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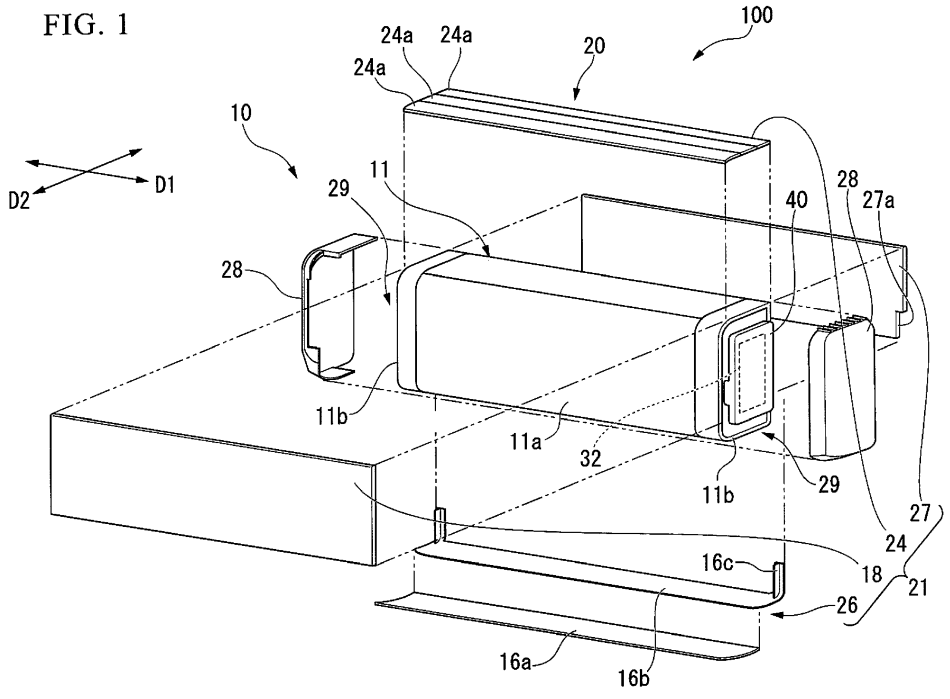
(54) INDOOR UNIT OF AIR CONDITIONER

(57) The indoor unit 10 includes a casing 11 configured to accommodate a blower fan and a heat exchanger; a top panel 24, an inlet panel 18, a bottom surface panel 26 having a flap 16a, and a rear surface panel 27 continuously disposed to surround a body portion 11a of the casing 11; and right and left side surface panels 28 detachably continued to the top panel 24, the inlet panel 18, the bottom surface panel 26 and the rear surface panel 27 and configured to cover an entire side portion 11b of the casing 11.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

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

Description of Related Art

[0002] Conventionally, an indoor unit of an air conditioner has a structure in which a heat exchanger, a blower fan and so on are accommodated in a casing. Additionally, for example, in Japanese Unexamined Patent Application, First Publication No. 2004-101013, the casing is covered with a front surface cover having an inlet port and an outlet port provided above and below each other and an upper surface cover installed on an upper surface of the front surface cover. In this casing, the upper surface cover disposed on the front surface cover is divided and disposed in a right and left direction, or a service cover is installed with an opening providing for electrical components on a part of the upper surface cover, thereby reducing costs and improving external appearance.

SUMMARY OF THE INVENTION

Technical Problem

[0003] However, in Japanese Unexamined Patent Application, First Publication No. 2004-101013, since the service cover covers only an upper portion of a side portion of the front surface cover (casing), even if the service cover is removed, it is not easy to access the internal electrical components. Further, in Japanese Unexamined Patent Application, First Publication No. 2004-101013, even if the service cover or the upper surface cover is simply exchanged, it is impossible to sufficiently improve the aesthetic appearance.

[0004] Therefore, the present invention provides an indoor unit of an air conditioner with which it is possible to secure workability at the time of maintenance or the like while the aesthetic appearance is improved.

[0005] An indoor unit of an air conditioner according to a first aspect of the present invention includes a casing; a blower fan and a heat exchanger accommodated in the casing; a top panel, a front surface panel, a bottom surface panel having a flap, and a rear surface panel continuously disposed to surround a body portion of the casing; and right and left side surface panels which are detachable and continuous with the top panel, the front surface panel, the bottom surface panel and the rear surface panel and configured to cover an entire side portion of the casing.

[0006] According to the indoor unit of the air conditioner, since the respective panels continuously cover the body portion and side portions of the casing and surround them, the entire design surface of the indoor unit which is seen from the outside can be formed to have a continuous appearance with a good configuration. Further, since the side surface panel detachably covers an entire side portion of the casing, access to electrical components and the like inside the casing is facilitated by removing the side surface panel.

[0007] According to the indoor unit of the air conditioner according to a second aspect of the present invention, in the first aspect, side portion accommodating spaces may be provided between the right and left side surface panels and a side portion of the casing, and a controller configured to control the blower fan and the heat exchanger may be accommodated in a first side portion accommodating space, and a device may be accommodated in a second side portion accommodating space to be attachable to and detachable from at least one of the casing and the side surface panels.

