0043] In such a configuration, the substantially enclosed space D defined by the partition plate 20 and the side plate 9a is interposed as an air layer between the inside of the electric component box 9 and the cooling duct 12, so that an effect of shielding heat from the inside of the electric component box 9 to the cooling duct 12 can be obtained.

[0044] Many of the guide holes 21 are formed at portions in the vicinity of the electric component C2 with a great heating value in the partition plate 20, thereby making it possible to improve a cooling efficiency with respect to the electric component C2. On the other hand, the air in the electric component box 9 is smoothly led to the cooling duct 12 via the guide holes 21, the substantially enclosed space D, and the vent hole 13. Thus, a rise in temperature inside the electric component box 9 is securely suppressed.

(Third Example useful for understanding the present invention)

[0045] Next, a third example, useful for understanding the present invention will be described with reference to FIGS. 3 to 5. Because the entire configuration of an outdoor unit is basically the same as that described above in FIG. 1, additional descriptions thereof will be omitted by applying the drawing thereto. FIG. 3 is an exploded perspective view of an electric component box 9, and FIG. 4 is a schematic cross-sectional view of a double structure member 30 configuring a part of the electric component box 9, and FIG. 5 is a perspective view of the double structure member 30.

[0046] In FIG. 3, the electric component box 9 is viewed from the front face side, and a vent hole 13 formed in a side plate 9a of the electric component box 9 is illustrated. However, a cooling duct 12 attached to the rear face side is omitted. The configuration described above in FIG. 1 is applied as is to the configuration of the cooling duct 12 itself, and all the descriptions are omitted.

[0047] The electric component box 9 is configured by a main electric component box 9M which houses an electric component C1 with a little heating value and an electric component C2 with a great heating value, and an auxiliary electric component box 9N which houses only an electric component C3 with an extremely great heating value, such as a reactor.

[0048] An opening 25 which will be described later is formed at one side portion of the main electric component box 9M, the electric components C1 and C2 are housed in the remaining space, and a vent hole 13 is formed at a predetermined portion. The opening 25 formed in the main electric component box 9M is blocked up with the double structure member 30, and the auxiliary electric component box 9N is attached via the double structure member 30.

[0049] The auxiliary electric component box 9N is formed in a cross-sectional substantially U shape as seen in plan view, and the upper end opening is formed to be closed with a top plate 9e which is formed to be bent at the upper end of the main electric component box 9M. A bottom plate 9f is provided to the bottom end of the auxiliary electric component box 9N, and a flange unit 9h provided along both of the left and right side portion edges is attached to the double structure member 30.

[0050] In this way, the auxiliary electric component box 9N is a housing which is attached separately from the main electric component box 9M, and it is formed to have a substantially enclosed structure. For this reason, there is no case in which heat radiated from the electric component C3 housed in the inside affects the inside of the main electric component box 9M.

[0051] Both of the left and right side portions of the auxiliary electric component box 9N are made to be a so-called shutter structure, which ensures ventilation to the inside. No heat radiated from the electric component C3 housed in the inside fills in the inside of the auxiliary electric component box 9N, and no thermal effect reaches the electric component C3 itself. It is unthinkable that water droplets such as rainwater are poured onto the auxiliary electric component box 9N. However, even if the auxiliary electric component box 9N has got wet, the water droplets could not have infiltrated into the inside from the space of the shutters.

[0052] As shown in FIGS. 3 to 5, the double structure member 30 is configured by a first plate body 31 which is directly attached to the main electric component box side plate 9a, and a second plate body 32 which is superimposed on the first plate body 31 with a predetermined space. The first plate body 31 closes the opening 25 formed in the main electric component box 9M, and the second plate body 32 is positioned so as to be projected to the inside of the main electric component box 9M. Then, the electric component C1 which is the same as the electric component C1 housed in the main electric component box 9M is attached to the inside of the main electric component box 9M of the second plate body 32.

[0053] An air layer is formed between these first plate body 31 and second plate body 32, which has an insulation effectiveness. Therefore, even if the double structure member 30 receives heat radiated from the electric component C3 with an extremely great heating value such as a reactor housed in the auxiliary electric component box 9N, heat transfer to the inside of the main electric component box 9M can be suppressed to a minimum due to the air layer exerting the insulation effectiveness. Consequently, there is hardly thermal effect onto the electric component C3 in the main electric component box 9M.

[0054] Moreover, a part which is relatively hard to get out of order, such as a reactor, is arranged in the auxiliary electric component box 9N, whereby the small-spacing of the main electric component box 9M and the degree of freedom in a component layout are improved in addition to the problem of thermal treatment.

(Fourth Example useful for understanding the present invention)

[0055] Next, a fourth example, useful for understanding the present invention will be described with reference to FIGS. 6 to 7. The entire configuration of an outdoor unit is basically the same as that described above in FIG. 1. The configuration in which a partition plate 20 is provided so as to have a predetermined space with an electric component box side plate 9a is the same as that described above in FIG. 2. In addition, it is the same as the configuration described above in FIGS. 3 to 5 that an electric component box 9 is configured by a main electric component box 9M and an auxiliary electric component box 9N having a double structure member 30. Here, additional descriptions thereof will be omitted by applying the drawing thereto.

[0056] FIG. 6 is a perspective view of the assembled electric component box 9, and FIG. 7 is a cross-sectional

view of the main electric component box 9M. FIG. 6 is a cross-sectional view of the main electric component box 9M, and FIG. 7 is a perspective view of the assembled electric component box 9.

