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(54) **OUTDOOR UNIT**

AUSSENEINHEIT

UNITÉ EXTÉRIEURE

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Description

Patent Publication No. 2003-294271

[Technical Field]

[Summary of Invention]

[0001] The present invention relates to an outdoor unit of an air conditioner.

5 [Technical Problem]

[Background Art]

[0002] In an outdoor unit of an air conditioner, a compressor and a heat exchanger are provided, and a control board for controlling members such as the compressor and a motor-operated valve is further provided. The outdoor unit is provided with a terminal block with which a power source line from an indoor unit is connected. The terminal block is attached to a terminal block attaching plate which is provided at around a side face of the outdoor unit. In a known outdoor unit, a control board is typically disposed in a horizontal manner.

10 **[0006]** Beside the heat exchanger of the outdoor unit, the control board may be provided along the vertical direction and the terminal block attaching plate may be provided to be in parallel to the control board. To improve the heat exchange efficiency in this outdoor unit, the heat exchanger may be increased in size. In connection with this, a space for the control board provided beside the heat exchanger may be reduced in size, with the result that the control board may be provided to be slanted to the terminal block attaching plate. In such a case, because the distance between the control board and the terminal block attaching plate is short on the back face side inside the outdoor unit, it is difficult to connect a harness with the control board from the front face side of the outdoor unit.

[0003] Further, WO 2008/149719 A1 discloses the features of the preamble of claim 1, showing an electrical equipment unit for an outdoor unit, which comprises a first substrate so arranged in a machine room as to confront a partition, and a second substrate arranged to confront the front face of a casing, so as to facilitate the layouts of outdoor coolant circuit constituting parts arranged in the machine room and the electrical equipments on the substrates. The electrical equipment unit comprises the first and second substrates mounting electrical equipments, a unit body and a reactor. The unit body includes a first substrate mounting unit mounting the first substrate and so arranged in the machine room as to confront a partition, and a second substrate mounting unit mounting the second substrate and arranged to confront the front face of a unit casing. The reactor is arranged in a space of a generally triangular pole shape formed between the first substrate mounting unit and the second substrate mounting unit, and is attached to the unit body.

15 **[0007]** An object of the present invention is therefore to provide an outdoor unit in which a harness is easily connected with a control board during assembly.

[Solution to Problem]

[0004] JP 2008 106948 discloses a rib as a drip-proof wall integrally formed on an upside part of the terminal board and portions of hanging parts positioned on both sides thereof. This rib is shaped substantially like a half-ring, and shaped like a projection projected on the outside surfaces of the hanging parts. Thus, the rib projected outward to cover the terminal board is provided on the upside of the terminal board, whereby when dew drips of dew condensation caused on the upside of the hanging parts flow down, the drips flow downward along the upside of the ribs so that the drips do not adhere to the terminal board. Therefore, the terminal board can eliminate operational failure due to the drips of dew condensation.

20 **[0008]** An outdoor unit according to the present invention is defined by claim 1. Dependent claims relate to preferred embodiments.

25 **[0009]** According to the first aspect of the invention, an outdoor unit includes: a casing which houses a compressor and a heat exchanger; a terminal block attaching plate which is provided in the vicinity of a side face of the casing and includes a terminal block to which a power source line from an indoor unit is connectable; and a control board which is provided in the casing, opposes the terminal block attaching plate, and is provided to be slanted to the terminal block attaching plate. The control board is slanted so that the distance between the control board and the terminal block attaching plate decreases toward a back face side, the terminal block attaching plate being rotatable away from the control board.

30 **[0010]** In this outdoor unit, during assembly, when the connection of a harness with the control board is carried out from the front face side of the outdoor unit, the terminal block attaching plate is rotated away from the control board, with the result that the distance between the control board and the terminal block attaching plate increases or the terminal block attaching plate becomes no longer opposing the control board. It is therefore easy to connect a harness to the control board during assembly.

35 **[0011]** According to the second aspect, the outdoor unit of the first aspect is arranged such that the terminal block attaching plate is rotatable to a position where the terminal block attaching plate does not oppose the control board.

[Citation List]

[Patent Literatures]

[0005] [Patent Literature 1] Japanese Unexamined

[0012] In this outdoor unit, during assembly, when the connection of a harness with the control board is carried out from the front face side of the outdoor unit, the terminal block attaching plate is rotated to a position where the terminal block attaching plate does not oppose the control board, and hence the connection of a harness to the control board during assembly is efficiently done.

[0013] According to the third aspect, the outdoor unit of the first or second aspect is arranged such that the terminal block attaching plate is rotatable about a rotational axis which is in the vicinity of an upper end portion of the terminal block attaching plate, and a lower end portion of the terminal block attaching plate moves away from the control board as the terminal block attaching plate rotates.

[0014] In this outdoor unit, a space in which members such as a pipe are not provided must be provided on the locus of rotation of the terminal block attaching plate to allow the terminal block attaching plate to rotate away from the control board. For example, when the front end portion of the terminal block attaching plate is moved away from the control board as the terminal block attaching plate is rotated about a rotational axis which is in the vicinity of the end portion on the back face side of the terminal block attaching plate and extends along a substantially vertical direction, the terminal block attaching plate may not be rotated extensively on account of the existence of a pipe or the like on the locus of rotation of the terminal block attaching plate. According to the present invention, because the lower end portion of the terminal block attaching plate is moved away from the control board as the terminal block attaching plate is rotated about the rotational axis which is in the vicinity of the upper end portion of the terminal block attaching plate and extends along a substantially horizontal direction, the terminal block attaching plate is extensively rotatable.

