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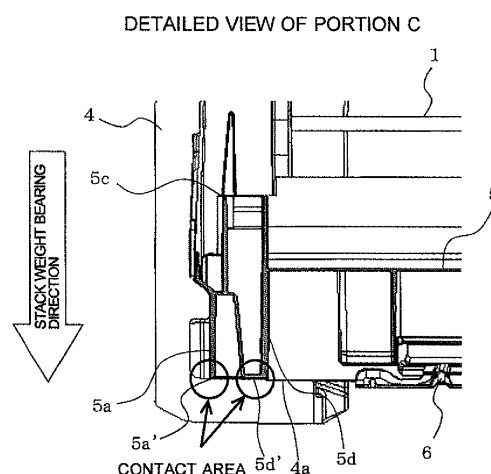
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(54) **Indoor unit for air-conditioning apparatus**

(57) [Object] Provided is an indoor unit for an air-conditioning apparatus, which prevents a part of its casing from digging into a cushioning member even when the indoor unit is stacked up in its packed state and which, therefore, archives the ease of unpacking.

[Solution] An indoor unit for an air-conditioning apparatus includes a designed side rib part 5a and a designed side planar part 5d. The designed side rib part 5a is provided so as to protrude along the short direction of a casing 5, and has a distal end portion 5a' having a linear shape in rear view. The designed side planar part 5d is provided so as to protrude along the short direction of the casing 5, and has a distal end portion 5d' having a substantially rectangular shape in rear view. When a cushioning member 4 for packing is fitted to the side of the casing 5, both the distal end portion 5a' of the designed side rib part 5a and the distal end portion 5d' of the designed side planar part 5d contact an inner wall 4a of the cushioning member 4 opposite to the distal end portion 5a' of the designed side rib part 5a.

FIG. 6



## Description

[Technical Field]

**[0001]** The present invention relates to an indoor unit for an air-conditioning apparatus, and more specifically, the present invention relates to the structure of the side of a casing.

[Background Art]

**[0002]** In related art, an indoor unit for an air-conditioning apparatus is fitted with a cushioning member made of polystyrene foam or the like so that load due to vibration, impact, or weight bearing during shipping or transport does not transfer to the indoor unit. The indoor unit fitted with such a cushioning member is packed in a corrugated cardboard box or the like and shipped (see Patent Literatures 1 and 2).

**[0003]** Hereinafter, how an indoor unit for an air-conditioning apparatus according to related art is packed will be described with reference to Figs. 7 to 15.

Fig. 7 is a perspective view showing an example of how an indoor unit for an air-conditioning apparatus according to related art is packed as a whole. Fig. 8 is an exploded perspective view showing an example of how the indoor unit for an air-conditioning apparatus according to related art is packed as a whole. Fig. 9 is a perspective front view showing the casing of the indoor unit for an air-conditioning apparatus according to related art. Fig. 10 is a perspective rear view showing the casing of the indoor unit for an air-conditioning apparatus according to related art. Fig. 11 is a cross-sectional view taken along a line D-D of the casing shown in Fig. 9. Fig. 12 is a perspective rear view showing how the indoor unit for an air-conditioning apparatus according to related art is packed as a whole. Fig. 13 is a cross-sectional view taken along a line E-E of the casing shown in Fig. 12. Fig. 14 is a detailed view of a portion F of the casing shown in Fig. 13. Fig. 15 is a detailed view of a portion G of the casing shown in Fig. 13.

As shown in Figs. 7 and 8, an indoor unit for an air-conditioning apparatus has a cushioning member such as polystyrene foam fitted to the both sides. The indoor unit is stored in a corrugated cardboard box in that state, and packed with its outside wrapped with a band. The packed indoor unit for an air-conditioning apparatus is usually stacked up in multiple levels and kept in a warehouse or the like.

[Citation List]

[Patent Literature]

**[0004]**

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2009-113845 (see, for

example, [0002] and Fig. 3)

[Patent Literature 2] Japanese Unexamined Patent Application Publication No. 2008-150068 (see, for example, [0002] and Fig. 1)

[Summary of Invention]

[Technical Problem]

**[0005]** In a case where indoor units for air-conditioning apparatuses as described in each of Patent Literatures 1 and 2 each have a designed side rib part in the form of a protrusion provided on at least one side of a casing of an indoor unit as shown in Figs. 9 to 11, the following problem arises when the indoor units are packed and stacked up in multiple levels.

**[0006]** As the indoor units are stacked up higher and higher, the lower an indoor unit lies in the stack, the greater the weight bearing to the indoor unit in the direction indicated by an arrow in Figs. 13 to 15. At this time, on one side of the indoor unit, only the designed side rib part is in contact with a surface of a cushioning member opposite to the weight bearing direction. Therefore, the weight bearing concentrates at this contact part, and as the weight bearing increases as the number of stacking levels increases, there is a possibility that the distal end portion of the designed side rib part may dig into the cushioning material. As a result, it is difficult to remove the cushioning member from the indoor unit during unpacking, which compromises the ease of unpacking.

**[0007]** The present invention has been developed to solve the above-mentioned problem. Accordingly, it is an object of the present invention to provide an indoor unit for an air-conditioning apparatus, which prevents a part of its casing from digging into a cushioning member even when the indoor unit is stacked up in its packed state and which, therefore, archives the ease of unpacking.