[0057] There is a first plate body 31 configuring the double structure member 30 in plane with the side plate 9a of the main electric component box 9M, and there is a second plate body 32 in plane with the partition plate 20. A space between the side plate 9a and the partition plate 20 is equal to a space between the first plate body 31 and the second plate body 32. In addition, the respective edges of the side plate 9a and the first plate body 31 are provided to be thickly connected to each other, and the respective edges of the partition plate 20 and the second plate body 32 are provided to be thickly connected to each other.

[0058] Therefore, a gap D formed between the both of the first plate body 31 and the second plate body 32 is communicated with a gap (substantially enclosed space) D between the side plate 9a and the partition plate 20. As described above, because the gap (substantially enclosed space) D between the side plate 9a and the partition plate 20 is communicated with the vent hole 13, the gap D between the both of the first plate body 31 and the second plate body 32 which configure the double structure member 30 is communicated with the vent hole 13.

[0059] With such a configuration, the double structure member 30 receives heat radiated from an electric component C3 with an extremely great heating value such as a reactor housed in the auxiliary electric component box 9N, and heat is shielded by an air layer formed in these gaps D, so that the air in the air layer rises in temperature. Then, the air which has risen in temperature is led to the gap D between the side plate 9a and the partition plate 20, and is further guided to the cooling duct 12 via the vent hole 13 to be discharged to the outside.

[0060] Part of the outside air led into the main electric component box 9M is filled into the air layer of the double structure member 30, and a temperature rise is extremely efficiently suppressed. There is less possibility that the effect of heat radiated from the electric component C3 with an extremely great heating value, which is housed in the auxiliary electric component box 9N, affects up to the inside of the main electric component box 9M, and thus, heat transfer can be suppressed to an extremely minimum.

(Embodiment)

[0061] Next, an outdoor unit in accordance with an embodiment will be described with reference to FIGS. 1 to 7.

[0062] The entire configuration of an outdoor unit is basically the same as that described above in FIG. 1 except that two inverter driving compressors 8a and 8b which are separately controlled to operate are arranged in a machine chamber 4.

[0063] The configuration in which a partition plate 20 is provided so as to have a predetermined space with an electric component box side plate 9a is the same as that described above in FIG. 2 addition, it is the same as the configuration described above in FIGS. 3 to 5 that an electric component box 9 is configured by a main electric component box 9M and an auxiliary electric component box 9N having a double structure member 30. It is the same as the configuration described above in FIGS. 6 and 7 that a gap D formed between both of a first plate body 31 and a second plate body 32 is communicated with a gap (substantially enclosed space) D between a side plate 9a and a partition plate 20.

[0064] Here, additional descriptions are omitted by applying the respective drawings thereto, and only the different point will be described.

[0065] The two compressors 8a and 8b are arranged in the machine chamber, and they are driven by inverters C2a and C2b respectively arranged at the position of C2 of the main electric component box 9. The inverters C2a and C2b are arranged so as to be next to each other in the horizontal direction in a positional relationship corresponding to the compressors 8a and 8b which the respective inverters drive, and heat sinks 10 are integrally provided to the inverters C2a and C2b respectively so as to be projected.

[0066] With such a configuration, as compared with a case of a layout in tandem shape in which, for example, the inverter C2a is arranged at the lower side, and the inverter C2b is arranged above the inverter C2a, no heat generated from the heat sink 10 provided to be projected from the lower inverter C2a interferes with the heat sink 10 of the upper inverter C2b, and the both heat sinks 10 are efficiently cooled down by the duct 12. Further, because the inverters C2a and C2b are made to correspond to the positional relationship of the compressors 8a and 8b which the respective inverters drive, it excels in maintenance performance at the time of failure or the like.

[0067] Note that the present invention is not limited to the aforementioned embodiments, and it goes without saying that various modifications and implements are possible within a range which does not deviate from the scope of the appended claims.

Industrial Applicability

[0068] The present invention has effects that an effective and safe cooling structure can be obtained, in which a cooling efficiency with respect to electric components in an electric component box arranged in a machine chamber is ensured, and infiltration of water droplets into the electric component box is securely blocked, which causes no short-circuit accident or the like.

Claims

1. An outdoor unit of an air conditioning machine in which the inside of a casing (1) is partitioned above and below via a horizontal partition plate (2), and the

upper portion is made to be a heat exchange chamber (3) in which heat exchangers (5) and an air blower (6) are arranged while the lower portion is made to be a machine chamber (4) in which a compressor and the like are arranged, the machine chamber (4) being provided with an electric component box (9) which houses electric components (C) or the like, the outdoor unit further comprising:

a heat sink (10) to cool down electric components with a great heating value, the heat sink (10) being projected from a side plate (9a) configuring the electric component box (9);
a cooling duct (12) provided along the side plate (9a) of the electric component box (9) from which the heat sink is projected, the cooling duct (12) covering the heat sink (10) and comprising openings (12a, 12b) formed in the horizontal partition plate (2) and a base plate (1 a) of the case (1), and the cooling duct (12) introducing outside air from the opening at the base plate (1a) of the case (1) accompanying an operation of the air blower (6) to exchange heat between the outside air and the heat sink (10), and then guiding the air out of the opening of the horizontal partition plate (2) to the heat exchange chamber wherein two compressors (8a, 8b) are arranged in the machine chamber, the electric components with a great heating value are two inverter devices (C2a, C2b) which drive separately the two compressors (8a, 8b), and the two inverter devices (C2a, C2b) are arranged in a horizontal direction;
a vent hole (13) which is formed in the side plate (9a) of the electric component box (9), the vent hole (13) conducting air in the electric component box (9) and guiding the air so as to be discharged into the cooling duct (12);
a partition plate (20) which partitions the side plate (9a) of the electric component box (9) in which the vent hole (13) is formed, and the inside of the electric component box (9); and
guide holes (21) formed in the partition plate (20), the guide holes (21) allowing the inside of the electric component box (9) and the vent hole (13) to be communicated with each other.