[0015] According to the fourth aspect of the invention, the outdoor unit of any one of the first to third aspects is arranged such that a high current part of the control board is provided on a front face side of the outdoor unit and a low current part of the control board is provided on the back face side of the outdoor unit.

[0016] In this outdoor unit, the high current part of the control board is provided on the front face side of the outdoor unit, the low current part of the control board is provided on the back face side of the outdoor unit, and during assembly, connection of a harness with the control board from the front face side of the outdoor unit is often performed for the low current part of the control board. On this account, the present invention is particularly effective when a harness is connected with the low current part of the control board, which is provided at a narrow part between the control board and the terminal block attaching plate on the back face side inside the outdoor unit.

[Advantageous Effects of Invention]

[0017] As described hereinabove, the present invention brings about the following effects.

5 **[0018]** According to the first aspect of the invention, during assembly, when the connection of a harness with the control board is carried out from the front face side of the outdoor unit, the terminal block attaching plate is rotated away from the control board, with the result that the distance between the control board and the terminal block attaching plate becomes long or the terminal block attaching plate becomes no longer opposing the control board. It is therefore easy to connect a harness to the control board during assembly.

10 **[0019]** According to the second aspect of the invention, during assembly, when the connection of a harness with the control board is carried out from the front face side of the outdoor unit, the terminal block attaching plate is rotated to a position where the terminal block attaching plate does not oppose the control board, and hence the connection of a harness to the control board during assembly is efficiently done.

15 **[0020]** According to the third aspect of the invention, a space in which members such as a pipe are not provided must be provided on the locus of rotation of the terminal block attaching plate to allow the terminal block attaching plate to rotate away from the control board. For example, when the front end portion of the terminal block attaching plate is rotated away from the control board about a rotational axis which is in the vicinity of the end portion on the back face side of the terminal block attaching plate and extends along a substantially vertical direction, the terminal block attaching plate may not be rotated extensively on account of the existence of a pipe or the like on the locus of rotation of the terminal block attaching plate. According to the present invention, because the lower end portion of the terminal block attaching plate is moved away from the control board as the terminal block attaching plate is rotated about the rotational axis which is in the vicinity of the upper end portion of the terminal block attaching plate and extends along a substantially horizontal direction, the terminal block attaching plate is extensively rotatable.

20 **[0021]** According to the fourth aspect of the invention, the high current part of the control board is provided on the front face side of the outdoor unit, the low current part of the control board is provided on the back face side of the outdoor unit, and during assembly, connection of a harness with the control board from the front face side of the outdoor unit is often performed for the low current part of the control board. On this account, the present invention is particularly effective when a harness is connected with the low current part of the control board, which is provided at a narrow part between the control board and the terminal block attaching plate on the back face side inside the outdoor unit.

[Brief Description of Drawings]

[0022]

[FIG. 1] FIG. 1 is a circuit diagram showing a refrigerant circuit of an air conditioner of an embodiment of the present invention.

[FIG. 2] FIG. 2 (a) schematically shows a casing when an outdoor unit is viewed from above. FIG. 2(b) schematically shows the casing when the outdoor unit is viewed from the front.

[FIG. 3] FIG. 3 is a plan view of a control board.

[FIG. 4] FIG. 4 shows a state before the rotation of a terminal block attaching plate.

[FIG. 5] FIG. 5 shows a state after the rotation of the terminal block attaching plate.

[Description of Embodiments]

[0023] The following will describe an outdoor unit of an air conditioner of an embodiment of the present invention with reference to figures.

<Overall Structure of Air Conditioner>

[0024] As shown in FIG. 1, the air conditioner of the present embodiment is a multi-type air conditioner in which one outdoor unit 1 and six indoor units 2 are connected in a parallel manner by refrigerant pipes. The one outdoor unit 1 and the six indoor units 2 are connected by communication pipes 3, respectively. As the refrigerant, R32 refrigerant is used.

[0025] As shown in FIG. 1, the outdoor unit 1 includes a compressor 11, a four-pass switching valve 12 connected with the discharging side of the compressor 11, an accumulator 13 connected with the sucking side of the compressor 11, an outdoor heat exchanger 14 connected with the four-pass switching valve 12, a motor-operated valve 15 connected with the outdoor heat exchanger 14, and an outdoor fan 16. Each of the six indoor units 2 houses an indoor heat exchanger 2a and an unillustrated indoor fan.

[0026] This air conditioner is able to perform a cooling operation, a warming operation, a dehumidification operation, etc. In the cooling operation and the dehumidification operation, as indicated by solid arrows in the figure, refrigerant discharged from the compressor 11 flows from the four-pass switching valve 12 to the outdoor heat exchanger 14, the motor-operated valve 15, and the indoor heat exchanger 2a in order, and the refrigerant having passed the indoor heat exchanger 2a returns to the compressor 11 via the four-pass switching valve 12. A cooling cycle or a dehumidification cycle is formed in this way. In other words, the outdoor heat exchanger 14 functions as a condenser whereas the indoor heat exchanger 2a functions as an evaporator. In the warming operation, as indicated by dashed arrows in the figure, refrigerant discharged from the compressor 11 flows from the four-

pass switching valve 12 to the indoor heat exchanger 2a, the motor-operated valve 15, and the outdoor heat exchanger 14 in order as the four-pass switching valve 12 is switched, and the refrigerant having passed the outdoor heat exchanger 14 returns to the compressor 11 via the four-pass switching valve 12. A warming cycle is formed in this way. In other words, the indoor heat exchanger 2a functions as a condenser whereas the outdoor heat exchanger 14 functions as an evaporator.