[Solution to Problem]

**[0008]** An indoor unit for an air-conditioning apparatus according to the present invention includes, on at least one side of a casing, a designed side rib part that is provided so as to protrude along a short direction of the casing, the designed side rib part having a distal end portion that has a linear shape in rear view, and a designed side planar part that is provided so as to protrude along the short direction of the casing, the designed side planar part having a distal end portion that has a substantially rectangular shape in rear view. When a cushioning member for packing is fitted to the side of the casing, both the distal end portion of the designed side rib part and the distal end portion of the designed side planar part have contact with an inner wall of the cushioning member opposite to the distal end portion of the designed side rib part.

## [Advantageous Effects of Invention]

**[0009]** The indoor unit for an air-conditioning apparatus according to the present invention prevents a part of the casing from digging into a cushioning member even when the indoor unit is stacked up in its packed state. Therefore, the ease of unpacking is archived.

## [Brief Description of Drawings]

**[0010]**

[Fig. 1] Fig. 1 is a perspective front view showing the casing of an indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is a perspective rear view showing the casing of the indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a cross-sectional view taken along a line A-A of the casing shown in Fig. 1.

[Fig. 4] Fig. 4 is a perspective rear view showing how the indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention is packed as a whole.

[Fig. 5] Fig. 5 is a cross-sectional view taken along a line B-B of the casing shown in Fig. 4.

[Fig. 6] Fig. 6 is a detailed view of a portion C of the casing shown in Fig. 5.

[Fig. 7] Fig. 7 is a perspective view showing an example of how an indoor unit for an air-conditioning apparatus according to related art is packed as a whole.

[Fig. 8] Fig. 8 is an exploded perspective view showing an example of how the indoor unit for an air-conditioning apparatus according to related art is packed as a whole.

[Fig. 9] Fig. 9 is a perspective front view showing the casing of the indoor unit for an air-conditioning apparatus according to related art.

[Fig. 10] Fig. 10 is a perspective rear view showing the casing of the indoor unit for an air-conditioning apparatus according to related art.

[Fig. 11] Fig. 11 is a cross-sectional view taken along a line D-D of the casing shown in Fig. 9.

[Fig. 12] Fig. 12 is a perspective rear view showing how the indoor unit for an air-conditioning apparatus according to related art is packed as a whole.

[Fig. 13] Fig. 13 is a cross-sectional view taken along a line E-E of the casing shown in Fig. 12.

[Fig. 14] Fig. 14 is a detailed view of a portion F of the casing shown in Fig. 13.

[Fig. 15] Fig. 15 is a detailed view of a portion G of the casing shown in Fig. 13.

## [Description of Embodiments]

**[0011]** Embodiments of the present invention will be described below with reference to the drawings.

## Embodiment 1

**[0012]** Fig. 1 is a perspective front view showing the casing of an indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention. Fig. 2 is a perspective rear view showing the casing of the indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention. Fig. 3 is a cross-sectional view taken along a line A-A of the casing shown in Fig. 1. Fig. 4 is a perspective rear view showing how the indoor unit for an air-conditioning apparatus according to Embodiment 1 of the present invention is packed as a whole.

The outward appearance of an indoor unit 1 for an air-conditioning apparatus according to Embodiment 1 includes a casing 5, a design panel 7 mounted on the front of the casing 5, and an installation plate 6 mounted on the rear of the casing 5. The indoor unit 1 can be fixed to a wall or the like with the installation plate 6. When the indoor unit 1 is seen in front view, an electric-component-box storage part 5b, and a designed side rib part 5a are provided on the right hand side (hereinafter, referred to as electric-component-box storage side) and the left hand side (hereinafter, referred to as design side), respectively, of the casing 5.

**[0013]** Various type of machinery such as a heat exchanger and an air sending fan, which are not shown, are provided inside the casing 5. Air that has undergone heat exchange by the heat exchanger is sent indoors by the air sending fan from an air outlet, which is not shown, provided in a lower part of the front of the casing 5.

**[0014]** An electric component box is stored on the electric-component-box storage side of the casing 5. Accordingly, the electric-component-box storage part 5b has a box-like shape that conforms to the contours of the electric component box. The electric-component-box storage part 5b is formed along the short direction of the casing 5 in such a way that its distal end portion has a substantially rectangular shape in rear view.

**[0015]** A heat exchanger holding part 5c for holding the heat exchanger is formed on the design side of the casing 5. Accordingly, by taking mold strength and moldability into consideration, the designed side rib part 5a in the form of a protrusion is provided. The designed side rib part 5a is provided along the short direction of the casing 5 in such a way that a distal end portion 5a' of the designed side rib part 5a protrudes in a linear shape in rear view.

As shown in Fig. 3, the designed side planar part 5d is provided near the designed side rib part 5a. The designed side planar part 5d is provided along the short direction of the casing 5 in such a way that a distal end portion 5d' of the designed side planar part 5d protrudes in a sub-

stantially rectangular shape in rear view. In rear view, the distal end portion 5d' of the designed side planar part 5d is substantially in parallel to the distal end portion 5a' of the designed side rib part 5a, and protrudes to substantially the same distance as the distal end portion 5a' of the designed side rib part 5a.

**[0016]** Fig. 5 is a cross-sectional view taken along a line B-B of the casing shown in Fig. 4. Fig. 6 is a detailed view of a portion C of the casing shown in Fig. 5.

As shown in Fig. 4, a cushioning member 4 such as polystyrene foam is fitted to both sides of the indoor unit 1 for an air-conditioning apparatus according to Embodiment 1 during packing. The cushioning member 4 is fitted to each side of the indoor unit 1, and has a recessed shape that conforms to the shape of the side of the indoor unit 1 as shown in Fig. 8, in order to cover a part of the side of the indoor unit 1. The cushioning member 4a has an inner wall having the recessed shape.