2. The outdoor unit of an air conditioning machine according to claim 1, **characterized in that** the electric component box is configured by a main electric component box (9M) which houses electric components such as an inverter circuit, and an auxiliary electric component box (9N) which is attached to the main electric component box (9M), and which houses only electric components such as a reactor with an extremely great heating value, and a double structure member (30) having an air layer inside is provided at a portion of the auxiliary electric component box (9N) to which the main electric component box (9M) is attached.

3. The outdoor unit of an air conditioning machine according to claim 2, **characterized in that** the air layer of the double structure member (30) is communicated with the vent hole (13) formed in the side plate of the electric component box.

Patentansprüche

1. Außeneinheit eines Klimageräts, in welchem der Innenraum eines Gehäuses (1) über eine horizontale Trennplatte (2) nach oben und unten unterteilt ist, und wobei der obere Abschnitt als Wärmetauschkammer (3) ausgebildet ist, in welcher Wärmetauscher (5) und ein Luftgebläse (6) angeordnet sind, während der untere Abschnitt als Gerätekammer (4) ausgebildet ist, in welcher ein Kompressor und dergleichen angeordnet sind, wobei die Gerätekammer (4) mit einer elektrischen Komponentenschachtel (9) versehen ist, welche elektrische Komponenten (C) oder dergleichen aufnimmt, wobei die Außeneinheit ferner umfasst:

eine Wärmesenke (10) zum Kühlen elektrischer Komponenten mit einem großen Heizwert, wobei die Wärmesenke (10) aus einer Seitenplatte (9a) vorsteht, welche die elektrische Komponentenschachtel (9) konfiguriert;
eine Kühlleitung (12), welche entlang der Seitenplatte (9a) der elektrischen Komponentenschachtel (9) bereitgestellt ist, aus welcher die Wärmesenke vorsteht, wobei die Kühlleitung (12) die Wärmesenke (10) abdeckt und Öffnungen (12a, 12b) umfasst, welche in der horizontalen Trennplatte (2) und in einer Basisplatte (1a) des Gehäuses (1) gebildet sind, und die Kühlleitung (12) Außenluft aus der Öffnung an der Basisplatte (1a) des Gehäuses (1) einher mit einem Betrieb des Luftgebläses (6) einführt, um Wärme zwischen der Außenluft und der Wärmesenke (10) auszutauschen, und dann die Luft aus der Öffnung der horizontalen Trennplatte (2) zur Wärmeaustauschkammer zu führen, wobei zwei Kompressoren (8a, 8b) in der Gerätekammer angeordnet sind, wobei die elektrischen Komponenten mit einem großen Heizwert zwei Invertervorrichtungen (C2a, C2b) sind, welche die zwei Kompressoren (8a, 8b) unabhängig antreiben, und die zwei Invertervorrichtungen (C2a, C2b) in einer horizontalen Richtung angeordnet sind,
ein Lüftungsloch (13), welches in der Seitenplatte (9a) der elektrischen Komponentenschachtel (9) gebildet ist, wobei das Lüftungsloch (13) Luft in die elektrische Komponentenschachtel (9)

führt und die Luft leitet, sodass diese in die Kühlleitung (12) ausgelassen wird;
eine Trennplatte (20), welche die Seitenplatte (9a) der elektrischen Komponentenschachtel (9), in welche das Lüftungsloch (13) gebildet ist, und das Innere der elektrischen Komponentenschachtel (9) unterteilt; und
Leitlöcher (21), welche in der Trennplatte (20) gebildet sind, wobei die Leitlöcher (21) eine Kommunikation zwischen dem Inneren der elektrischen Komponentenschachtel (9) und dem Lüftungsloch (13) ermöglichen.

2. Außeneinheit eines Klimageräts nach Anspruch 1, **dadurch gekennzeichnet, dass** die elektrische Komponentenschachtel durch eine primäre elektrische Komponentenschachtel (9M), welche elektrische Komponenten aufnimmt, wie zum Beispiel eine Inverterschaltung, und eine sekundäre elektrische Komponentenschachtel (9N) konfiguriert ist, welche an der primären elektrischen Komponentenschachtel (9M) befestigt ist, und welche nur elektrische Komponenten aufnimmt, wie ein Reaktor mit einem extrem hohen Heizwert, und wobei ein Doppelstrukturelement (30), welches eine innere Luftschicht aufweist, an einem Abschnitt der sekundären elektrischen Komponentenschachtel (9N) bereitgestellt ist, an welchem die primäre elektrische Komponentenschachtel (9M) befestigt ist.

3. Außeneinheit eines Klimageräts nach Anspruch 2, **dadurch gekennzeichnet, dass** die Luftschicht des Doppelstrukturelements (30) mit dem Lüftungsloch (13) in Kommunikation gebracht wird, welches in der Seitenplatte der elektrischen Komponentenschachtel gebildet ist.

