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(71) Applicant: **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)

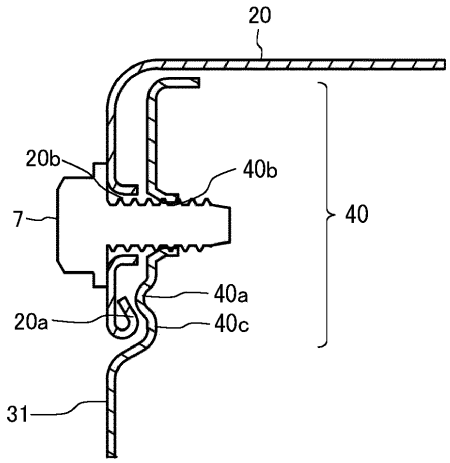
(72) Inventor: **HATA, Yuya**
Tokyo 102-0073 (JP)

(74) Representative: **Pfenning, Meinig & Partner mbB**
Patent- und Rechtsanwälte
Theresienhöhe 11a
80339 München (DE)

(54) OUTDOOR UNIT FOR AIR CONDITIONER

(57) An outdoor unit for an air-conditioning apparatus includes an outer box having a machine chamber formed therein in which a compressor is placed. The outer box includes a machine-chamber front panel placed on a front side of the machine chamber and removable from the outer box, and a top panel to cover a top surface. In a front surface of the top panel, a top-panel screw hole into which a screw is inserted, and a curled portion having a shape curled toward an inner side at a lower end of the top panel are provided. On a front surface of the machine-chamber front panel, at an upper portion thereof, an insertion portion is formed and recessed backward. The insertion portion is provided with a front-panel screw hole into which a screw is inserted, and a protruding portion with a shape projecting toward a front side. When the insertion portion is inserted inside a front surface of the top panel, and a position of the top-panel screw hole is aligned with a position of the front-panel screw hole, the protruding portion is engaged with the curled portion.

FIG. 4



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Description

Technical Field

[0001] The present disclosure relates to an outdoor unit for an air-conditioning apparatus, in which the outdoor unit includes a machine-chamber front panel forming a part of an outer box.

Background Art

[0002] There is conventionally an outdoor unit for an air-conditioning apparatus, in which the outdoor unit includes a machine-chamber front panel forming a part of an outer box (for example, see Patent Literature 1). The machine-chamber front panel disclosed in Patent Literature 1 is designed to be removable from the outer box in consideration of serviceability. However, when screw hole positions of the machine-chamber front panel are aligned with each other to screw the machine-chamber front panel to a top panel, the machine-chamber front panel is displaced downward by its own weight. This makes it difficult to align the screw hole positions with each other. Thus, Patent Literature 1 has a structure in consideration of workability, in which the top panel and the machine-chamber front panel are both provided with a temporary fixing portion at which the top panel and the machine-chamber front panel can be temporarily fixed to align their screw hole positions with each other.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2012-220127

Summary of Invention

Technical Problem

[0004] In Patent Literature 1, the top panel is formed with a groove-shaped portion as the temporary fixing portion. However, there is a problem in that the appearance of this groove-shaped portion can be perceived as a dent, and makes the design unattractive.

[0005] The outdoor unit of the present disclosure has been made to overcome the above problem, and aims to provide an outdoor unit for an air-conditioning apparatus that can minimize an unattractive design and can also maintain workability.

Solution to Problem

[0006] An outdoor unit for an air-conditioning apparatus according to an embodiment of the present disclosure includes an outer box having a machine chamber formed therein in which a compressor is placed, wherein the outer box includes a machine-chamber front panel placed on a front side of the machine chamber and removable from the outer box, and a top panel to cover a top surface, in a front surface of the top panel, a top-panel screw hole into which a screw is inserted, and a curled portion having a shape curled toward an inner side at a lower end of the top panel are provided, on a front surface of the machine-chamber front panel, at an upper portion thereof, an insertion portion is formed and recessed backward, the insertion portion is provided with a front-panel screw hole into which a screw is inserted, and a protruding portion with a shape projecting toward a front side, and when the insertion portion is inserted inside a front surface of the top panel, and a position of the top-panel screw hole is aligned with a position of the front-panel screw hole, the protruding portion is engaged with the curled portion.