**[0017]** The designed side rib part 5a and the designed side planar part 5d are so positioned that when the cushioning member 4 is fitted to the design face side of the indoor unit 1, their respective distal end portions 5a' and 5b' both have contact with an inner wall 4a of the cushioning member 4 opposite to the distal end portion 5a' of the designed side rib part 5a as shown in Figs. 5 and 6. The indoor unit 1 is stored in a corrugated cardboard box, which is not shown, in that state, and is packed with its outside wrapped with a band 3, which is not shown.

**[0018]** Indoor units each composed of the indoor unit 1 for an air-conditioning apparatus in its packed state are usually stacked up in multiple levels and kept in a warehouse or the like. At this time, the indoor unit 1 is stacked up in such a way that weight acts on the indoor unit 1 in the direction indicated by an arrow in Figs. 5 and 6. That is, the indoor unit 1 is stacked up with its front at the top and its rear at the bottom. As the indoor unit 1 is stacked up higher and higher, the lower the indoor unit 1 lies in the stack, the greater the weight bearing to the contact area between the inner wall 4a of the cushioning member 4, and the distal end portion 5a' of the designed side rib part 5a and the distal end portion 5d' of the designed side planar part 5d.

**[0019]** At this time, if only the distal end portion 5a' of the designed side rib part 5a is in contact with the inner wall 4a of the cushioning member 4, the weight bearing concentrates at the contact area. Accordingly, the lower the indoor unit 1 lies in the stack, the greater the amount that the distal end 5a' of the designed side rib part 5a digs into the cushioning member 4.

**[0020]** However, in Embodiment 1, the distal end portion 5d' of the designed side planar part 5d as well as the distal end portion 5a' of the designed side rib part 5a are also in contact with the cushioning member 4. Consequently, the weight bearing on the contact area can be dispersed, which makes it possible to reduce digging of the distal end portion 5a' of the designed side rib part 5a into the cushioning member 4, even for the indoor unit 1 that lies at the lower level of the stack. Moreover, even

when vibration or impact is applied to the contact area during transport or the like in addition to weight, such loads acting on the contact area can be dispersed.

**[0021]** From the foregoing discussion, by providing the designed side planar part 5d in addition to the designed side rib part 5a on the design side of the casing 5, the area of contact with the inner wall 4a of the cushioning member 4 fitted to the indoor unit 1 during packing can be increased. Therefore, load due to vibration, impact, or weight bearing during shipping, transport, or the like can be dispersed at the contact area, thereby reducing its digging of the distal end portion 5a' of the designed side rib part 5a into the cushioning material 4.

As a result, the cushioning member 4 can be smoothly removed from the indoor unit 1 during unpacking, and the ease of unpacking is archived.

**[0022]** In Embodiment 1, the electric-component-box storage side of the casing 5 is provided with the electric-component-box storage part 5b having a substantially rectangular distal end portion. Accordingly, on the electric-component-box storage side, the distal end portion of the electric-component-box storage part 5b is unlikely to dig into the cushioning member 4. Therefore, if only the designed side rib part 5a is provided on the design side of the casing 5, the distal end portion 5a' of the designed side rib part 5a digs into the cushioning member 4 only on the design side, causing only the design side to sag. Consequently, in a case where the indoor unit 1 is stacked up in multiple levels, the stack tilts and collapses.

**[0023]** However, the provision of the designed side planar part 5d on the design side makes it possible to reduce tilting and the resulting collapse of the stack.

**[0024]** While Embodiment 1 is directed to the case where the designed side rib part 5a is provided only on one side of the casing 5, the present invention is also applicable to a case where the designed side rib part 5a is provided on each of both sides of the casing 5.

**[0025]** In addition, the larger the area of the substantially rectangular shape of the distal end portion 5d' of the designed side planar part 5d, the more the load due to vibration, impact, or weight can be dispersed.

#### [Reference Signs List]

**[0026]** 1 indoor unit, 2 corrugated cardboard box, 3 band, 4 cushioning member, 4a inner wall, 5 casing, 5a designed side rib part, 5a' distal end portion, 5b electric-component-box storage part, 5c heat exchanger holding part, 5d designed side planar part, 5d' distal end portion, 6 installation plate, 7 design panel

#### Claims

1. An indoor unit for an air-conditioning apparatus, the indoor unit comprising: on at least one side of a casing (5),

a designed side rib part (5a) that is provided so as to protrude along a short direction of the casing (5), the designed side rib part (5a) having a distal end portion (5a') that has a linear shape in rear view; and a designed side planar part (5d) that is provided so as to protrude along the short direction of the casing (5), the designed side planar part (5d) having a distal end portion (5d') that has a substantially rectangular shape in rear view, wherein when a cushioning member (4) for packing is fitted to the side of the casing (5), both the distal end portion (5a') of the designed side rib part (5a) and the distal end portion (5d') of the designed side planar part (5d) have contact with an inner wall (4a) of the cushioning member (4) opposite to the distal end portion (5a') of the designed side rib part (5a).

2. The indoor unit for an air-conditioning apparatus of claim 1, wherein the distal end portion (5d') of the designed side planar part (5d) protrudes substantially in parallel to the distal end portion (5a') of the designed side rib part (5a).
3. The indoor unit for an air-conditioning apparatus of claim 1 or 2, wherein the casing (5) has the designed side rib part (5a) and the designed side planar part (5d) on each of both sides of the casing (5).