[0008] As described above, even when the side portion accommodating space is provided inside first side portion of the casings and the controller is accommodated therein, the side portion accommodating space can be opened to a large extent by removing the side surface panel from the casing, and workability when installing, adding, replacing and repairing the controller can be improved.

[0009] Also, since a side portion accommodating space is also provided inside the second side portion of the casing, various kinds of device such as optional components can be disposed in the second side portion accommodating space. Therefore, since various kinds of devices such as optional parts are covered by side surface panels, the optional components or the like are not exposed in a visible area. Thus, it is possible to install various devices such as optional components without the aesthetic appearance of the indoor unit deteriorating.

[0010] Further, according to the indoor unit of the air conditioner according to a third aspect of the present invention, in the second aspect, a weight of a second side surface panel forming the second side portion accommodating space may be greater than that of a first side surface panel forming the first side portion accommodating space.

[0011] As described above, when the weight of the second side surface panel in which the device is detachably accommodated is greater than that of the first side surface panel in which the controller is accommodated, it is possible to balance the weights of the right and left sides of the indoor unit in the case in which a device such as an optional component is not provided in the second side portion accommodating space. Also, since the controller is heavier than the optional components, even when an optional component is provided in the second side portion accommodating space, the weights of the right and left sides of the indoor unit can be balanced.

[0012] Further, according to the indoor unit of the air conditioner according to a fourth aspect of the present invention, in the first to third aspects, the bottom surface panel may be detachably installed on the casing.

[0013] As described above, if the bottom surface panel is detachable from the casing, by removing the bottom surface panel, it is possible to expose a bottom of the casing without disassembling the casing to a great extent.

[0014] Accordingly, when various members or devices are installed on or separated from the bottom side of the casing or when various members and devices arranged on the bottom side are repaired or exchanged, it is easy to access the bottom side, and thus the workability such as manufacturing and maintaining of the indoor unit can be improved.

[0015] Further, according to the indoor unit of the air conditioner according to a fifth aspect of the present invention, in the fourth aspect, a member supporting portion may be provided on a bottom surface portion of the casing covered with the bottom surface panel.

[0016] As described above, in the case in which the member supporting portion is provided on the bottom portion of the casing covered with the bottom panel, for example, even when a wiring or the like is added between the right and left side portions of the casing, since the wiring is not exposed to the outside of the indoor unit, adding of the wiring and the like can be performed without the aesthetic appearance of the air conditioner deteriorating.

[0017] Further, according to the indoor unit of the air conditioner according to a sixth aspect of the present invention, in the first to fifth aspects, the top panel may have a plurality of separate top panels separable from each other.

[0018] As described above, if the top panel has a plurality of separate top panels which can be separated from each other, it is possible to replace each separate top panel, thereby improving the maintainability. In addition, it is possible to improve the aesthetic appearance of the indoor unit by changing a color for each separate top panel, or the like.

[0019] Further, according to the indoor unit of the air conditioner according to a seventh aspect of the present invention, in the first to sixth aspects, the top panel, the bottom surface panel, the rear surface panel, and the side surface panels may be detachable from each other and may be detachably fixed to the casing.

[0020] As described above, when all the adjacent panels are separable and detachable from each other, it is easy to detach each of the panels and to expose corresponding portions of the casing to the outside, thereby further improving workability. Further, since the adjacent panels are fixed to each other, it is possible to sufficiently secure a strength for the indoor unit.

[0021] According to the indoor unit of the air conditioner, workability, such as for maintenance, can be secured while improving the aesthetic appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is an exploded perspective view of an indoor unit of an air conditioner according to an embodiment of the present invention.

FIG. 2 is a cross-sectional view of the indoor unit according to the embodiment of the present invention.

FIG. 3 is a partial perspective view showing a bottom portion of the indoor unit according to the embodiment of the present invention.

FIG. 4 is an exploded view of the indoor unit according to the embodiment of the present invention, and is a partial perspective view showing the vicinity of the second side portion accommodating space and also showing a case in which optional components (devices) are not installed.

FIG. 5 is an exploded view of the indoor unit according to the embodiment of the present invention and is a partial perspective view showing the vicinity of the second side portion accommodating space and also showing a case in which optional components (devices) and a top panel 24 are installed.

DETAILED DESCRIPTION OF THE INVENTION

[0023] An air conditioner 100 includes an indoor unit 10 provided in a room and an outdoor unit (not shown) connected to the indoor unit 10 by piping and provided outside the room.

[0024] The indoor unit 10 suctions air, adjusts a temperature or humidity thereof and then blows out the air, thereby performing air-conditioning in the room.

[0025] Hereinafter, the indoor unit 10 according to the embodiment of the present invention will be described.

[0026] As shown in FIGS. 1 and 2, the indoor unit 10 includes a casing 11, a heat exchanger 13 and a blower fan 14 accommodated in the casing 11, and panels which cover the casing 11.

[0027] The panels are panels surrounding a body portion 11a of the casing 11 and include an inlet panel (front surface panel) 18 which covers a front surface of the casing 11, a top panel 24 which covers an upper surface of the casing 11, a bottom surface panel 26 which covers a bottom surface of the casing 11, and a rear surface panel 27 which covers a rear surface of the casing 11. Further, regarding the panels, a pair of side surface panels 28 are also provided which cover entire right and left side portions 11b of the casing 11.

