



(11) **EP 3 101 354 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.12.2016 Bulletin 2016/49

(51) Int Cl.:
F24F 1/22 (2011.01)

(21) Application number: **14880244.0**

(86) International application number:
PCT/JP2014/084014

(22) Date of filing: **23.12.2014**

(87) International publication number:
WO 2015/111346 (30.07.2015 Gazette 2015/30)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **27.01.2014 JP 2014012445**

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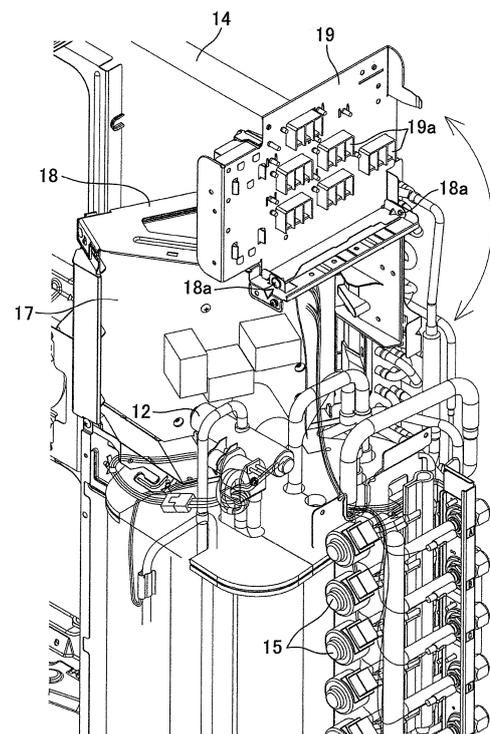
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(54) **OUTDOOR UNIT**

(57) It is difficult to connect a harness with a control board from the front face side of an outdoor unit. An outdoor unit of the present invention includes: a casing which houses a compressor and a heat exchanger; a terminal block attaching plate 19 which is provided in the vicinity of a side face of the casing and includes a terminal block 19a to which a power source line from an indoor unit is connected; and a control board 17 which is provided in the casing, opposes 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 a back face side. The terminal block attaching plate 19 is capable of rotating away from the control board 17.

FIG.5



Description

[Technical Field]

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

[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.

[Citation List]

[Patent Literatures]

[0003] [Patent Literature 1] Japanese Unexamined Patent Publication No. 2003-294271

[Summary of Invention]

[Technical Problem]

[0004] 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.

[0005] 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]

[0006] 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 connected; and a control board

which is provided in the casing, opposes the terminal block attaching plate, and 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.

[0007] 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.

[0008] 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.

[0009] 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.

[0010] 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.

[0011] 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.

[0012] 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.

[0013] 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]

[0014] As described hereinabove, the present invention brings about the following effects.

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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]

[0019]

[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]

[0020] The following will describe an outdoor unit of an air conditioner of an embodiment of the present invention with reference to figures.

[0021] <Overall Structure of Air Conditioner>

[0022] 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.

[0023] 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.

[0024] 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>

[0025] 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.

[0026] 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).

[0027] As shown in FIG. 3, the control board 17 in-

cludes 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.

[0028] 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.

[0029] 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>

[0030] 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.

[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 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.

[0032] 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.

[0033] 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.

[0034] 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.

[0035] 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.

[0036] 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 attaching 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.

[0037] 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.

[0038] 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]

[0039] The present invention makes it easy to connect a harness to the control board during assembly.

[Reference Signs List]

[0040]

- 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 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 connected; and
 a control board which is provided in the casing, opposes the terminal block attaching plate, and 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.

2. The outdoor unit according to claim 1, wherein, the terminal block attaching plate is rotatable to a position where the terminal block attaching plate does not oppose the control board.

3. The outdoor unit according to claim 1 or 2, wherein, 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.

4. The outdoor unit according to any one of claims 1 to 3, wherein, 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.