Advantageous Effects of Invention

[0007] In the outdoor unit for an air-conditioning apparatus according to an embodiment of the present disclosure, when the insertion portion is inserted inside the front surface of the top panel, and the position of the top-panel screw hole is aligned with the position of the front-panel screw hole, the protruding portion is engaged with the curled portion, so that the machine-chamber front panel can be temporarily fixed to the top panel. The curled portion has a shape curled toward the inner side of the top panel, and the protruding portion is positioned inside the front surface of the top panel. Thus, the curled portion and the protruding portion can hardly be seen from outside. Therefore, the outdoor unit can minimize the unattractive design and can also maintain workability.

Brief Description of Drawings

[0008]

[Fig. 1] Fig. 1 is a perspective view of an outdoor unit for an air-conditioning apparatus according to an embodiment of the present disclosure when viewed from the front top right side.

[Fig. 2] Fig. 2 is a schematic plan view of the interior of the outdoor unit for an air-conditioning apparatus according to the embodiment of the present disclosure.

[Fig. 3] Fig. 3 is a cross-sectional schematic view of a temporary fixing portion and surroundings of the temporary fixing portion immediately before a machine-chamber front panel of the outdoor unit for an air-conditioning apparatus according to the embodiment of the present disclosure is mounted to a top panel.

[Fig. 4] Fig. 4 is a cross-sectional schematic view of the temporary fixing portion and surroundings of the temporary fixing portion in a state where the machine-chamber front panel of the outdoor unit for an air-conditioning apparatus according to the embod-

iment of the present disclosure is mounted to an outer box.

Description of Embodiment

[0009] An embodiment of the present disclosure will be described hereinafter with reference to the drawings. Note that the present disclosure is not limited by the embodiment described below. In addition, the relationship of sizes of the parts in the drawings described below may differ from the actual sizes.

Embodiment

[0010] Fig. 1 is a perspective view of an outdoor unit 100 for an air-conditioning apparatus according to an embodiment of the present disclosure when viewed from the front top right side. Fig. 2 is a schematic plan view of the interior of the outdoor unit 100 for an air-conditioning apparatus according to the embodiment of the present disclosure.

[0011] With reference to Fig. 1 and Fig. 2, the configuration of the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment will be described below.

[0012] Note that in the following descriptions, for ease of understanding, directional terms, for example, "up," "down," "right," "left," "front," and "rear," may be used as appropriate. These directional terms are used herein solely for description purposes, and should not be construed to limit the scope of the disclosure of the present application. In the present embodiment, the directional terms, such as "up," "down," "right," "left," "front," and "rear," are used when the outdoor unit 100 is viewed from the front.

[0013] The outdoor unit 100 for an air-conditioning apparatus according to the present embodiment includes a box-shaped outer box 1 constituting the outer casing as shown in Fig. 1. Also as shown in Fig. 2, the outdoor unit 100 includes a separator 10 to partition the interior of the outer box 1 into a fan chamber 10A and a machine chamber 10B.

[0014] The fan chamber 10A is formed on the left of the interior of the outer box 1. In the fan chamber 10A, an outdoor heat exchanger 5 to exchange heat between air and refrigerant, and a fan 4 to deliver air to the outdoor heat exchanger 5 are placed. The machine chamber 10B is formed on the right of the interior of the outer box 1. In the machine chamber 10B, a compressor 2 to compress refrigerant, and an electrical component box (not shown) to accommodate therein various types of electrical components are placed.

[0015] Note that in the present embodiment, two fans 4 are provided in an up-and-down direction as shown in Fig. 1. However, the number of the fans 4 is not limited thereto. At least one fan 4 may be provided.

[0016] As shown in Fig. 1, the outer box 1 includes a top panel 20 to cover a top surface, and a machine-chamber panel 30 to cover the machine chamber 10B formed on the right of the interior of the outer box 1. The machine-chamber panel 30 is made up of a machine-chamber front panel 31 to cover an upper portion of the machine-chamber front surface, and a forward upper portion of the machine-chamber right side, a lower machine-chamber front panel 32 to cover a lower portion of the machine-chamber front surface and a forward lower portion of the machine-chamber right side, a machine-chamber rear panel 33 to cover a rearward upper portion of the machine-chamber right side, and an upper portion of the machine-chamber back surface, and a lower machine-chamber rear panel 34 to cover a rearward lower portion of the machine-chamber right side and a lower portion of the machine-chamber back surface.