[0028] Here, the front surface, the upper surface, the bottom surface, the rear surface and the side surfaces are surfaces expressed with reference to a state in which the indoor unit 10 is installed. Therefore, the front surface is a front side surface, the upper surface is surface on the side of the ceiling of the room, the bottom surface is a surface on the side of the floor of the room, the rear surface is a surface on a side of a wall surface of the room, and the side surfaces are right and left surfaces in a lateral direction toward the wall surface sides of the room.

[0029] The casing 11 includes the body portion 11a which is formed in substantially a horizontally elongated rectangular parallelepiped shape having an air inlet port 17 formed at an upper portion of the front surface and an outlet port 15 formed at a lower portion thereof, and side portions 11b which are provided on both right and left end sides of the body portion 11a.

[0030] The blower fan 14 is a cross flow fan which extends in the lateral direction.

[0031] The heat exchanger 13 is provided to surround the blower fan 14 from an outer circumference thereof.

[0032] Next, each of the panels will be described in detail.

[0033] The inlet panel 18 is detachably provided on the body portion 11a of the casing 11 to cover a front surface of the body portion 11a of the casing 11 and to suction the air into the casing 11 from a space between the inlet panel 8 and the casing 11.

[0034] The top panel 24 is detachably provided on the body portion 11a of the casing 11 to cover a top surface of the casing 11 and has a plurality of separate top panels 24a. The plurality of separate top panels 24a are separable from each other and also detachably provided on the casing 11. In the embodiment, the top panel 24 is divided into three portions in a forward and backward direction D2 and three separate top panels 24a are provided.

[0035] The bottom surface panel 26 is detachably provided on the body portion 11a of the casing 11 and covers the bottom surface of the casing 11. The bottom surface panel 26 has a flap 16a disposed on a front surface side of the bottom surface of the casing 11 and a panel main body 16b disposed on a rear surface side of the flap 16a to be separable from the flap 16a.

[0036] The flap 16a is provided to cover the outlet port 15 of the body portion 11a of the casing 11 from a lower side. Further, the flap 16a is formed to adjust the size of an opening of the outlet port 15 by a rotation mechanism which is not shown.

[0037] A plate-shaped protruding portion 16c which protrudes to a rear surface side of the casing 11 from both ends in a lateral direction D1 is provided at the panel main body 16b.

[0038] Here, as shown in FIG. 3, a member supporting portion 31 which can support a long object such as a wiring and a piping as shown in FIG. 3 is provided on a bottom portion of the body portion 11a of the casing 11 inside the panel main body 16b. A plurality of the member supporting portions 31 are provided to be separated from each other in the lateral direction D1. In the member supporting portion 31, for example, a groove 31a recessed downward from an upper end edge thereof is formed such that wiring is able to be hooked and supported.

[0039] The rear surface panel 27 is detachably provided on the body portion 11a of the casing 11 to cover the rear surface of the casing 11 and faces the wall surface of the room at the time of installation of the indoor unit 10. A cut-out portion 27a cut out from a lower end thereof in the lateral direction D1 is provided at both ends of the rear surface panel 27 in the lateral direction D1. The protruding portion 16c provided on the panel main body 16b of the bottom surface panel 26 is engaged with the cut-out portion 27a without any gaps therebetween and covers the rear surface of the casing 11 together with the rear surface panel 27.

[0040] As described above, the inlet panel 18, the top panel 24, the bottom surface panel 26, and the rear surface panel 27 are disposed to continuously surround a circumference of the body portion 11a of the casing 11, and thus the body portion 11a of the casing 11 is substantially covered in a cylindrical shape. Therefore, a portion of the side portion 11b directed in the lateral direction D1 is structured not to be covered with the inlet panel 18, the top panel 24, the bottom surface panel 26 and the rear surface panel 27.

[0041] The pair of side surface panels 28 are detachably provided on the right and left side portions 11b of the casing 11 to cover the side surfaces of the casing 11. As shown in FIG. 4, each of the side surface panels 28 includes an end wall 28a which closes the side portion 11b of the casing 11 in a side view (as seen from the lateral direction D1), an opening protrusion 28b which is integrally and continuously formed to stand up from the end wall 28a toward the body portion 11a side and covers the side portion 11b from the outer circumference side, and a fixing structure 28c which fixes the side surface panel 28 to the body portion 11a. In the embodiment, the right and left side surface panels 28 have substantially the same shape and their weights are equal.

[0042] In the right and left side surface panels 28, the opening protrusion 28b has a shape corresponding to an end of the side portion 11b. Additionally, the opening protrusion 28b has a shape corresponding to a shape of each end edge of the top panel 24, the bottom surface panel 26 and the rear surface panel 27 covering the body portion 11a in the lateral direction D1. Accordingly, when the side surface panel 28 is installed at the side portion 11b, the panels 18, 24, 26, 27 and 28 provide a continuous appearance on the entire surface of the casing 11.