<Details of Structure of Outdoor Unit>

[0027] As shown in FIG. 2, the outdoor unit 1 includes members such as a casing 4 which is substantially rectangular parallelepiped in shape. In the casing 4 are formed: a heat exchanging chamber 5 in which the outdoor heat exchanger 14, the outdoor fan 16, and the like are provided; an equipment chamber 6 in which the compressor 11, the accumulator 13, and the like are provided; and an electric equipment chamber 7 in which a control board 17 with electronic components and the like are provided.

[0028] As shown in FIG. 2, FIG. 4, and FIG. 5, in the electric equipment chamber 7, in addition to the control board 17, a supporting plate 18 to which the control board 17 is fixed is provided and a terminal block attaching plate 19 is provided in the vicinity of a side face of the casing 4. An upper end portion of the control board 17 is, as shown in FIG. 4 and FIG. 5, fixed to one end portion of the supporting plate 18. To the other end portion of the supporting plate 18, the terminal block attaching plate 19 is attached to be rotatable about a rotational axis in the vicinity of its upper end portion. The terminal block attaching plate 19 includes a terminal block 19a to which a power source line from the indoor unit 2 is connected. The control board 17 is provided along a substantially vertical direction in the casing 4 to oppose the terminal block attaching plate 19, and is slanted so that the distance between the control board 17 and the terminal block attaching plate 19 decreases toward the back face side as shown in FIG. 2(a).

[0029] As shown in FIG. 3, the control board 17 includes a high current part 17a and a low current part 17b. The high current part 17a is a part with which a harness for connection with the compressor 11 or the like is connected, whereas the low current part 17b is a part with which a harness for connection with the motor-operated valve 15, a thermistor provided in the casing 4, and the like, is connected. In the vicinity of the upper end portion of the control board 17, the high current part 17a is provided on the front face side of the outdoor unit 1 and the low current part 17b is provided on the back face side of the outdoor unit 1. On the reverse surface of the control board 17, a radiation fin 17c is provided to oppose the outdoor fan 16. The radiation fin 17c is provided to cover the substantially entire reverse face of the control board 17. The heat radiation capability is high on the front face side of the outdoor unit 1 close to the outdoor fan 16, on

account of high air flow velocity. The high current part 17a is therefore located on the front face side of the outdoor unit 1 as compared to the low current part 17b.

[0030] As shown in FIG. 4, before the rotation of the terminal block attaching plate, the terminal block attaching plate 19 is disposed to be substantially in parallel to the side face of the casing 4. At this stage, the terminal block attaching plate 19 is capable of rotating away from the control board 17 at a rotation supporting portion 18a at the other end portion of the supporting plate 18.

[0031] In the outdoor unit 1 of the present embodiment, during assembly, when the connection of a harness with the control board 17 is carried out from the front face side of the outdoor unit 1, the lower end portion of terminal block attaching plate 19 is moved to an upper position where the terminal block attaching plate 19 does not oppose the control board 17 as the terminal board attaching plate 19 is rotated about the rotation supporting portion 18a, as shown in FIG. 5. In the present embodiment, after the rotation of the terminal block attaching plate 19, the terminal block attaching plate 19 self-stands on the other end portion of the supporting plate 18. On this account, after the rotation of the terminal block attaching plate 19, it is unnecessary to hold and retain the terminal block attaching plate 19 to prevent the terminal block attaching plate 19 from moving away from the position of not opposing the control board 17.

<Characteristics of Outdoor Unit of Present Embodiment>

[0032] In the outdoor unit 1 of the present embodiment, during assembly, when the connection of a harness with the control board 17 is carried out from the front face side of the outdoor unit 1, the terminal block attaching plate 19 is rotated away from the control board 17, with the result that the terminal block attaching plate 19 becomes no longer opposing the control board 17. It is therefore easy to connect a harness to the control board 17 during assembly.

[0033] In the outdoor unit 1 of the present embodiment, during assembly, when the connection of a harness with the control board 17 is carried out from the front face side of the outdoor unit 1, the terminal block attaching plate 19 is rotated to a position where the terminal block attaching plate 19 does not oppose the control board 17, and hence the connection of a harness to the control board 17 during assembly is efficiently done.

[0034] In the outdoor unit 1 of the present embodiment, a space in which members such as a pipe are not provided must be provided on the locus of rotation of the terminal block attaching plate 19 to allow the terminal block attaching plate 19 to rotate away from the control board 17. For example, when the front end portion of the terminal block attaching plate 19 is moved away from the control board 17 as the terminal block attaching plate 19 is rotated about a rotational axis which is in the vicinity of the end portion on the back face side of the terminal

block attaching plate 19 and extends along a substantially vertical direction, the terminal block attaching plate 19 may not be rotated extensively on account of the existence of a pipe or the like on the locus of rotation of the terminal block attaching plate 19. According to the present invention, because the lower end portion of the terminal block attaching plate 19 is moved away from the control board 17 as the terminal block attaching plate 19 is rotated about the rotational axis which is in the vicinity of the upper end portion of the terminal block attaching plate 19 and extends along a substantially horizontal direction, the terminal block attaching plate 19 is extensively rotatable.