[0017] The machine-chamber front panel 31 forms a part of the outer box 1, and is configured to be removable from the outer box 1.

[0018] Fig. 3 is a cross-sectional schematic view of a temporary fixing portion and surroundings of the temporary fixing portion immediately before the machine-chamber front panel 31 of the outdoor unit 100 for an air-conditioning apparatus according to the embodiment of the present disclosure is mounted to the top panel 20. Note that Fig. 3 shows a part of the vertical cross section when the outdoor unit 100 is viewed from the right side.

[0019] Next, the structure of the temporary fixing portion of the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment will be described with reference to Fig. 3.

[0020] As shown in Fig. 3, on the front surface of the top panel 20, a top-panel screw hole 20b is formed, into which a fixing screw 7 (see Fig. 4 described later) is inserted. At an end portion of the top panel 20 below the top-panel screw hole 20b, a curled portion 20a is provided. The curled portion 20a has a shape curled toward the inner side of the top panel 20.

[0021] At an upper portion of the front surface of the machine-chamber front panel 31, an insertion portion 40 is formed and recessed toward the back side. The insertion portion 40 is provided with a front-panel screw hole 40b, a protruding portion 40a, and a recessed portion 40c. The screw 7 is inserted into the front-panel screw hole 40b. The protruding portion 40a is provided below the front-panel screw hole 40b, and has a shape projecting toward the front side to be engaged with the curled portion 20a of the top panel 20. The recessed portion 40c is provided below the protruding portion 40a, and has a shape recessed toward the back side to accommodate therein the curled portion 20a of the top panel 20.

[0022] As described above, the temporary fixing portion of the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment is made up of the curled portion 20a of the top panel 20, and the protruding portion 40a and the recessed portion 40c of the machine-chamber front panel 31.

[0023] The protruding portion 40a, the front-panel screw hole 40b, and the recessed portion 40c of the ma-

chine-chamber front panel 31 are provided in the insertion portion 40 recessed toward the back side, and are positioned on the inner side of the outer box 1 relative to the other portion of the front surface of the machine-chamber front panel 31, that is, relative to the lower portion below the insertion portion 40.

[0024] The top-panel screw hole 20b is provided above the curled portion 20a. The protruding portion 40a is provided below the front-panel screw hole 40b.

[0025] The distance on the top panel 20 between the top-panel screw hole 20b and the curled portion 20a is approximately equal to the distance on the machine-chamber front panel 31 between the front-panel screw hole 40b and the recessed portion 40c.

[0026] In the present embodiment, one protruding portion 40a is provided in the insertion portion 40. However, the configuration is not limited thereto, and two or more protruding portions 40a may be provided.

[0027] Fig. 4 is a cross-sectional schematic view of the temporary fixing portion and surrounding of the temporary fixing portion in a state where the machine-chamber front panel 31 of the outdoor unit 100 for an air-conditioning apparatus according to the embodiment of the present disclosure is mounted to the outer box 1. Note that Fig. 4 shows a part of the vertical cross section when the outdoor unit 100 is viewed from the right side.

[0028] Next, a method for mounting the machine-chamber front panel 31 of the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment to the outer box 1 will be described with reference to Fig. 3 and Fig. 4.

[0029] As shown in Fig. 3, in a state where the front surface of the top panel 20 and the front surface of the machine-chamber front panel 31 are at the same position in a front-and-rear direction, the insertion portion 40 of the machine-chamber front panel 31 is moved upward to be inserted inside the front surface of the top panel 20. The position of the top-panel screw hole 20b is aligned with the position of the front-panel screw hole 40b in the up-and-down direction.

[0030] At this time, as shown in Fig. 4, the protruding portion 40a of the machine-chamber front panel 31 is engaged with the curled portion 20a of the top panel 20, and the curled portion 20a of the top panel 20 is accommodated in the recessed portion 40c of the machine-chamber front panel 31, so that the machine-chamber front panel 31 is temporarily fixed to the top panel 20. In this state, the machine-chamber front panel 31 is fixed to the top panel 20 with the screw 7.