[0043] The fixing structure 28c between the side surface panel 28 and the side portion 11b includes a locking portion 34 provided on the opening protrusion 28b of the side surface panel 28 and locking in a direction (lateral direction D1) facing the end of the side portion 11b, and a fastening portion 35 which fastens the opening protrusion 28b of the side surface panel 28 and the end of the side portion 11b in a direction (forward and backward direction D2) intersecting this facing direction with a screw.

[0044] The side surface panel 28 is locked on the casing 11 by the locking portion 34 in the facing direction and fastened by the fastening portion 35 in the direction intersecting the facing direction, and thus the side surface panel 28 and the casing 11 are fixed to each other such that they may not be relatively displaced.

[0045] A side portion accommodating space 29 capa-

ble of accommodating various devices 33 is provided inside of each side surface panel 28. That is, the side portion accommodating space 29 is a space formed between the side portion 11b of the casing 11 and the end wall 28a in a state in which the side surface panel 28 is connected to the casing 11.

[0046] In the embodiment, as shown in FIG. 1, a controller 32 is accommodated in first side portion accommodating space 29. The controller 32 is supported by the side portion 11b of the casing 11 and further covered with the side surface panel 28 in a state of being covered with a detachable controller cover 40.

[0047] As shown in FIGS. 4 and 5, various devices 33 can be accommodated in the second side portion accommodating space 29, and in the embodiment, the various devices 33 are optional components and the like and are components such as an extension board which connects between a terminal like a mobile phone and the indoor unit 10. Here, the various devices 33 are not limited to these optional components, and some functions of the controller 32 may be provided in the second side portion accommodating space 29 at the time of manufacturing.

[0048] Here, a claw-shaped device locking portion 37 which fixes the various devices 33 accommodated in the side portion accommodating space 29 is provided on the end wall 28a of the side surface panel 28 which covers the second side portion accommodating space 29. Due to the device locking portion 37, the various devices 33 can be fixed to the side surface panel 28 without using fasteners such as screws.

[0049] Additionally, in the top panel 24, the bottom surface panel 26, the rear surface panel 27 and the pair of side surface panels 28 which cover the casing 11, adjacent panels 24, 26, 27 and 28 are separably fixed to each other by screws, locking claws or the like (not shown) not to be relatively displaced.

[0050] According to the indoor unit 10 described above, the entire body portion 11a of the casing 11 is continuously covered and surrounded by the panels 18, 24, 26 and 27, and the side portions 11b are covered with the side surface panels 28, and thus the entire surface of the casing 11 is continuously covered. Accordingly, it is possible to make the entire design surface viewed from the outside continuous with good appearance and to improve the aesthetic appearance of the indoor unit 10.

[0051] Further, the side surface panel 28 which covers the entire side portion 11b is detachable from the casing 11. Therefore, it is possible to easily expose an inside of the side portion 11b of the casing 11 simply by removing the side surface panel 28 without disassembling the casing 11. Accordingly, it is easy to access the electrical components such as the controller 32 inside the casing 11. Thus, workability is good at the time of installing, adding, exchanging, and repairing the controller 32 and other constituent devices.

[0052] Further, it is possible to add other various devices 33 to the second side portion accommodating space 29 or to separate and dispose a part of the configuration of the controller 32. Additionally, since the various devices 33 and the like are covered with the side surface panel 28, the various devices 33 and the like are not exposed in a visible range. Therefore, it is possible to install the various devices 33 and the like without deteriorating the aesthetic appearance of the indoor unit 10.

[0053] In the indoor unit 10 of the embodiment, since the bottom surface panel 26 is attachable to and detachable from the casing 11, it is possible to expose a bottom of the casing 11 by removing the bottom surface panel 26 without disassembling the casing 11 on a large-scale.

[0054] Accordingly, when various members or devices are installed at or separated from the bottom side of the casing 11 or when the various members and devices arranged on the bottom side are repaired or exchanged, it is easy to access the bottom side, and thus the workability such as manufacturing and maintenance of the indoor unit 10 can be improved.

[0055] Further, in the embodiment, for example, it is possible to hook and support the wiring connecting the controller 32 of a first side portion accommodating space 29 and the device 33 of a second side portion accommodating space 29 by the member supporting portion 31. Also at this time, by removing the bottom surface panel 26, the wiring hooking work can be performed without largely disassembling the casing 11. Furthermore, even if a wiring is added according to the addition of such a device 33, the wiring is not exposed to the outside by the bottom surface panel 26. Therefore, the aesthetic appearance of the indoor unit 10 is not deteriorated.

[0056] Further, since the top panel 24 has a plurality of separate top panels 24a which can be separated from each other, it is possible to replace each separate top panels 24a, thereby improving the maintainability. In addition, it is possible to improve the aesthetic appearance of the indoor unit 10 by changing a color for each separate top panels 24a, or the like.

[0057] Further, in the indoor unit 10 of the embodiment, when all the adjacent panels 18, 24, 26, 27 and 28 are separable and detachable from each other, each of the panels 18, 24, 26, 27 and 28 are easily removed to expose corresponding portions of the casing 11 to the outside, thereby further improving the workability. Also, since the panels 24, 26, 27 and 28 excluding the inlet panel 18 are fixed to each other for adjacent panels, sufficient strength of the indoor unit 10 can be secured.