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FIG. 1

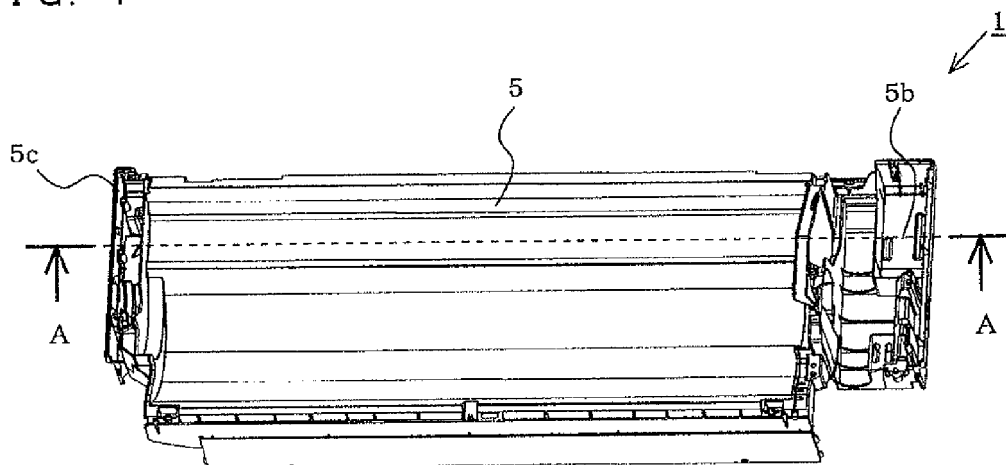


FIG. 2

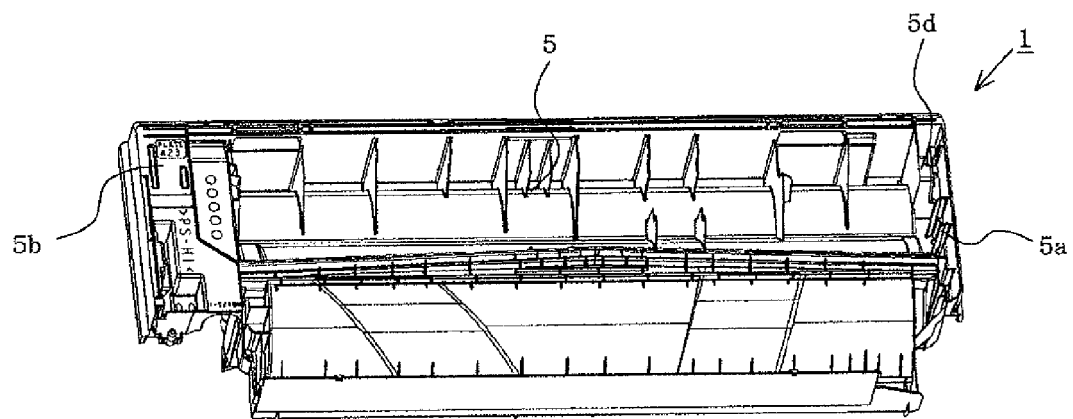


FIG. 3

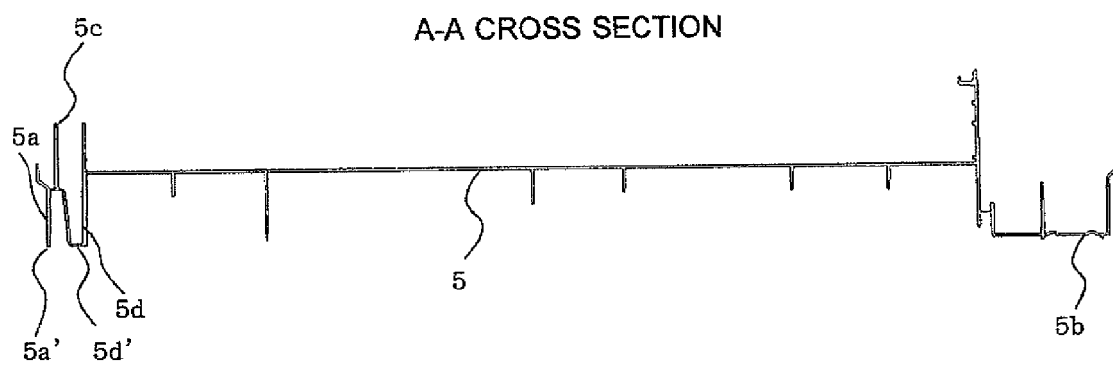