Revendications

1. Unité extérieure d'une machine de climatisation dans laquelle l'intérieur d'un carter (1) est partitionné selon un dessus et un dessous via une plaque de partition horizontale (2), et la partie supérieure est constituée de manière à être une chambre d'échange thermique (3) dans laquelle des échangeurs thermiques (5) et un souffleur d'air (6) sont agencés tandis que la partie inférieure est constituée de manière à être une chambre de machine (4) dans laquelle un compresseur et similaire sont agencés, la chambre de machine (4) étant munie d'un boîtier de composants électriques (9) qui loge des composants électriques (C) ou similaire, l'unité extérieure comprenant en outre :

un dissipateur thermique (10) pour refroidir des composants électriques présentant un grand pouvoir calorifique, le dissipateur thermique (10) faisant saillie depuis une plaque latérale (9a) qui configure le boîtier de composants électriques (9) ;
un conduit de refroidissement (12) qui est prévu le long de la plaque latérale (9a) du boîtier de composants électriques (9) depuis laquelle le dissipateur thermique fait saillie, le conduit de refroidissement (12) recouvrant le dissipateur thermique (10) et comprenant des ouvertures (12a, 12b) qui sont formées dans la plaque de partition horizontale (2) et dans une plaque de base (1a) du carter (1), et le conduit de refroidissement (12) introduisant de l'air extérieur en provenance de l'ouverture au niveau de la plaque de base (1a) du carter (1) en accompagnement d'un fonctionnement du souffleur d'air (6) de manière à échanger de la chaleur entre l'air extérieur et le dissipateur thermique (10), et guidant ensuite l'air hors de l'ouverture de la plaque de partition horizontale (2) jusqu'à la chambre d'échange thermique dans laquelle deux compresseurs (8a, 8b) sont agencés dans la chambre de machine, les composants électriques présentant un grand pouvoir calorifique sont deux dispositifs d'inverseur (C2a, C2b) qui commandent de manière séparée les deux compresseurs (8a, 8b), et les deux dispositifs d'inverseur (C2a, C2b) sont agencés dans une direction horizontale ;
un trou d'évent (13) qui est formé dans la plaque latérale (9a) du boîtier de composants électriques (9), le trou d'évent (13) acheminant l'air dans le boîtier de composants électriques (9) et guidant l'air de manière à ce qu'il soit déchargé à l'intérieur du conduit de refroidissement (12) ;
une plaque de partition (20) qui partitionne la plaque latérale (9a) du boîtier de composants électriques (9), dans laquelle le trou d'évent (13) est formé, et l'intérieur du boîtier de composants électriques (9) ; et
des trous de guidage (21) qui sont formées dans la plaque de partition (20), les trous de guidage (21) permettant la mise en communication de l'intérieur du boîtier de composants électriques (9) et du trou d'évent (13) l'un avec l'autre.

2. Unité extérieure d'une machine de climatisation selon la revendication 1, **caractérisée en ce que** le boîtier de composants électriques est configuré au moyen d'un boîtier de composants électriques principal (9M), qui loge des composants électriques tels qu'un circuit d'inverseur, et au moyen d'un boîtier de composants électriques auxiliaire (9N), qui est fixé au boîtier de composants électriques principal (9M) et qui loge seulement des composants électriques tels qu'un réacteur qui présentent un très grand pouvoir calorifique, et un élément à structure double (30) qui comporte une couche d'air à l'intérieur étant pré-

vu au niveau d'une partie du boîtier de composants électriques auxiliaire (9N) à laquelle le boîtier de composants électriques principal (9M) est fixé.

3. Unité extérieure d'une machine de climatisation selon la revendication 2, **caractérisée en ce que** la couche d'air de l'élément à structure double (30) est mise en communication avec le trou d'évent (13) qui est formé dans la plaque latérale du boîtier de composants électriques.