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FIG.1

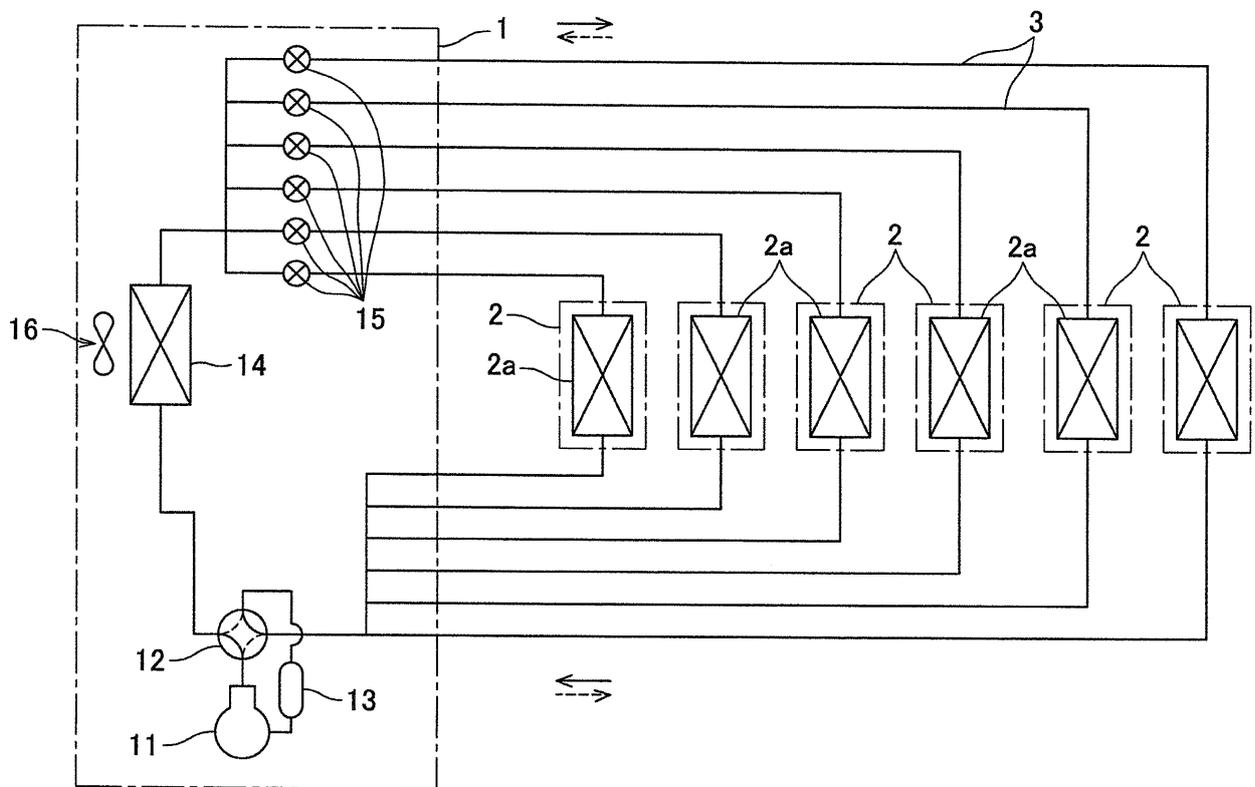


FIG.2

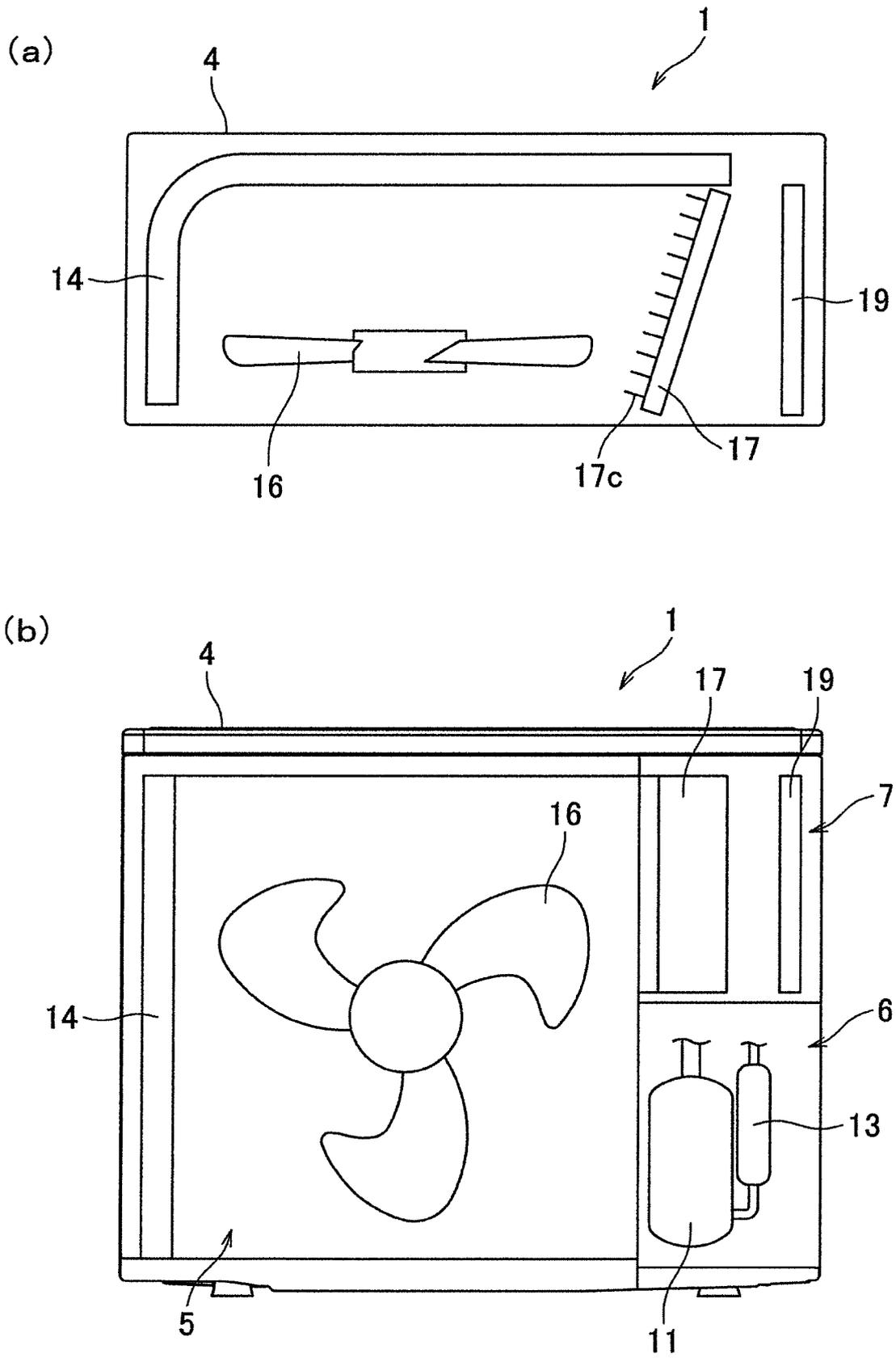