[0058] Although the embodiments of the present invention have been described in detail above, it is possible to make some design changes within a range not departing from the technical idea of the present invention.

[0059] For example, of all the panels 18, 24, 26, 27 and 28 covering and forming the casing 11, the panels 24, 26, 27 and 28 are fixed to each other, but the panels 24, 26 and 27 may be directly fixed to the casing 11.

[0060] Further, shapes and weights of the right and left side surface panels 28 may be different from each other. For example, a weight of the other side surface panel 28

forming the second side portion accommodating space 29 may be larger than that of one side surface panel 28 forming the first side portion accommodating space 29. In this case, when the weight of the other side surface panel 28 on the side in which the devices 33 are detachably accommodated is greater, it is possible to balance the weights of the right and left sides of the indoor unit 10 in the case in which devices 33 such as the optional components are not provided in the second side portion accommodating space 29. Also, since the controller 32 is heavier than the optional components, even when the optional component is provided in the second side portion accommodating space 29, the weights of the right and left sides of the indoor unit 10 can be balanced.

[0061] Further, the shapes of the right and left side surface panels 28 may be determined so that a volume of the second side portion accommodating space 29 in which the device 33 is accommodated is larger than that of the first side portion accommodating space 29 in which the controller 32 is accommodated.

[0062] Further, the device 33 such as the optional component may be fixed not to the side surface panel 28 but to the side portion 11b of the casing 11.

EXPLANATION OF REFERENCES

[0063]

D1 Lateral direction
D2 Forward and backward direction
10 Indoor unit
11 Casing
11a Body portion
11b Side portion
13 Heat exchanger
14 Blower fan
15 Outlet port
16a Flap
16b Panel main body
16c Protruding portion
17 Inlet port
18 Inlet panel (front surface panel)
24 Top panel
24a Separate top panel
26 Bottom surface panel
27 Rear surface panel
27a Cut-out portion
28 Side surface panel
28a End wall
28b Opening protrusion
28c Fixing structure
29 Side portion accommodating space
31 Member supporting portion
31a Groove
32 Controller
33 Device
34 Locking portion
35 Fastening portion
37 Device locking portion
40 Controller cover
100 Air conditioner

Claims

1. An indoor unit (10) of an air conditioner, comprising:

a casing (11) ;
a blower fan (14) and a heat exchanger (13) accommodated in the casing;
a top panel (24), a front surface panel (18), a bottom surface panel (26) having a flap (16a), and a rear surface panel (27) continuously disposed to surround a body portion (11a) of the casing; and
right and left side surface panels (28) detachably continued to the top panel (24), the front surface panel (18), the bottom surface panel (26) and the rear surface panel (27) and configured to cover an entire side portion (11b) of the casing.

2. The indoor unit according to claim 1, wherein side portion accommodating spaces (29) are provided between the right and left side surface panels (28) and a side portion (11b) of the casing, and a controller (32) configured to control the blower fan (14) and the heat exchanger (13) is accommodated in a first side portion accommodating space, and a device (33) is accommodated in a second side portion accommodating space to be attachable to and detachable from at least one of the casing and the side surface panels.

3. The indoor unit according to claim 2, wherein a weight of a second side surface panel (28) forming the second side portion accommodating space (29) is greater than that of a first side surface panel (28) forming the first side portion accommodating space (29).