FIG. 4

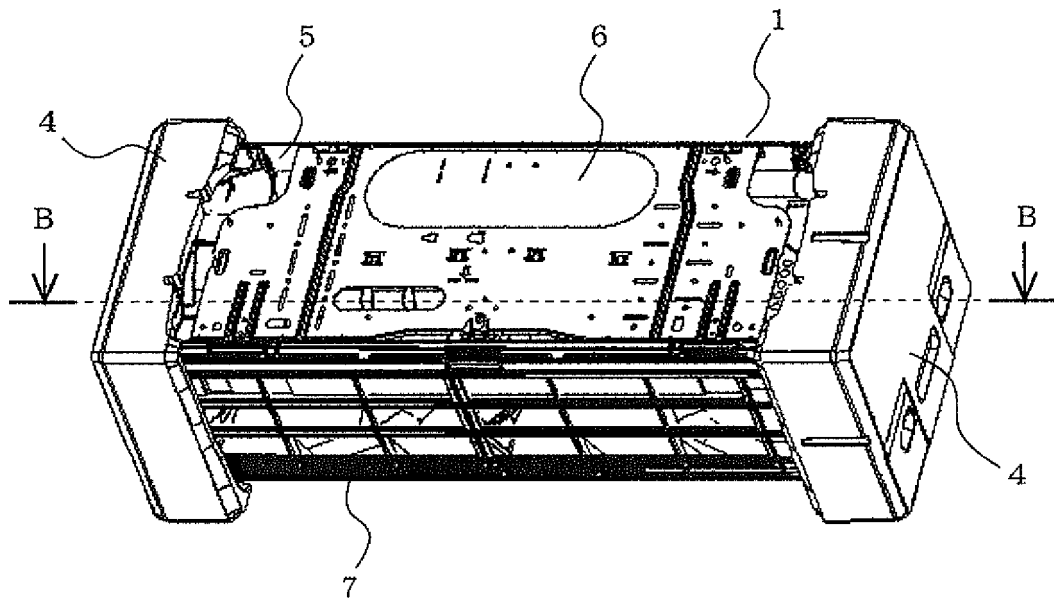


FIG. 5

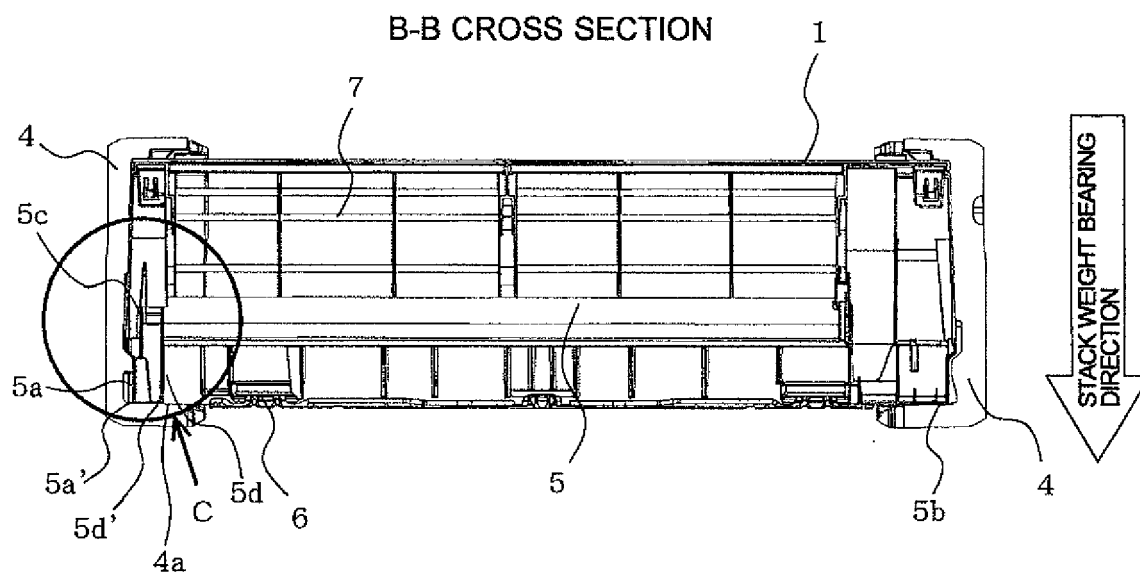


FIG. 6

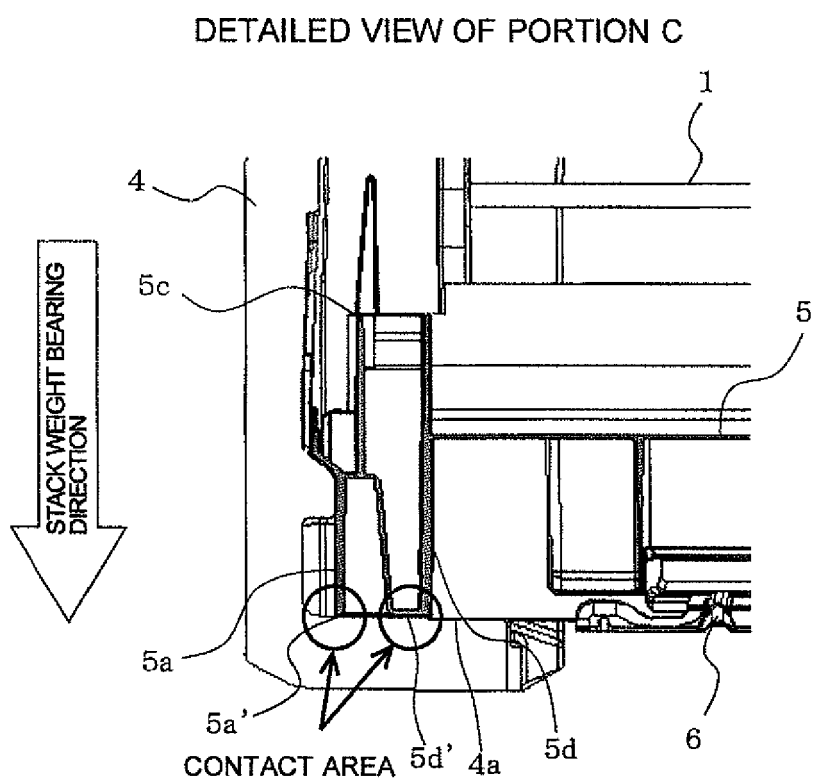




FIG. 7

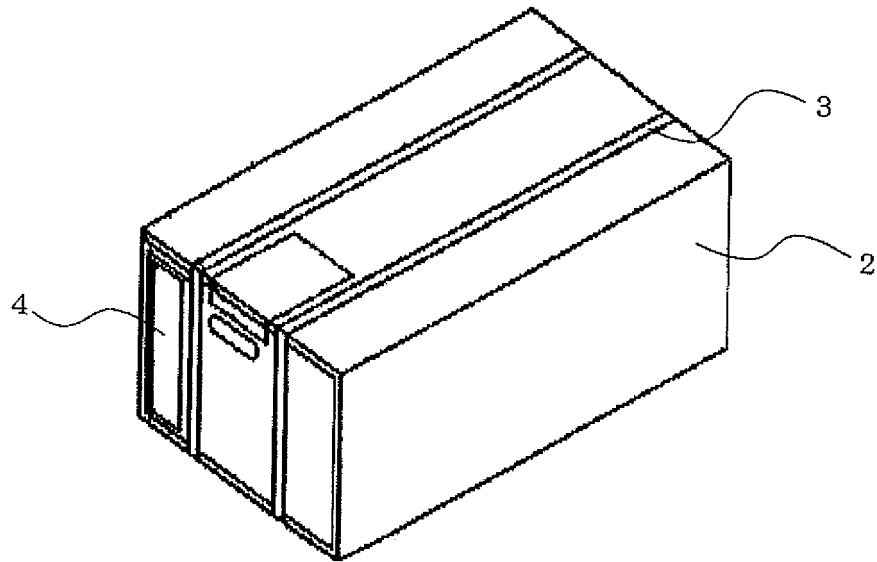