FIG.3

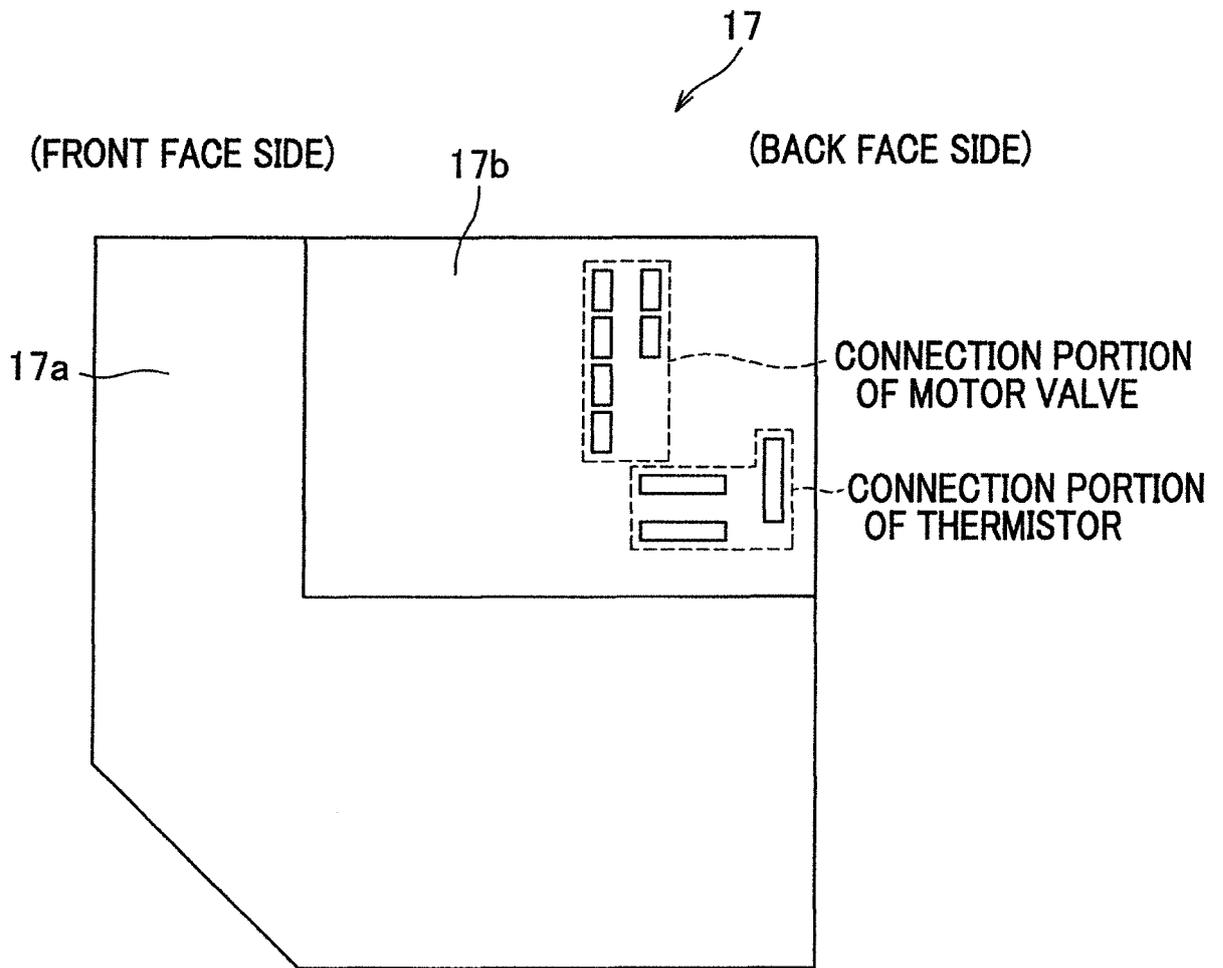


FIG.4