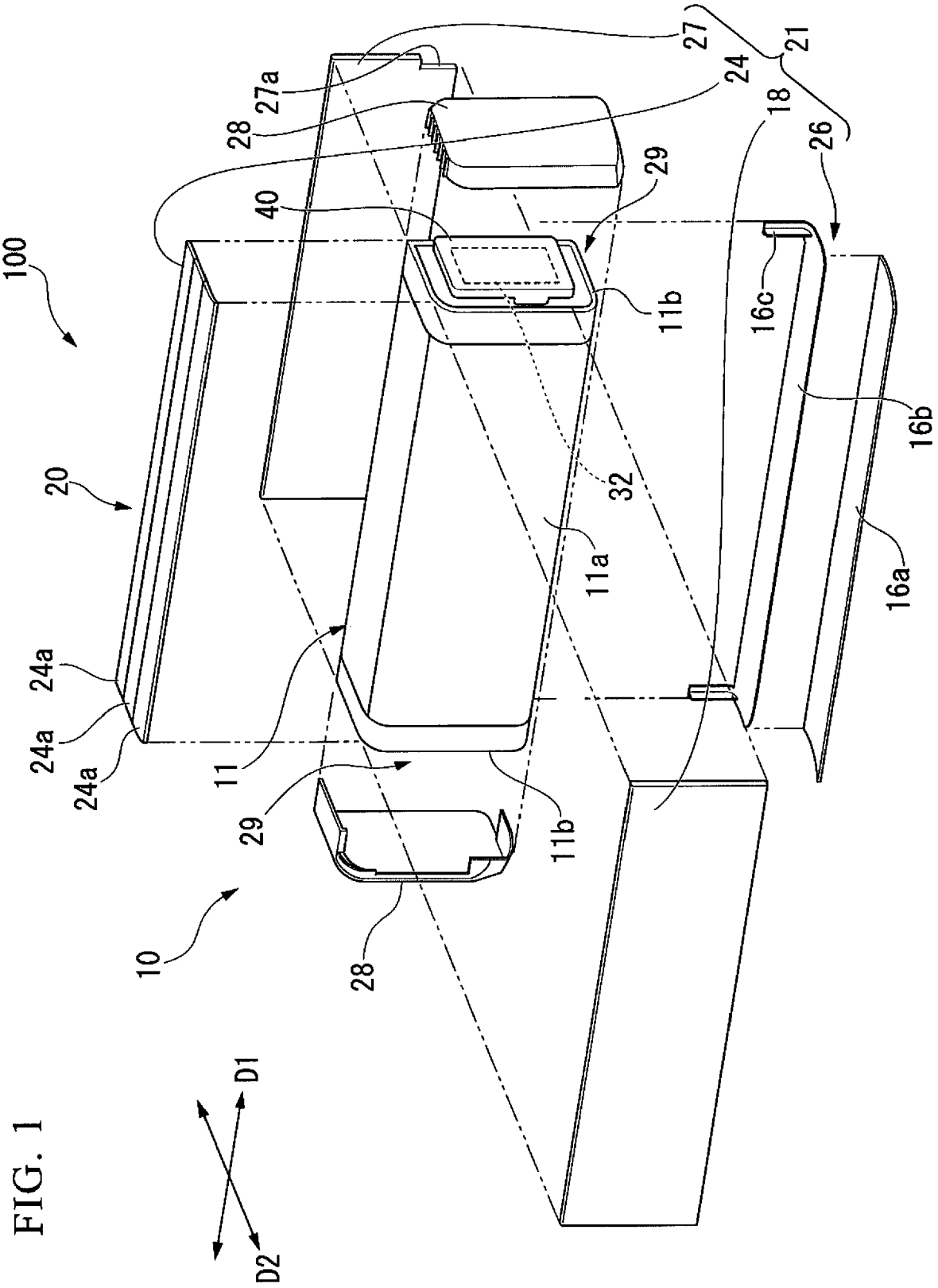
4. The indoor unit according to any one of claims 1 to 3, wherein the bottom surface panel (26) is detachably installed at the casing (11).

5. The indoor unit according to claim 4, wherein a member supporting portion (31) is provided on a bottom portion of the casing (11) covered with the bottom surface panel (26).

6. The indoor unit according to any one of claims 1 to 5, wherein the top panel (24) has a plurality of separate top panels (24a) separable from each other.

7. The indoor unit according to any one of claims 1 to 6, wherein the top panel (24), the bottom surface panel (26), the rear surface panel (27), and the side

surface panels (28) are detachable from each other and detachably fixed to the casing (11).


100
20
24a
24a
24a
10
11
29
28
11b
40
29
28
27a
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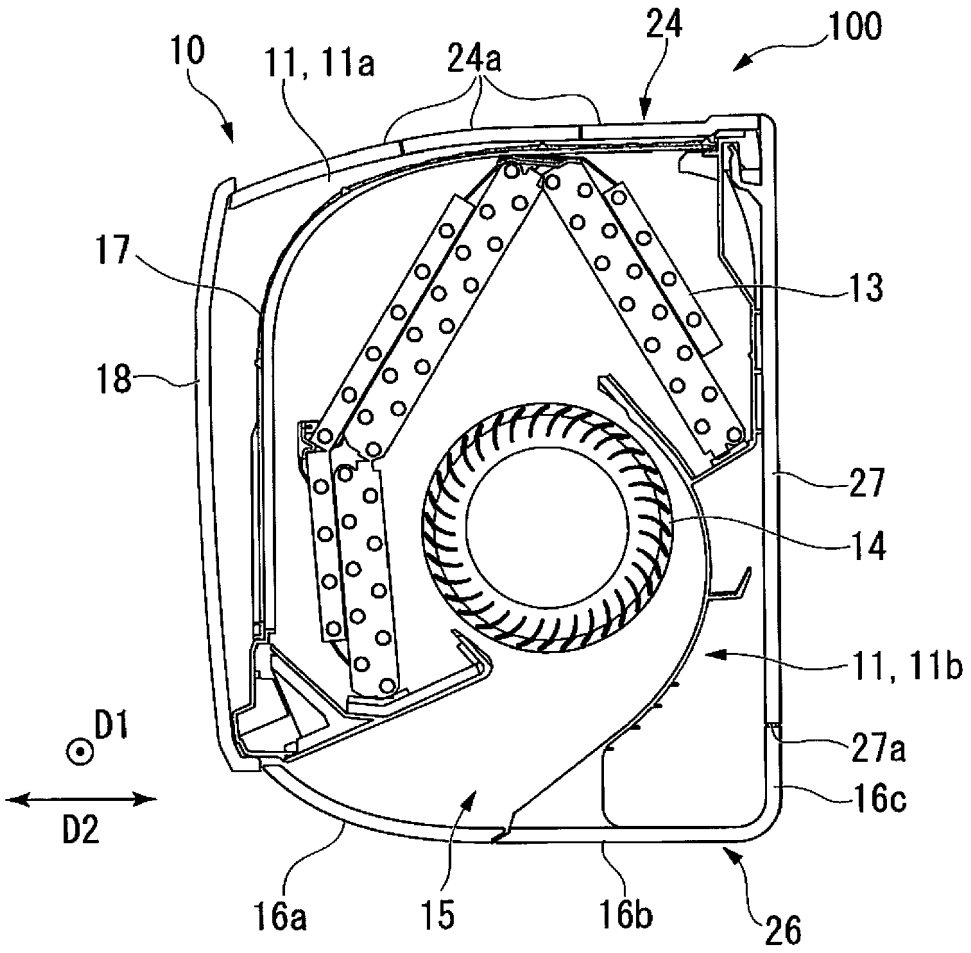
24
21
18
26
16c
16b
16a
11a
32
D1
D2