[0031] In the conventional structure, a groove-shaped portion is formed as a temporary fixing portion on a top panel. There is thus a problem in that the appearance of this groove-shaped portion can be perceived as a dent, and makes the design unattractive.

[0032] In the present embodiment, the curled portion 20a is provided as the temporary fixing portion on the top panel 20. The curled portion 20a has a shape curled toward the inner side of the top panel 20. In the mounted state of the machine-chamber front panel 31 to the top panel 20, the protruding portion 40a and the recessed portion 40c of the machine-chamber front panel 31 are positioned inside the front surface of the top panel 20. That is, in the mounted state of the machine-chamber front panel 31 to the top panel 20, the temporary fixing portion can hardly be seen from outside. This can minimize the unattractive design of the outdoor unit 100 and can also maintain workability.

[0033] In the conventional structure, an insertion portion is formed as a temporary fixing portion at an upper portion of a machine-chamber front panel. When this insertion portion is inserted inside the top panel, the insertion portion is pressed by a groove-shaped portion formed on the top panel and thus becomes deflected toward the back side, so that a reactive force against the pressing force brings the insertion portion into close contact with the inner side of the top panel to be temporarily fixed to the top panel. However, in this conventional structure, even when the machine-chamber front panel is mounted to the top panel, the insertion portion of the machine-chamber front panel is still deflected. The deflection caused by mounting the machine-chamber front panel to the top panel deforms a part of the insertion portion of the machine-chamber front panel. This leads to a problem that it is difficult to align the screw hole positions of the machine-chamber front panel and the top panel with each other, and this makes it difficult to screw the machine-chamber front panel to the top panel.

[0034] In the present embodiment, the insertion portion 40 is provided with the protruding portion 40a, the front-panel screw hole 40b, and the recessed portion 40c of the machine-chamber front panel 31, and this insertion portion 40 is positioned on the inner side of the outer box 1 relative to the other portion of the front surface of the machine-chamber front panel 31. The protruding portion 40a of the machine-chamber front panel 31 is engaged with the curled portion 20a of the top panel 20, and the curled portion 20a of the top panel 20 is accommodated in the recessed portion 40c of the machine-chamber front panel 31, so that the machine-chamber front panel 31 is temporarily fixed to the top panel 20.

[0035] As described above, when the machine-chamber front panel 31 is temporarily fixed to the top panel 20, the curled portion 20a of the top panel 20 is accommodated in the recessed portion 40c. With this structure, at the time of the temporary fixing, a stress only acts on the protruding portion 40a. Thus, the machine-chamber front panel 31 and the top panel 20 can be screwed to each other in a state where such an external force as to deflect and deform the machine-chamber front panel 31 is hardly applied. That is, the machine-chamber front panel 31 and the top panel 20 can be screwed to each other without deforming the machine-chamber front panel 31. Consequently, this can prevent a case where it is difficult to align the position of the top-panel screw hole 20b with the position of the front-panel screw hole 40b, and deformation of the machine-chamber front panel 31

makes it difficult to screw the machine-chamber front panel 31 to the top panel 20.

[0036] In the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment, the distance on the top panel 20 between the top-panel screw hole 20b and the curled portion 20a is approximately equal to the distance on the machine-chamber front panel 31 between the front-panel screw hole 40b and the recessed portion 40c. It is thus easy to align the position of the top-panel screw hole 20b with the position of the front-panel screw hole 40b in the up-and-down direction, so that the machine-chamber front panel 31 and the top panel 20 can be easily screwed to each other.

[0037] The outdoor unit 100 for an air-conditioning apparatus according to the present embodiment includes the outer box 1 having the machine chamber 10B formed therein to place the compressor 2 in the machine chamber 10B, wherein the outer box 1 includes the machine-chamber front panel 31 placed on the front side of the machine chamber 10B and removable from the outer box 1, and the top panel 20 to cover the top surface, and on the front surface of the top panel 20, the top-panel screw hole 20b into which the screw 7 is inserted, and the curled portion 20a having a shape curled toward the inner side at the lower end of the top panel 20 are provided, and on the front surface of the machine-chamber front panel 31, at the upper portion thereof, the insertion portion 40 is formed and recessed toward the back side, the insertion portion 40 is provided with the front-panel screw hole 40b into which the screw 7 is inserted, and the protruding portion 40a with a shape projecting toward the front side, and when the insertion portion 40 is inserted inside the front surface of the top panel 20, and the position of the top-panel screw hole 20b is aligned with the position of the front-panel screw hole 40b, the protruding portion 40a is engaged with the curled portion 20a.