FIG. 8

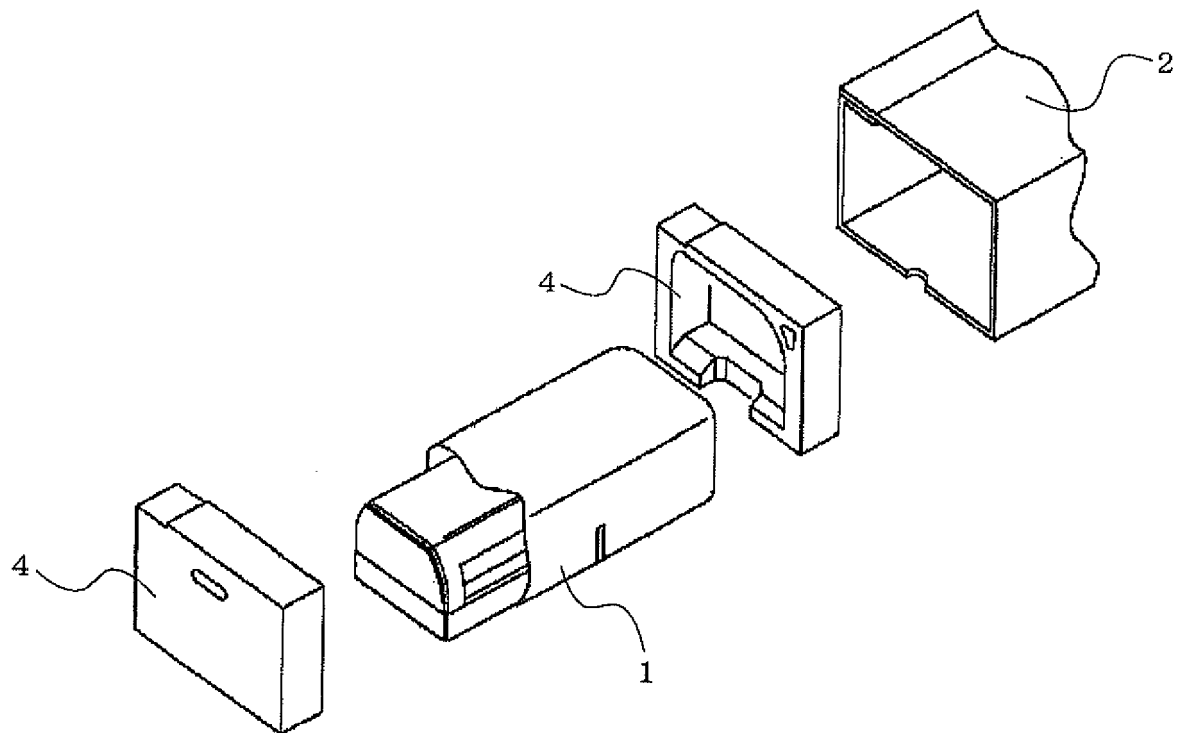


FIG. 9

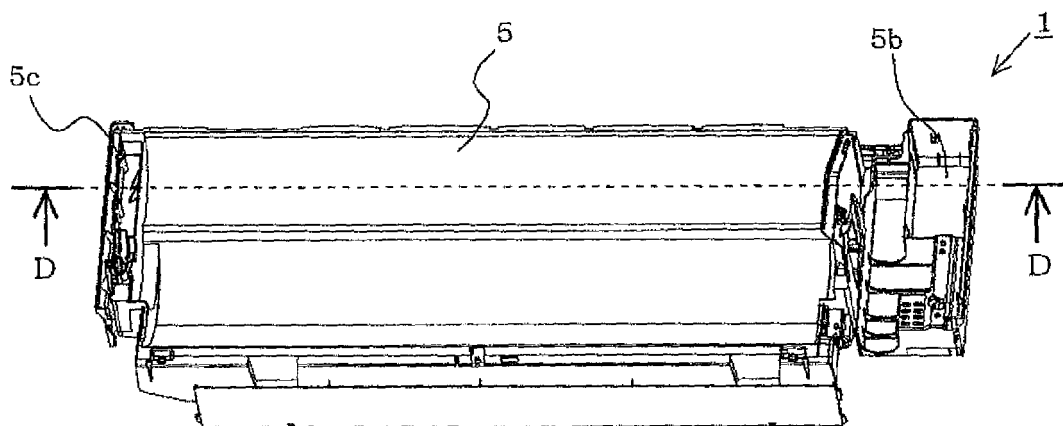


FIG. 10

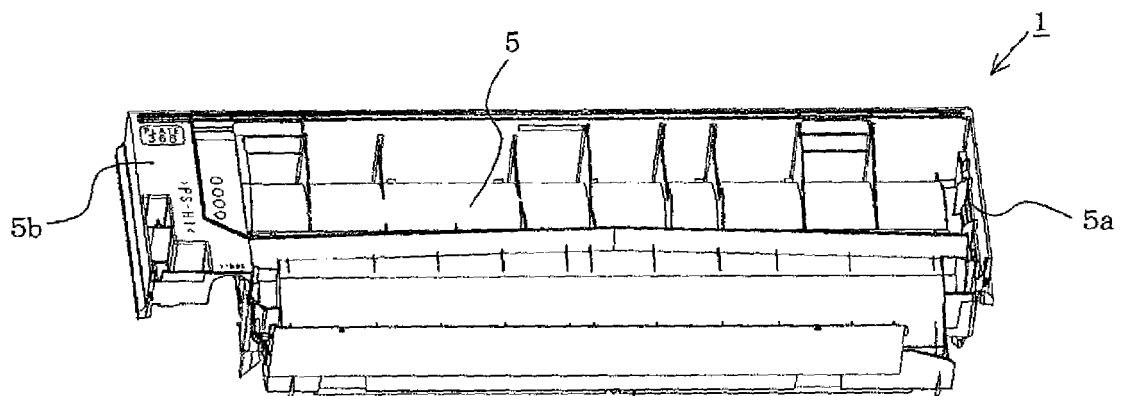


FIG. 11

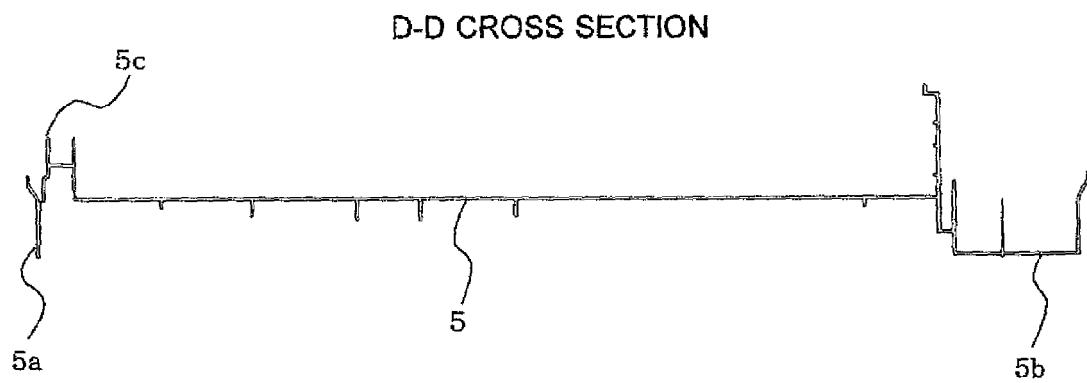