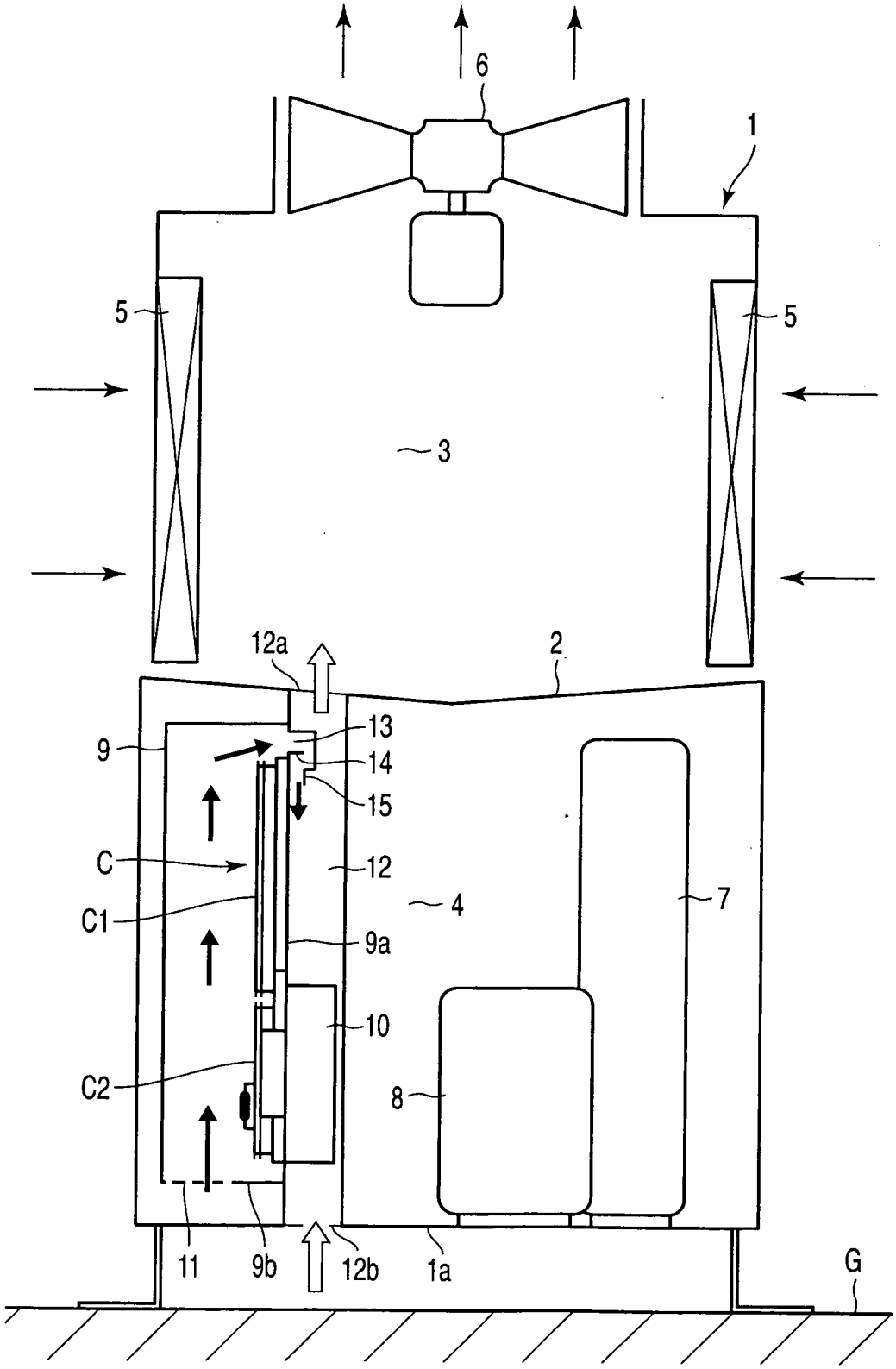

FIG. 1

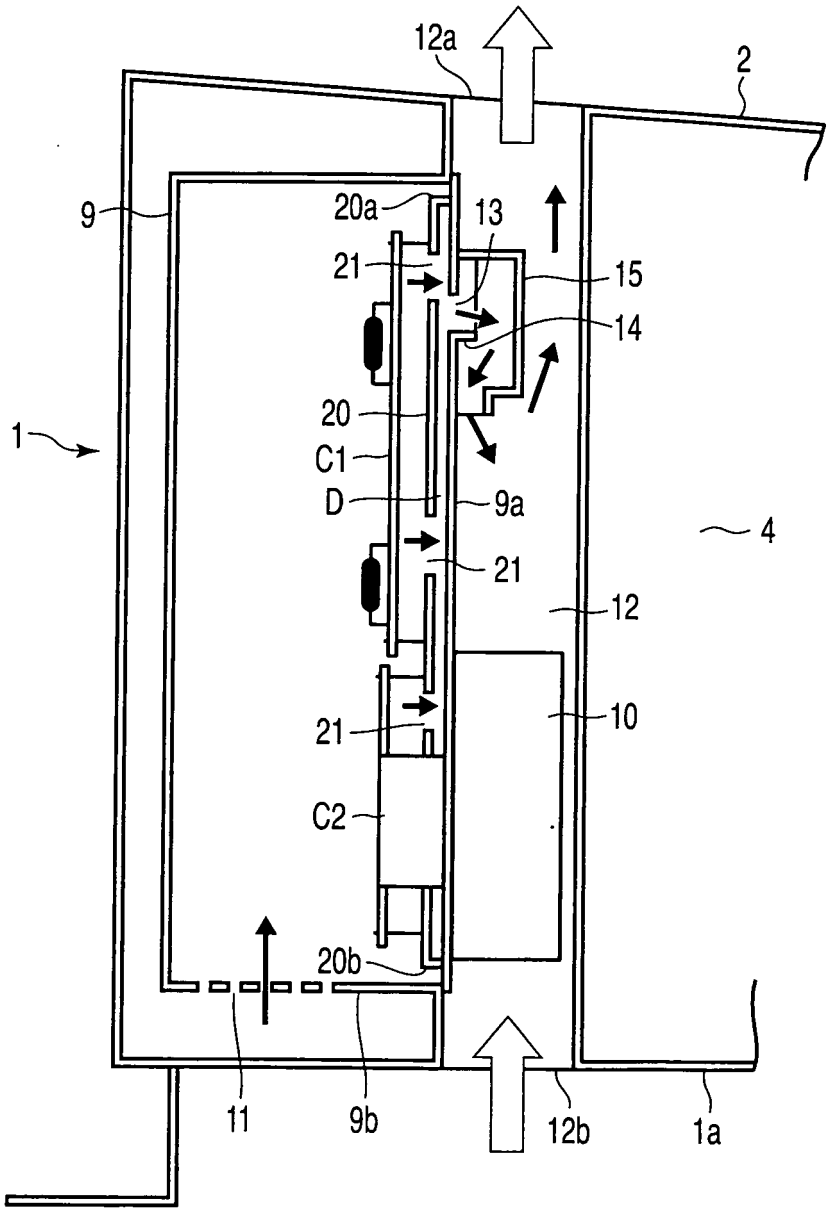

FIG. 2