[0035] In the outdoor unit 1 of the present embodiment, the high current part 17a of the control board 17 is provided on the front face side of the outdoor unit 1, the low current part 17b of the control board 17 is provided on the back face side of the outdoor unit 1, and during assembly, connection of a harness with the control board 17 from the front face side of the outdoor unit 1 is often performed for the low current part 17b of the control board 17. On this account, the present invention is particularly effective when a harness is connected with the low current part 17b of the control board 17, which is provided at a narrow part between the control board 17 and the terminal block attaching plate 19 on the back face side inside the outdoor unit 1.

[0036] Thus, the embodiment of the present invention is described hereinabove. However, the specific structure of the present invention shall not be interpreted as to be limited to the above described embodiments. The scope of the present invention is defined not by the above embodiment but by claims set forth below, and shall encompass the equivalents in the meaning of the claims and every modification within the scope of the claims.

[0037] For example, while in the embodiment above the lower end portion of the terminal block attaching plate is moved away from the control board as the terminal block attaching plate is rotated about the rotational axis provided in the vicinity of the upper end portion of the terminal block attaching plate and extending in a substantially horizontal direction, the rotational direction may be changed as long as the terminal block attaching plate is rotated away from the control board. On this account, for example, the front end portion of the terminal block attaching plate may be moved away from the control board as the terminal block attaching plate is rotated about a rotational axis provided in the vicinity of the end portion on the back face side of the terminal block attaching plate and extending in a substantially vertical direction.

[0038] In addition to the above, while in the embodiment above the terminal block attaching plate is rotated to a position where the terminal block attaching plate does not oppose the control board, the terminal block attaching plate may not be rotated to a position where the terminal block attaching plate does not oppose the control board, on condition that the terminal block attach-

ing plate is rotated away from the control board. Also in this case, because the distance between the terminal block attaching plate and the control board becomes long after the rotation of the terminal block attaching plate away from the control board, it becomes easy to connect a harness with the control board during assembly.

[0039] In addition to the above, while in the embodiment above the high current part is provided on the front face side of the control board whereas the low current part is provided on the back face side of the control board, the high current part and the low current part may be differently disposed.

[0040] In addition to the above, while in the embodiment above R32 refrigerant is used as the refrigerant in the multi-type air conditioner, only one indoor unit may be connected with the outdoor unit and the refrigerant may be of another type. For example, in the outdoor unit, R410A refrigerant may be used as the refrigerant.

[Industrial Applicability]

[0041] The present invention makes it easy to connect a harness to the control board during assembly.

[Reference Signs List]

[0042]

- 1 outdoor unit
- 2 indoor unit
- 4 casing
- 11 compressor
- 14 heat exchanger
- 17 control board
- 19 terminal block
- 19a terminal block attaching plate

Claims

1. An outdoor unit comprising:

a casing (4) which houses a compressor (11) and a heat exchanger (14);
 a terminal block attaching plate (19) which is provided in the vicinity of a side face of the casing (4) and includes a terminal block (19a) to which a power source line from an indoor unit (2) is connectable; and
 a control board (17) which is provided in the casing (4), opposes the terminal block attaching plate (19), wherein the control board (17) is provided to be slanted to the terminal block attaching plate (19)

characterized in that the control board (17) is slanted so that the distance between the control board (17) and the terminal block attaching plate (19) de-

creases toward a back face side inside the outdoor unit, the terminal block attaching plate (19) being rotatable away from the control board (17).

- 5 2. The outdoor unit according to claim 1, wherein, the terminal block attaching plate (19) is rotatable to a position where the terminal block attaching plate (19) does not oppose the control board (17).
- 10 3. The outdoor unit according to claim 1 or 2, wherein, the terminal block attaching plate (19) is rotatable about a rotational axis which is in the vicinity of an upper end portion of the terminal block attaching plate (19), and
- 15 a lower end portion of the terminal block attaching plate (19) moves away from the control board (17) as the terminal block attaching plate (19) rotates.
- 20 4. The outdoor unit according to any one of claims 1 to 3, wherein, a high current part of the control board (17) is provided on a front face side of the outdoor unit (1) and a low current part of the control board (17) is provided on the back face side of the outdoor unit (1).

25

Patentansprüche

1. Außeneinheit, umfassend:

30

ein Gehäuse (4), in welchem ein Kompressor (11) und ein Wärmetauscher (14) untergebracht sind;

35

eine Anschlussblockbefestigungsplatte (19), welche in der Nähe einer Seitenfläche des Gehäuses (4) vorgesehen ist und einen Anschlussblock (19a) beinhaltet, an welchen eine Spannungsversorgungsleitung von einer Innenraumeinheit (2) anschließbar ist; und
 eine Steuerplatine (17), welche in dem Gehäuse (4) vorgesehen ist, liegt der Anschlussblockbefestigungsplatte (19) gegenüber, wobei die Steuerplatine (17) so vorgesehen ist, dass sie zur Anschlussblockbefestigungsplatte (19) geneigt ist

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dadurch gekennzeichnet, dass die Steuerplatine (17) so geneigt ist, dass die Distanz zwischen der Steuerplatine (17) und der Anschlussblockbefestigungsplatte (19) sich zu einer Rückflächenseite innerhalb der Außeneinheit hin verringert,

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wobei die Anschlussblockbefestigungsplatte (19) von der Steuerplatine (17) weg drehbar ist.

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- 2. Außeneinheit nach Anspruch 1, wobei die Anschlussblockbefestigungsplatte (19) bis zu einer Position drehbar ist, in der die Anschlussblockbefestigungsplatte (19) der Steuerplatine (17) nicht gegen-

überliegt.