[0038] In the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment, when the insertion portion 40 is inserted inside the front surface of the top panel 20, and the position of the top-panel screw hole 20b is aligned with the position of the front-panel screw hole 40b, the protruding portion 40a is engaged with the curled portion 20a, so that the machine-chamber front panel 31 can be temporarily fixed to the top panel 20. The curled portion 20a has a shape curled toward the inner side of the top panel 20, and the protruding portion 40a is positioned inside the front surface of the top panel 20. Thus, the curled portion 20a and the protruding portion 40a can hardly be seen from outside. With this structure, the outdoor unit 100 for an air-conditioning apparatus, in which the outdoor unit 100 includes the machine-chamber front panel 31 removable from the outer box 1, can minimize the unattractive design and can also maintain workability.

[0039] In the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment, the insertion portion 40 is provided with the recessed portion 40c with a shape recessed toward the back side, the recessed portion 40c is provided below the protruding portion 40a, and when the insertion portion 40 is inserted inside the front surface of the top panel 20, and the position of the top-panel screw hole 20b is aligned with the position of the front-panel screw hole 40b, the curled portion 20a is accommodated in the recessed portion 40c.

[0040] In the outdoor unit 100 for an air-conditioning apparatus according to the present embodiment, when the machine-chamber front panel 31 is temporarily fixed to the top panel 20, the curled portion 20a of the top panel 20 is accommodated in the recessed portion 40c. With this structure, at the time of the temporary fixing, a stress only acts on the protruding portion 40a. Thus, the machine-chamber front panel 31 and the top panel 20 can be screwed to each other in a state where such an external force as to deflect and deform the machine-chamber front panel 31 is not applied. That is, the machine-chamber front panel 31 and the top panel 20 can be screwed to each other without deforming the machine-chamber front panel 31. Consequently, this can prevent a case where it is difficult to align the position of the top-panel screw hole 20b with the position of the front-panel screw hole 40b, and deformation of the machine-chamber front panel 31 makes it difficult to screw the machine-chamber front panel 31 to the top panel 20.

Reference Signs List

[0041]

1 outer box 2 compressor 4 fan 5 outdoor heat exchanger
7 screw 10 separator 10A fan chamber 10B machine chamber 20 top panel 20a curled portion 20b top-panel screw hole 30 machine-chamber panel 31 machine-chamber front panel 32 lower machine-chamber front panel 33 machine-chamber rear panel 34 lower machine-chamber rear panel 40 insertion portion 40a protruding portion 40b front-panel screw hole 40c recessed portion 100 outdoor unit

Claims

1. An outdoor unit for an air-conditioning apparatus, the outdoor unit comprising an outer box having a machine chamber formed therein in which a compressor is placed, wherein
the outer box includes
a machine-chamber front panel placed on a front side of the machine chamber and removable from the outer box, and
a top panel to cover a top surface,
in a front surface of the top panel, a top-panel screw hole into which a screw is inserted, and a curled portion having a shape curled toward an inner side at a lower end of the top panel are provided,
on a front surface of the machine-chamber front pan-

el, at an upper portion thereof, an insertion portion is formed and recessed backward,
the insertion portion is provided with a front-panel screw hole into which a screw is inserted, and a protruding portion with a shape projecting toward a front side, and
when the insertion portion is inserted inside a front surface of the top panel, and a position of the top-panel screw hole is aligned with a position of the front-panel screw hole, the protruding portion is engaged with the curled portion.

2. The outdoor unit for an air-conditioning apparatus of claim 1, wherein
the insertion portion is provided with a recessed portion with a shape recessed backward,
the recessed portion is provided below the protruding portion, and
when the insertion portion is inserted inside a front surface of the top panel, and a position of the top-panel screw hole is aligned with a position of the front-panel screw hole, the curled portion is accommodated in the recessed portion.