FIG. 1

FIG. 2


10
11, 11a
24a
24
100
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13
18
27
14
11, 11b
D1
D2
27a
16c
16a
15
16b
26

FIG. 3

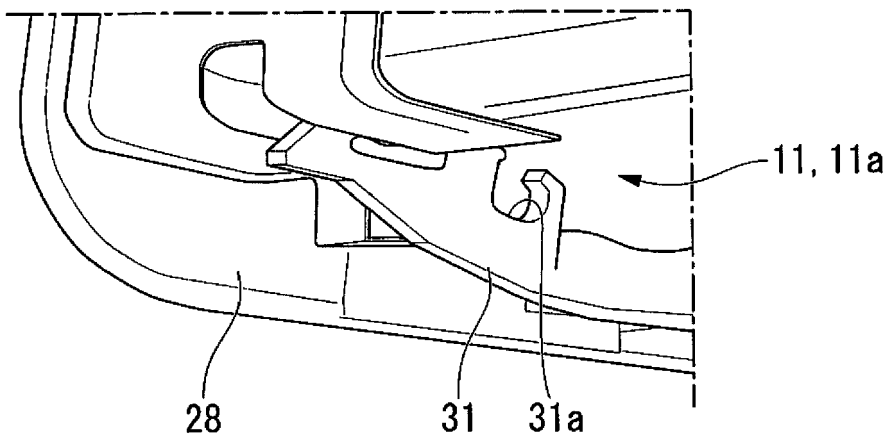

11, 11a
28
31
31a

FIG. 4

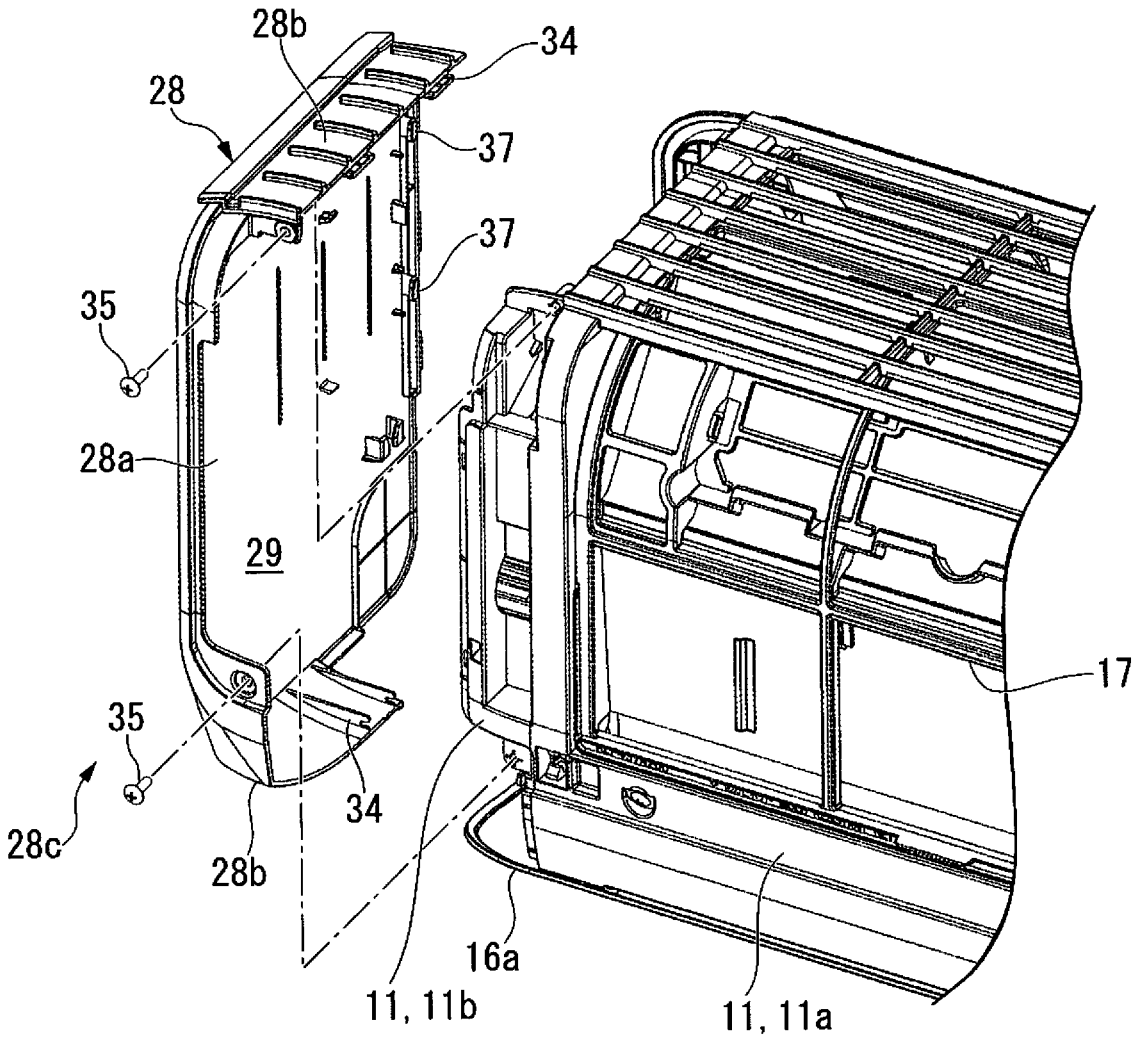
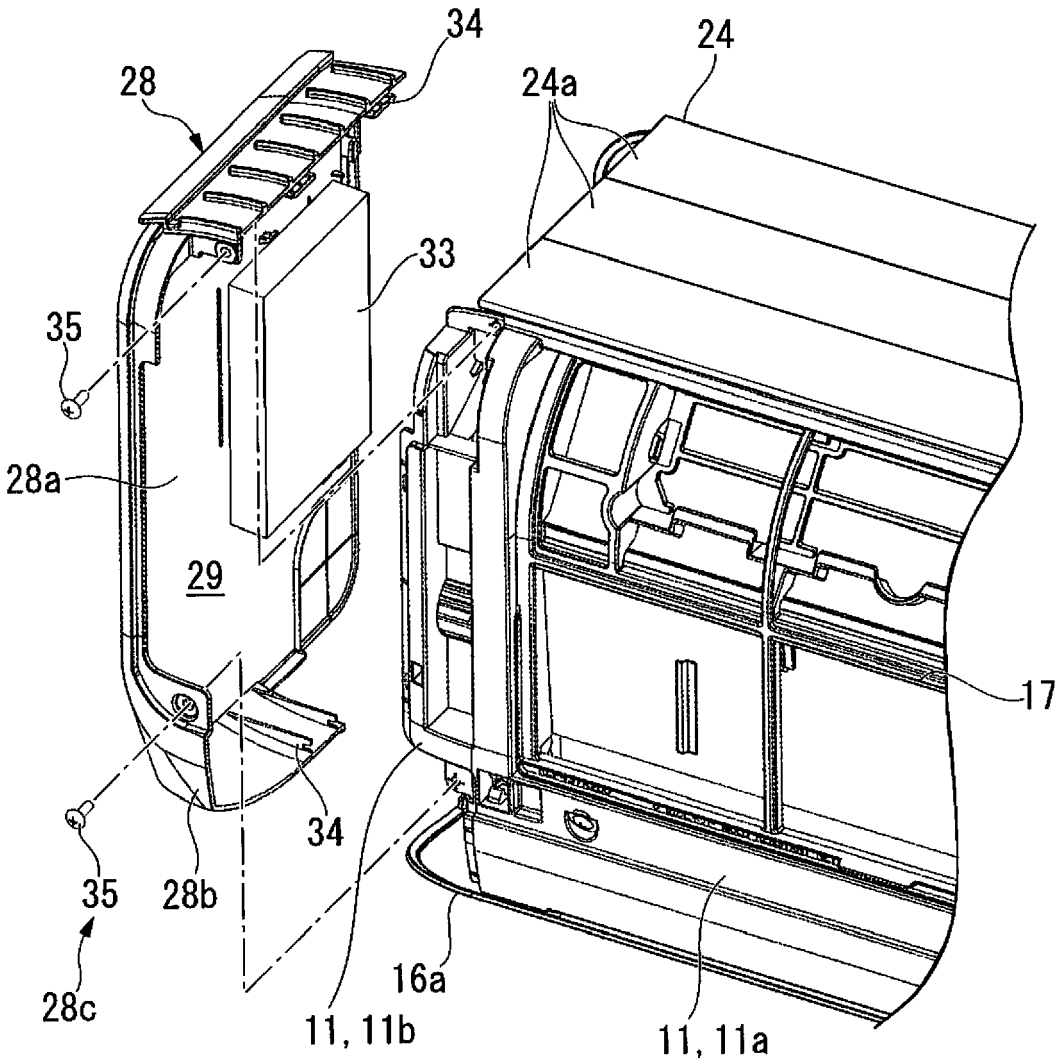


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 17 20 4454

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	US 2015/054393 A1 (LEE WOOK JIN [KR] ET AL) 26 February 2015 (2015-02-26) * paragraphs [0056] - [0061], [0074], [0075], [0082] - [0084]; figures 1-4,9,11 *	1-7	
X	EP 1 693 626 A1 (TOSHIBA CARRIER CORP [JP]; ADVANCED AIR CONDITIONING RES [JP]; SANYO C) 23 August 2006 (2006-08-23) * paragraphs [0010] - [0016]; figures 1,4 *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 April 2018	Lienhard, Dominique

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 20 4454

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-04-2018

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