FIG. 12

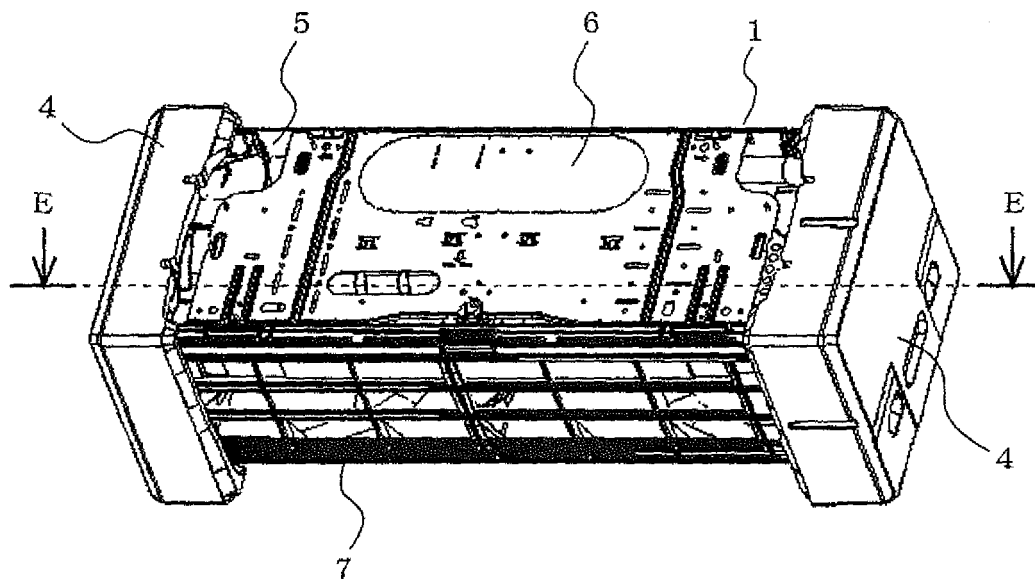


FIG. 13

E-E CROSS SECTION

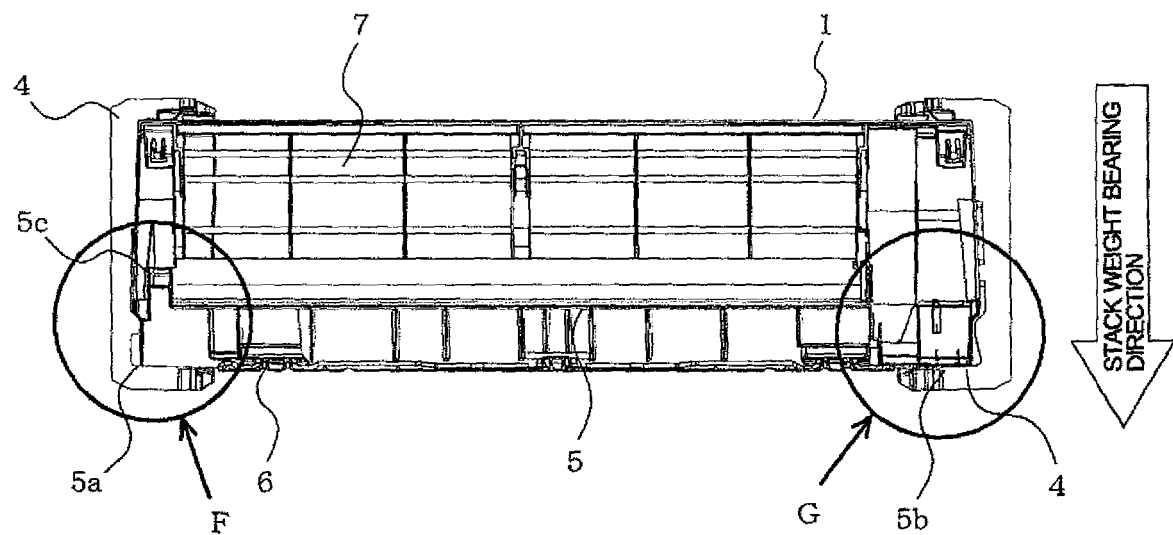


FIG. 14

DETAILED VIEW OF PORTION F

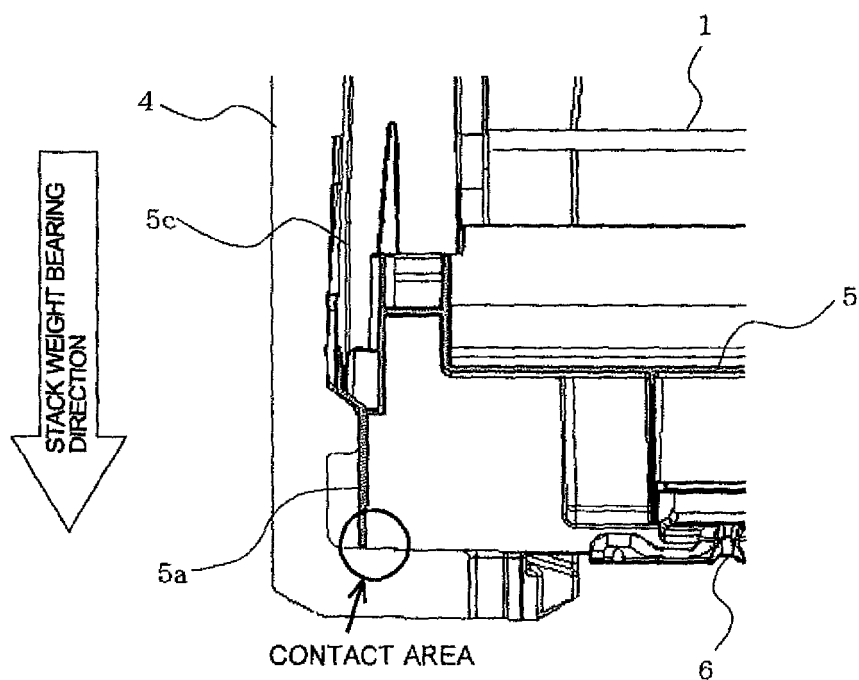