3. The outdoor unit for an air-conditioning apparatus of claim 1 or 2, wherein the protruding portion is provided below the front-panel screw hole.

FIG. 1

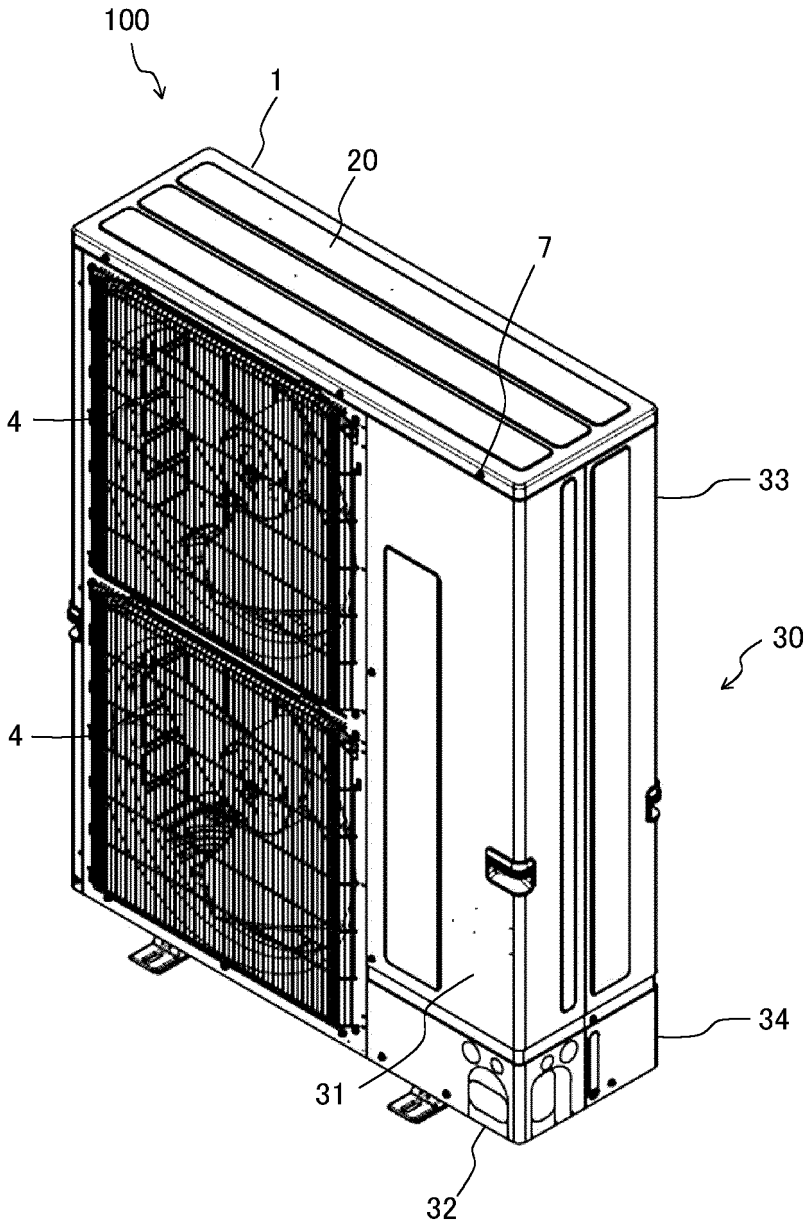


FIG. 2

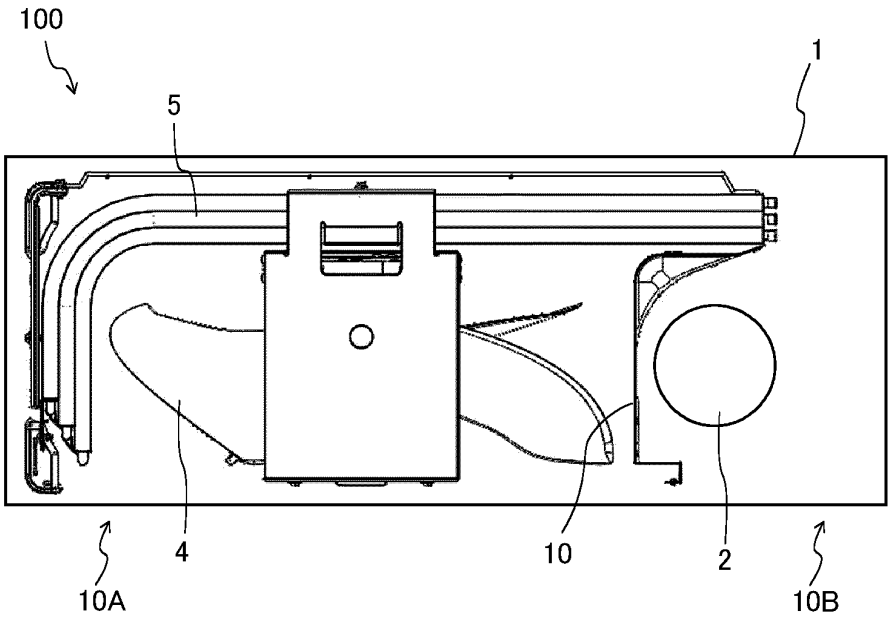


FIG. 3

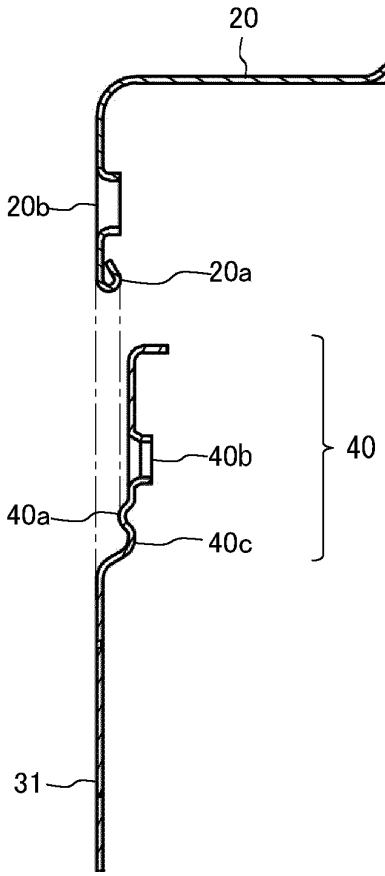
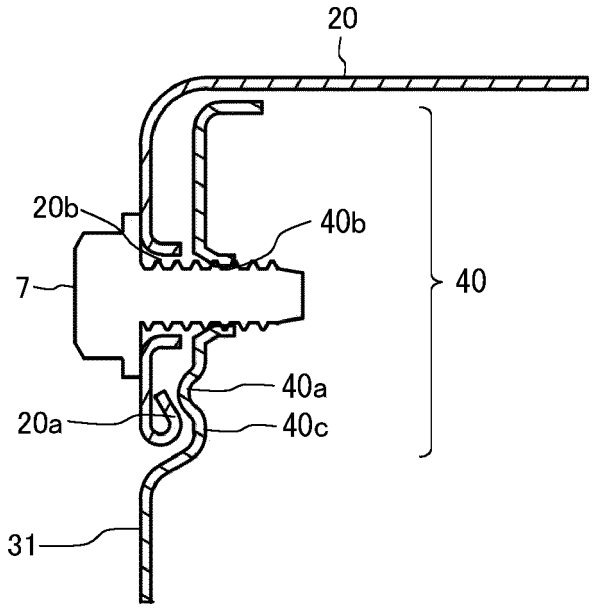


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/002815

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F24F1/56(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. F24F1/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2012-220127 A (PANASONIC CORPORATION) 12 November 2012, paragraphs [0021]-[0028], fig. 1-6 (Family: none)	1-3
Y	JP 2010-164221 A (PANASONIC CORPORATION) 29 July 2010, paragraphs [0021]-[0037], fig. 1-5 (Family: none)	1-3
A	CN 103375900 A (ZHUHAI GREE ELECTRICAL APPLIANCES INC.) 30 October 2013, entire text, all drawings (Family: none)	1-3

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search 08.03.2018	Date of mailing of the international search report 20.03.2018
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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Patent documents cited in the description

- JP 2012220127 A **[0003]**