3. Außeneinheit nach Anspruch 1 oder 2, wobei die Anschlussblockbefestigungsplatte (19) rund um eine Drehachse drehbar ist, welche sich in der Nähe eines oberen Endabschnitts der Anschlussblockbefestigungsplatte (19) befindet, und ein unterer Endabschnitt der Anschlussblockbefestigungsplatte (19) sich von der Steuerplatine (17) wegbewegt, während sich die Anschlussblockbefestigungsplatte (19) dreht.
4. Außeneinheit nach einem der Ansprüche 1 bis 3, wobei ein Starkstromteil der Steuerplatine (17) auf einer Stirnflächenseite der Außeneinheit (1) vorgesehen ist und ein Schwachstromteil der Steuerplatine (17) auf der Rückflächenseite der Außeneinheit (1) vorgesehen ist.

tache de bloc de bornes (19) se déplace loin de la carte de commande (17) lorsque la plaque d'attache de bloc de bornes (19) tourne.

4. Unité extérieure selon l'une quelconque des revendications 1 à 3, dans laquelle une partie à courant élevé de la carte de commande (17) est prévue sur un côté de face avant de l'unité extérieure (1) et une partie à courant faible de la carte de commande (17) est prévue sur le côté de face arrière de l'unité extérieure (1).

20

Revendications

1. Unité extérieure comprenant :

un boîtier (4) qui loge un compresseur (11) et un échangeur de chaleur (14) ;
 une plaque d'attache de bloc de bornes (19) qui est prévue à proximité d'une face latérale du boîtier (4) et inclut un bloc de bornes (19a) auquel une ligne de source d'alimentation d'une unité intérieure (2) peut être raccordée ; et
 une carte de commande (17) qui est prévue dans le boîtier (4), s'oppose à la plaque d'attache de bloc de bornes (19), dans laquelle la carte de commande (17) est prévue de sorte à être inclinée vers la plaque d'attache de bloc de bornes (19),
caractérisée en ce que la carte de commande (17) est inclinée de sorte que la distance entre la carte de commande (17) et la plaque d'attache de bloc de bornes (19) diminue vers un côté de face arrière dans l'unité extérieure,
 la plaque d'attache de bloc de bornes (19) pouvant tourner de façon à s'éloigner de la carte de commande (17).

2. Unité extérieure selon la revendication 1, dans laquelle la plaque d'attache de bloc de bornes (19) peut tourner dans une position où la plaque d'attache de bloc de bornes (19) ne s'oppose pas à la carte de commande (17).
3. Unité extérieure selon la revendication 1 ou 2, dans laquelle la plaque d'attache de bloc de bornes (19) peut tourner autour d'un axe rotatif qui est à proximité d'une portion d'extrémité supérieure de la plaque d'attache de bloc de bornes (19), et une portion d'extrémité inférieure de la plaque d'at-