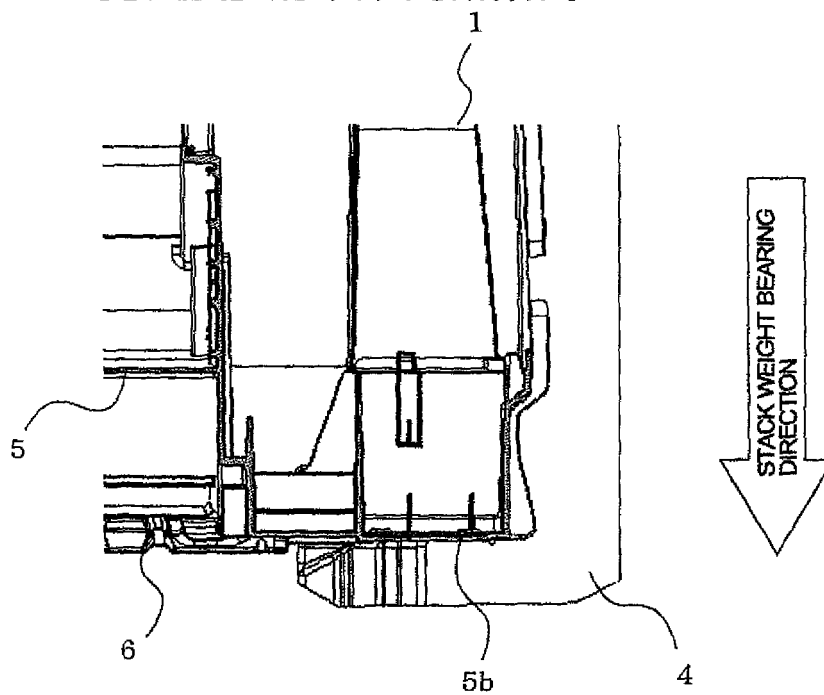


FIG. 15

DETAILED VIEW OF PORTION G



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 2009113845 A [0004]
- JP 2008150068 A [0004]