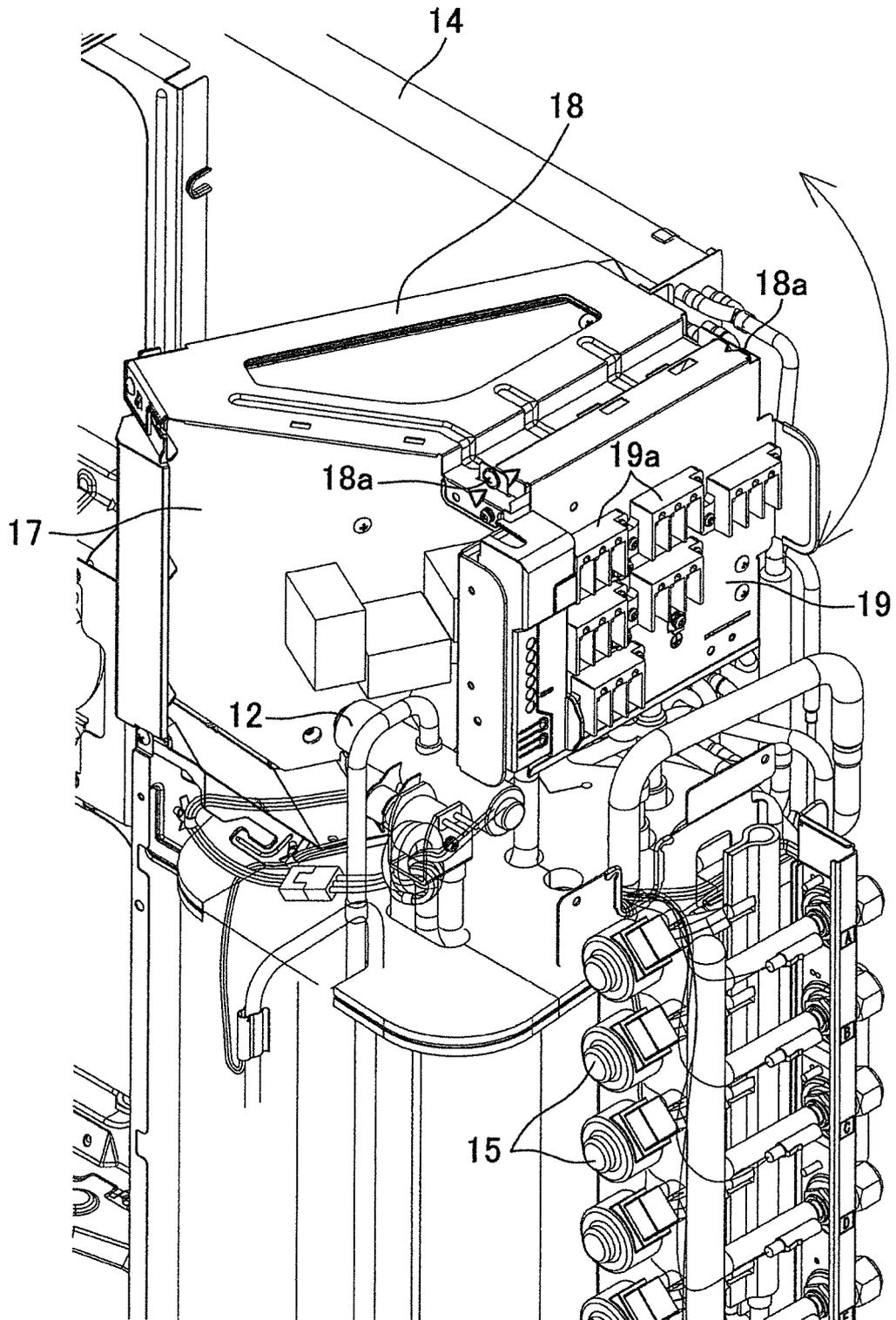
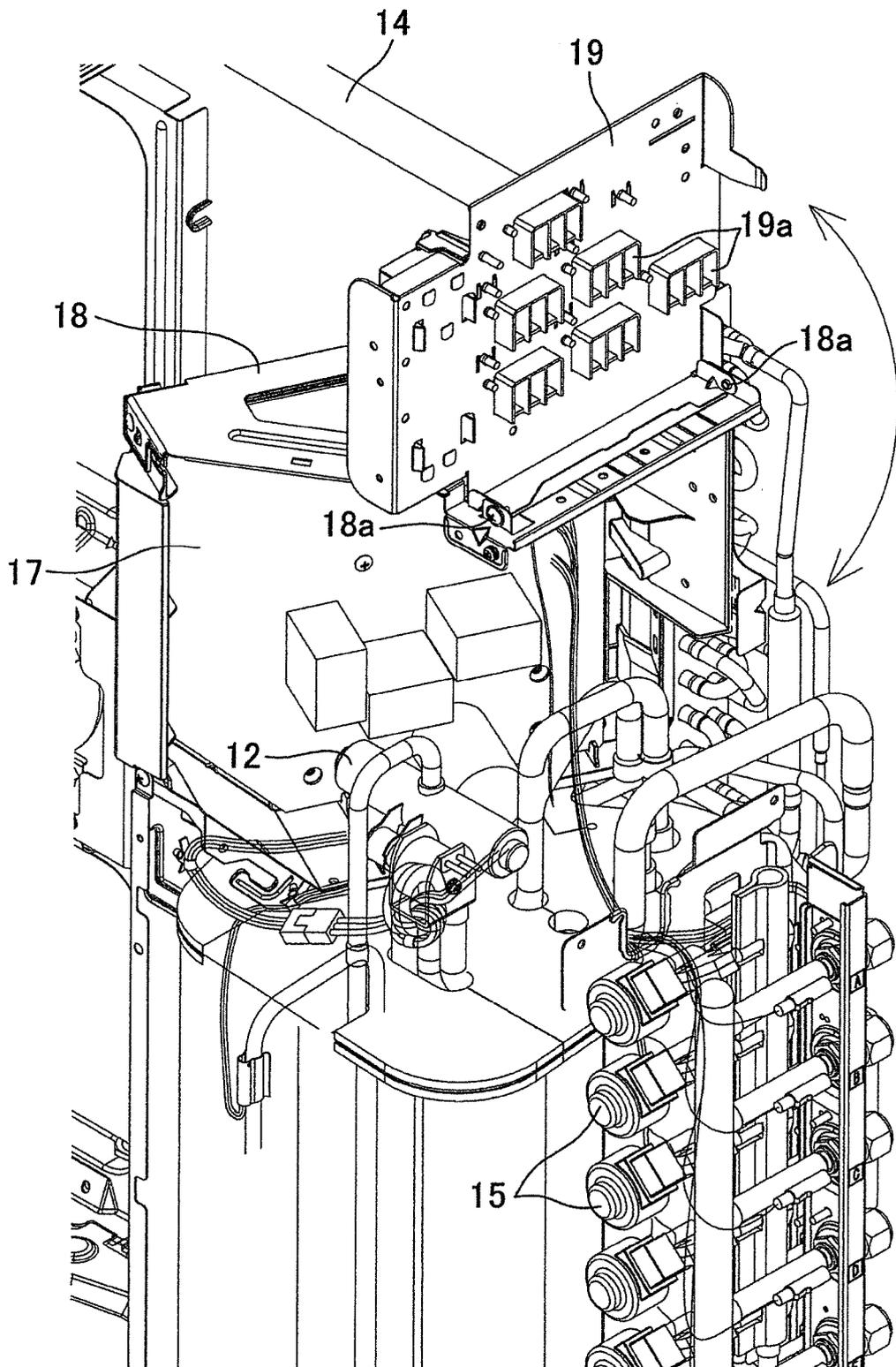