FIG.1

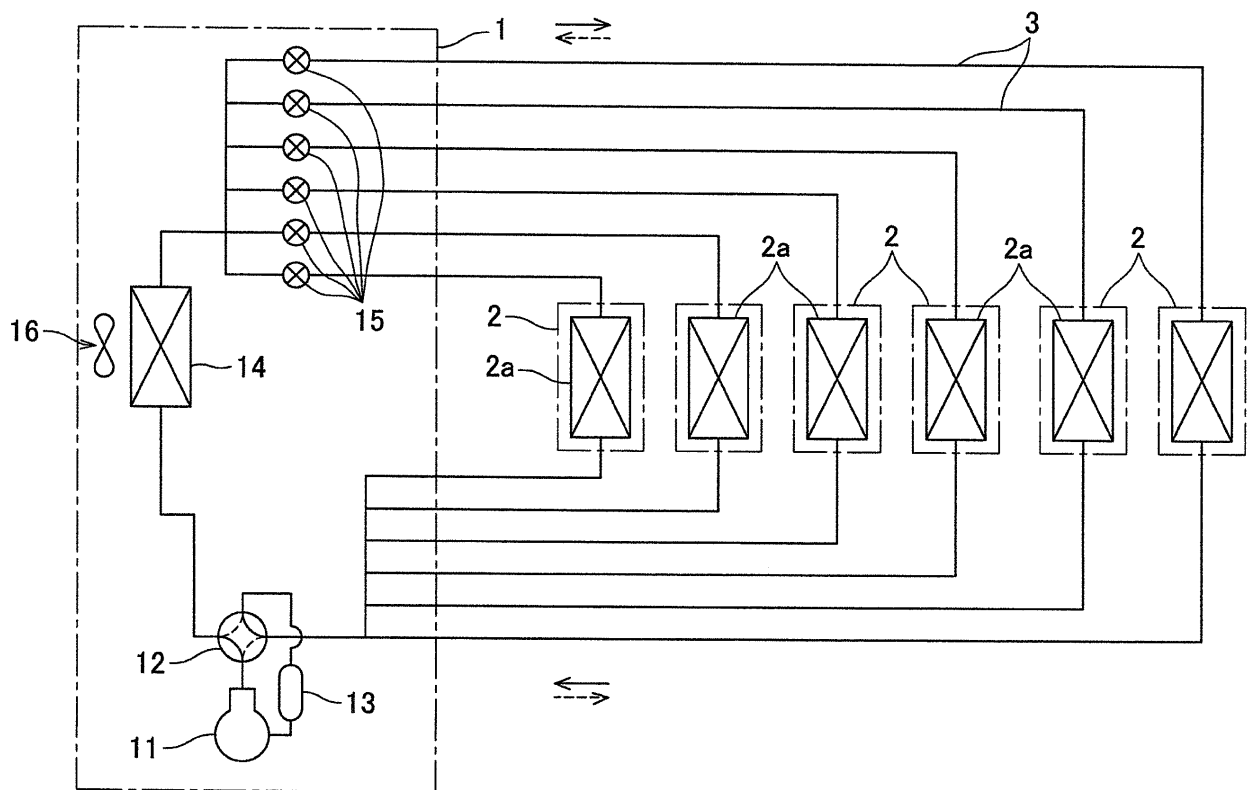


FIG.2

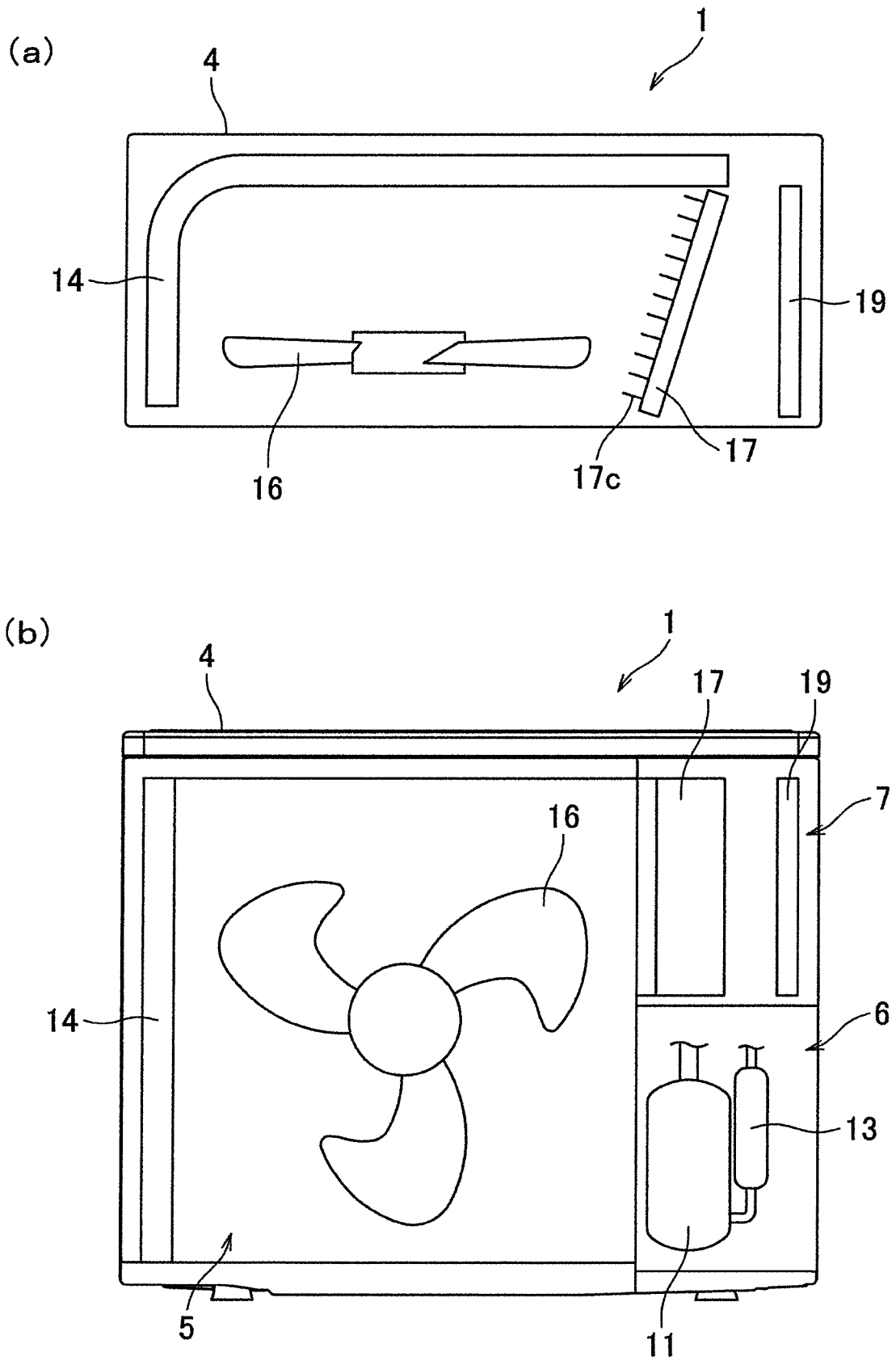


FIG.3