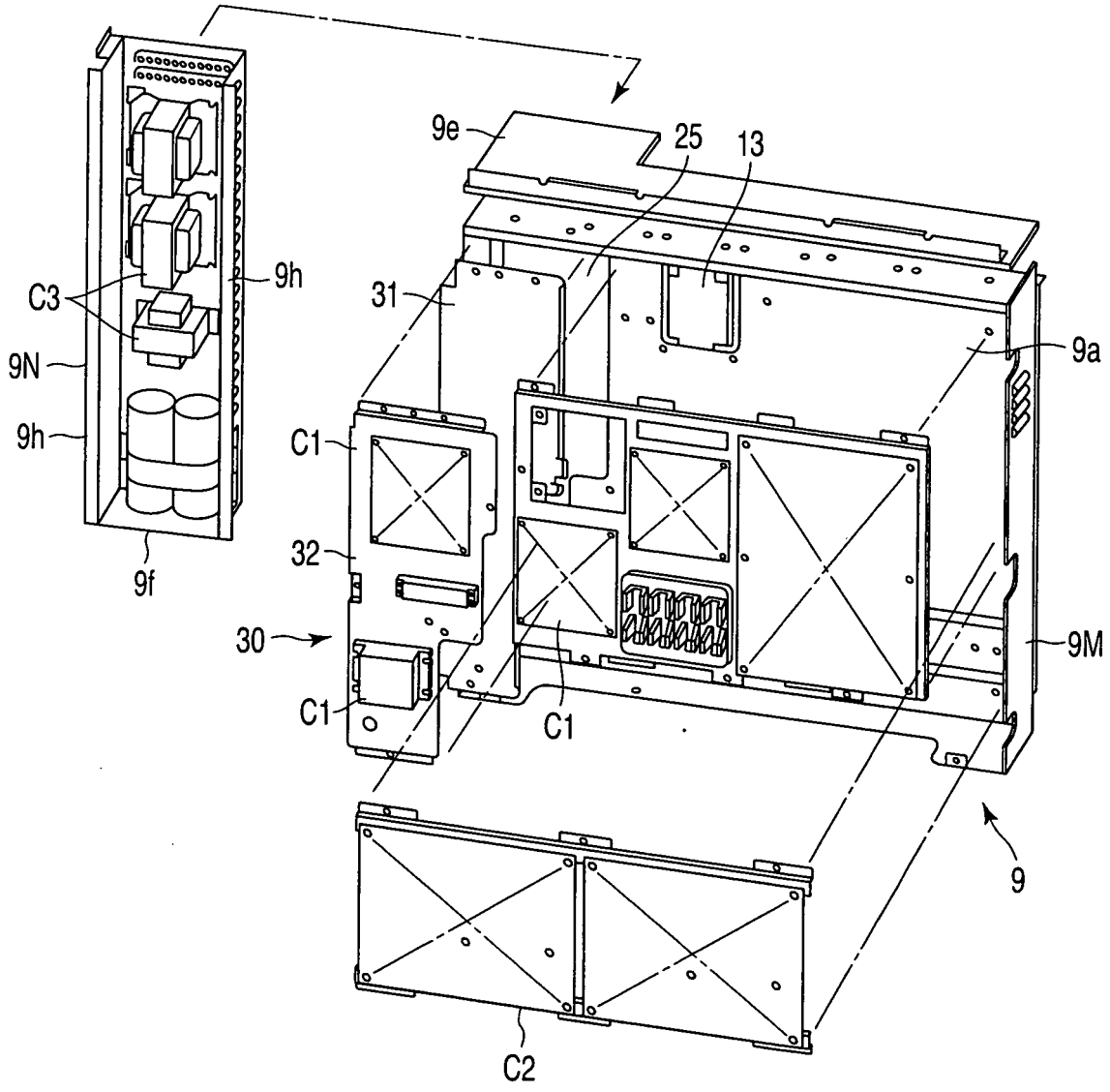

FIG. 3

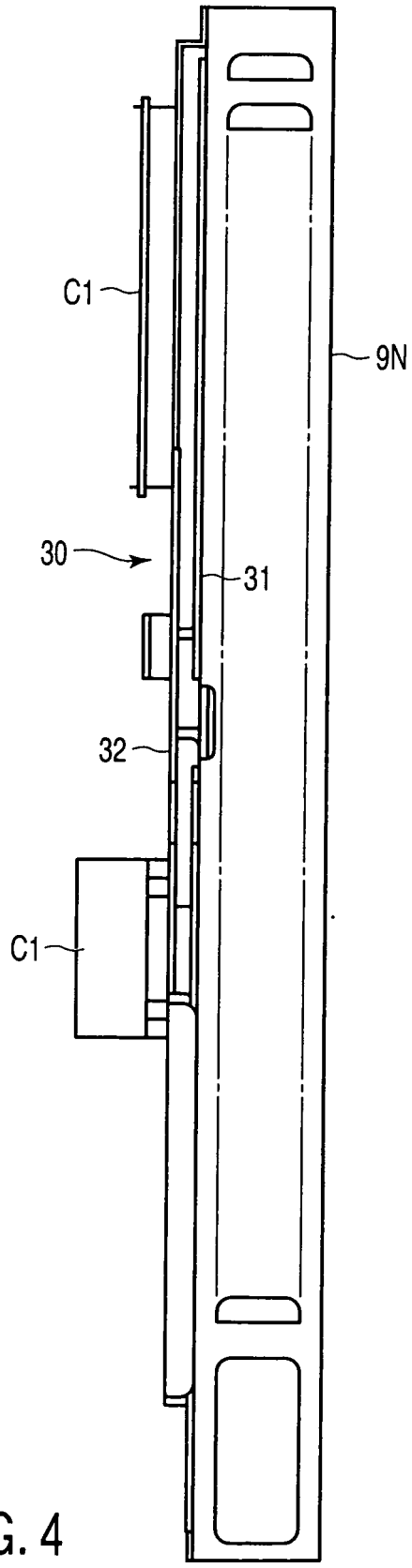

FIG. 4

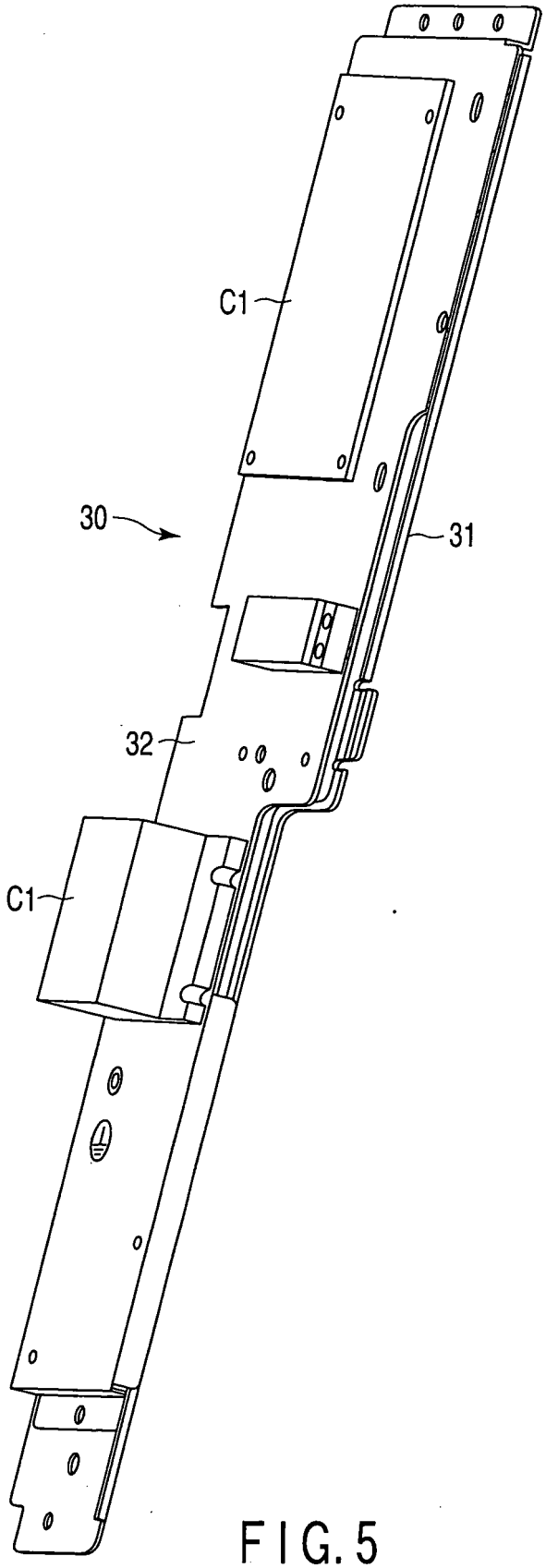