FIG.5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/084014

5	A. CLASSIFICATION OF SUBJECT MATTER F24F1/22(2011.01) i	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED	
	Minimum documentation searched (classification system followed by classification symbols) F24F1/22	
15	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2015 Kokai Jitsuyo Shinan Koho 1971-2015 Toroku Jitsuyo Shinan Koho 1994-2015	
	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
	Category*	Citation of document, with indication, where appropriate, of the relevant passages
25	Y	JP 2008-106948 A (Daikin Industries, Ltd.), 08 May 2008 (08.05.2008), paragraphs [0001], [0016] to [0021]; fig. 1 to 3 (Family: none)
30	Y	WO 2009/041425 A1 (Toshiba Carrier Corp.), 02 April 2009 (02.04.2009), paragraphs [0001], [0006] to [0009], [0011] to [0072]; fig. 1 to 3 & JP 4923106 B2 & CN 101578488 A
35	Y	JP 2010-175227 A (Daikin Industries, Ltd.), 12 August 2010 (12.08.2010), paragraphs [0001], [0005] to [0007], [0029], [0034], [0036] to [0107]; fig. 5 to 9, 11 to 13 (Family: none)
40	<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.	
45	* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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	"P" document published prior to the international filing date but later than the priority date claimed	
50	Date of the actual completion of the international search 19 March 2015 (19.03.15)	Date of mailing of the international search report 31 March 2015 (31.03.15)
55	Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/084014

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2013-108669 A (Daikin Industries, Ltd.), 06 June 2013 (06.06.2013), paragraphs [0001], [0006], [0007], [0012], [0014] to [0028]; fig. 2 (Family: none)	4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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