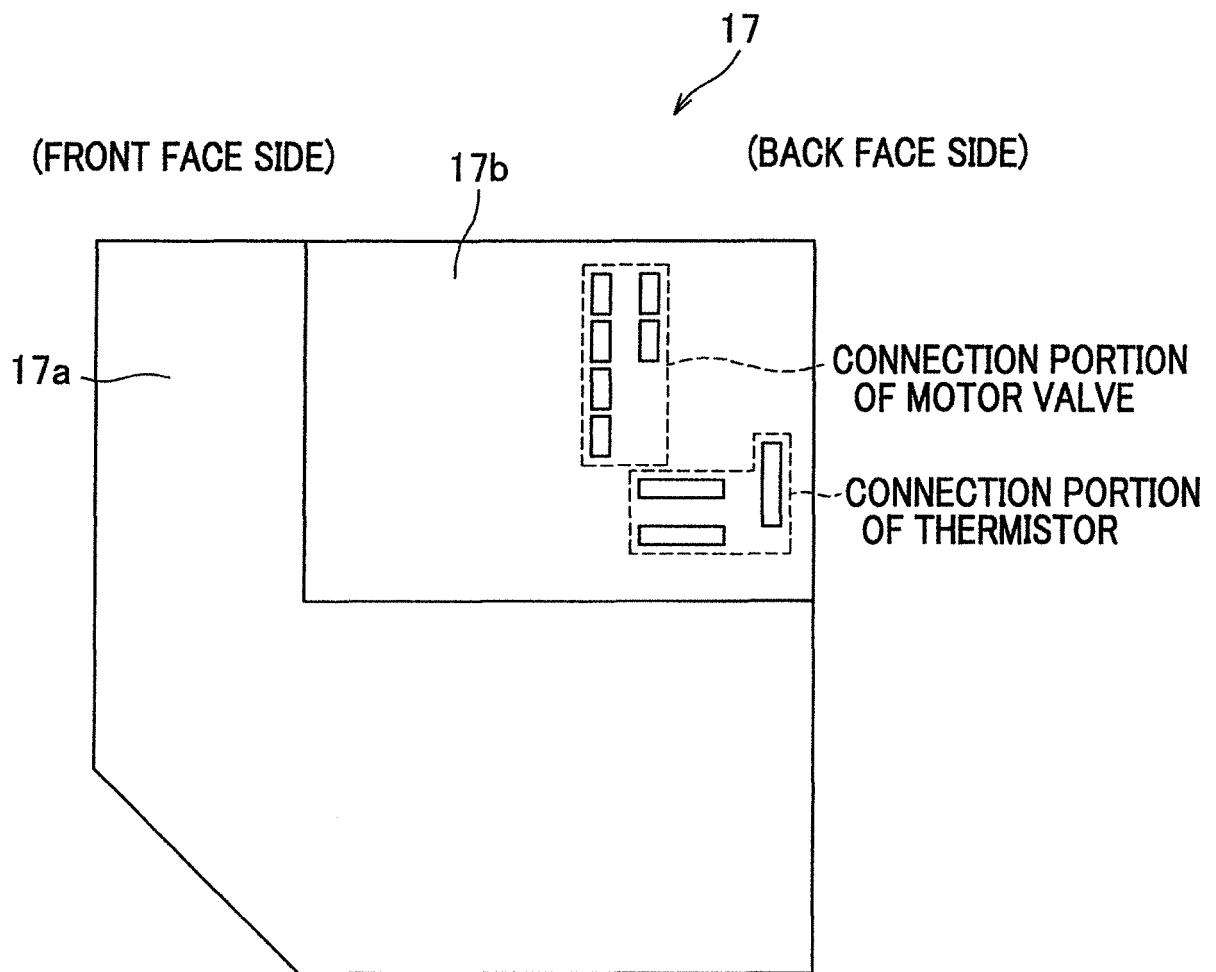


FIG.4

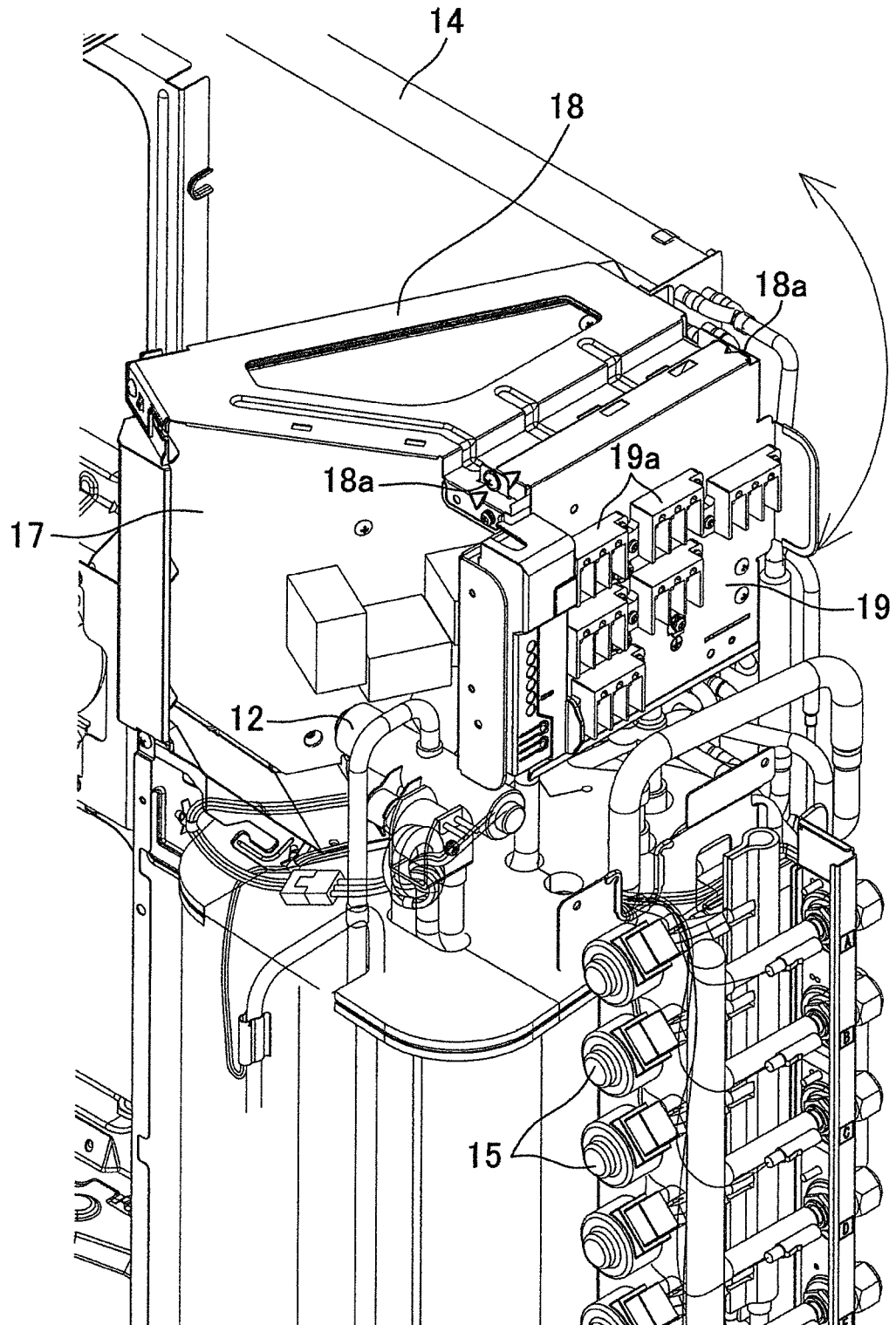
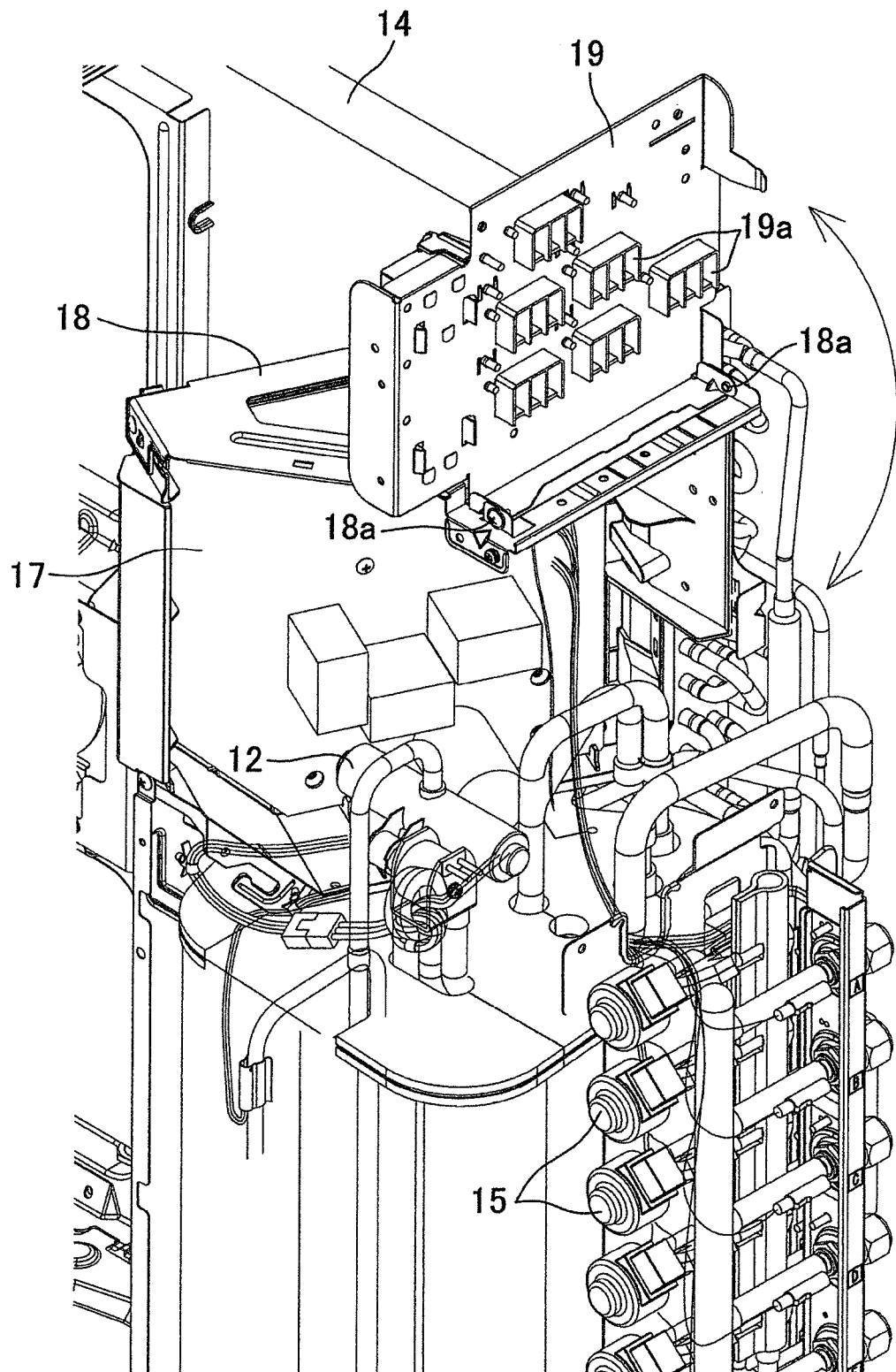


FIG.5



REFERENCES CITED IN THE DESCRIPTION

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