FIG. 5

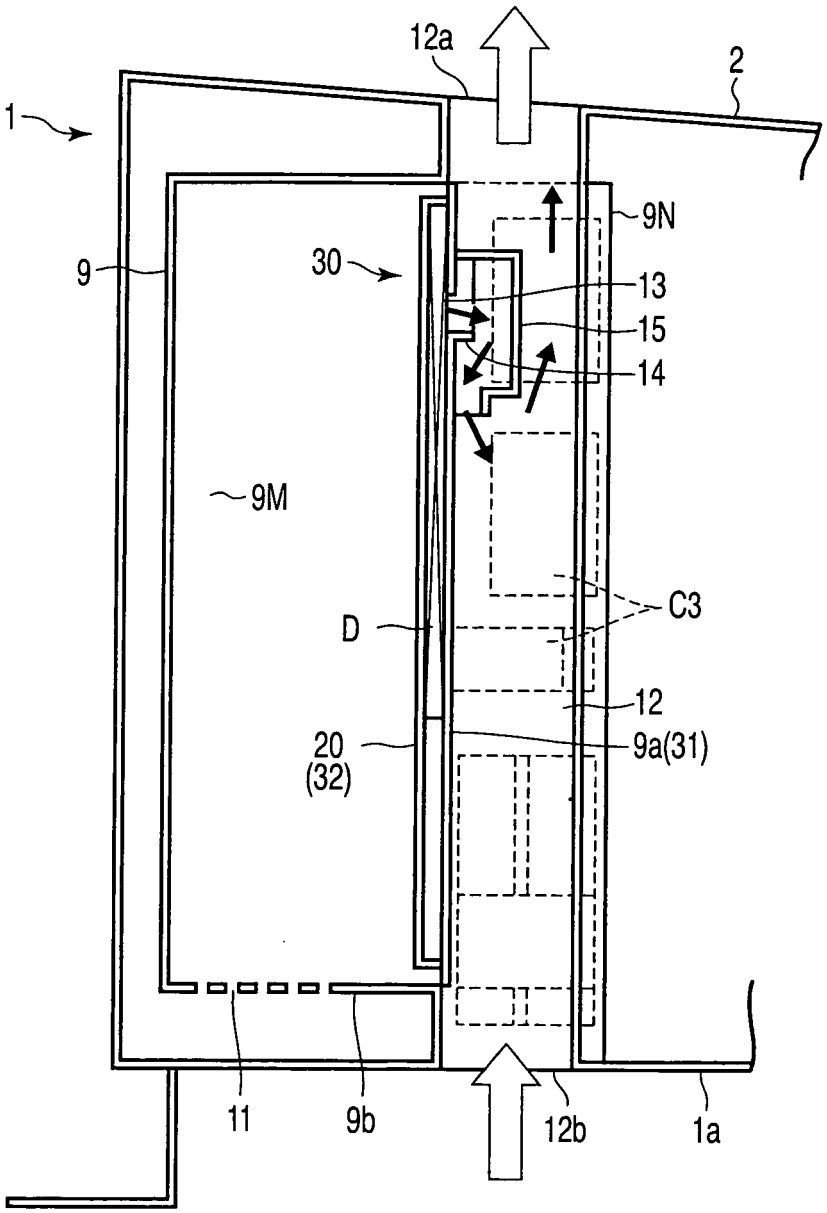

FIG. 6

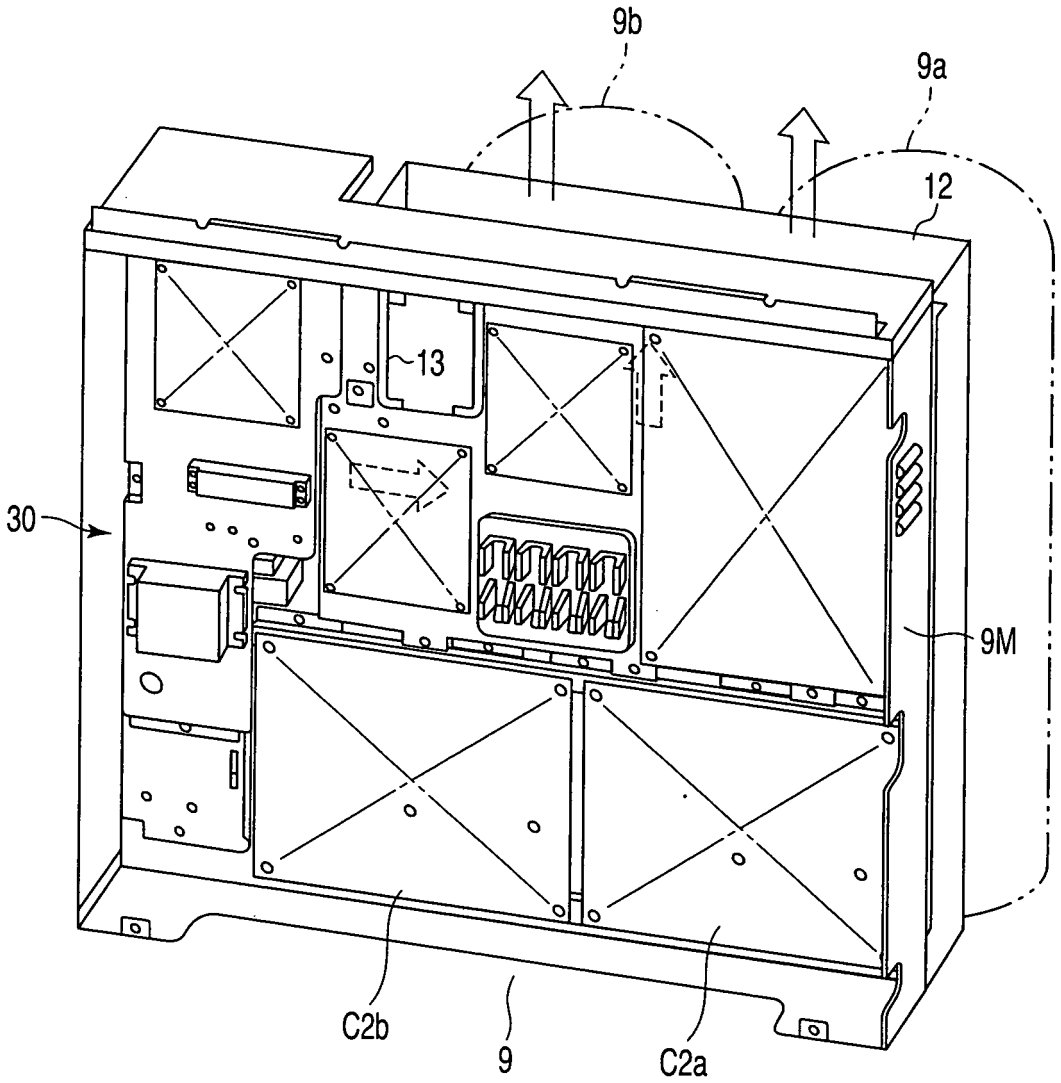

FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2001201108 A **[0002]**
- WO 0151859 A **[0004]**
- JP 2002275372 B **[0005]**