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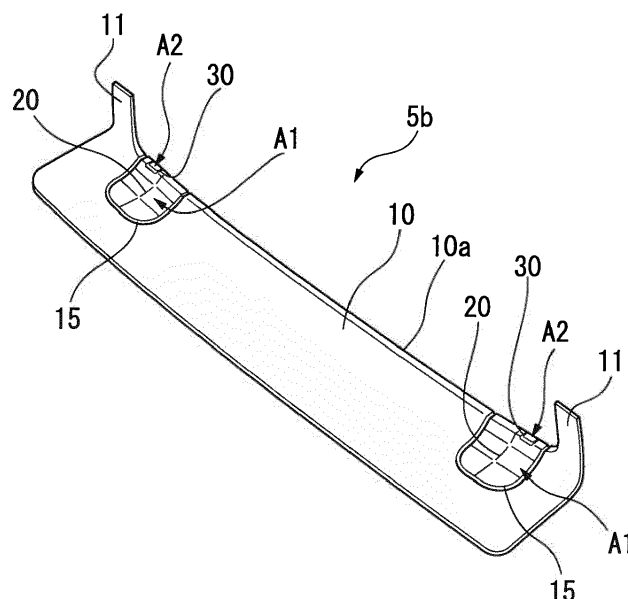
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(54) **OUTER SURFACE PANEL, INDOOR UNIT OF AIR CONDITIONER, METHOD OF KNOCKING OUT, AND METHOD OF INSTALLING INDOOR UNIT OF AIR CONDITIONER**

(57) An outer surface panel includes a panel main body 10 that is provided on a surface of a casing of an indoor unit of an air conditioner accommodating a blower fan and a heat exchanger therein. The panel main body 10 is provided with an outer peripheral groove 15 that is recessed from an inside of the panel main body 10 and

extends so as to enclose a knockout portion A1 that is one region on the panel main body 10, and an inner groove 20 that is recessed from the inside of the panel main body 10, is connected to the outer peripheral groove 15, and extends so as to partition the knockout portion A1.

FIG. 2



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an outer surface panel of an indoor unit of an air conditioner, an indoor unit including an outer surface panel, a method of knocking out a knockout portion of an outer surface panel, and a method of installing an indoor unit.

Description of Related Art

[0002] In the related art, there is known an air conditioner which performs adjustment of a temperature and humidity by taking air in a room, and then supplies air into the room. The air conditioner includes an indoor unit that is provided in a room and an outdoor unit that is connected to the indoor unit by piping and is provided outside the room.

[0003] The indoor unit of the air conditioner is provided with an outer surface panel so as to cover a casing that accommodates a blower and a heat exchanger. The outer surface panel is provided with a knockout portion enclosed by a groove having a reduced thickness of the outer surface panel so that the piping connecting the indoor unit and the outdoor unit penetrates the outer surface panel so as to be disposed and a part of the outer surface panel can be removed. For example, such a knockout portion is disclosed in Japanese Unexamined Utility Model Application, First Publication No. H2-65012.

SUMMARY OF THE INVENTION

Technical Problem

[0004] However, there are a plurality of standards (dimensions) in the piping connecting the indoor unit and the outdoor unit. Therefore, in a case where a dimension of the knockout portion removed from the outer surface panel with respect to a diameter of the piping is large, an inner casing inside the outer surface panel is exposed to the outside, which may degrade aesthetic appearance. Here, in the knockout portion disclosed in the related art, it is difficult to adjust an opening diameter according to the diameter of the piping.

[0005] An object of the invention is to provide an outer surface panel capable of easily setting a region to be removed by a knockout portion without degrading aesthetic appearance, an indoor unit of an air conditioner including the outer surface panel, a method of knocking out, and a method of installing an indoor unit of an air conditioner. Solution to Problem

[0006] An outer surface panel conditioner according to a first aspect of the invention includes a panel main body that is provided on a surface of a casing of an indoor unit of an air conditioner accommodating a blower fan and a

heat exchanger therein. The panel main body is provided with an outer peripheral groove that is recessed from an inside of the panel main body and extends so as to enclose a knockout portion that is one region on the panel main body, and an inner groove that is recessed from the inside of the panel main body, is connected to the outer peripheral groove, and extends so as to partition the knockout portion.

[0007] In such an outer surface panel, the outer peripheral groove and the inner groove are provided from the inside. Therefore, in a state where the panel main body is attached to the casing, the outer peripheral groove and the inner groove cannot be visually recognized from the outside. Therefore, the aesthetic appearance of the indoor unit is not degraded. Furthermore, since the inner groove is provided in the panel main body in addition to the outer peripheral groove, not only the entire knockout portion but also only a region partitioned by the outer peripheral groove and the inner groove, which is a part of the knockout portion, can be removed. Therefore, for example, in a case where piping connecting the indoor unit and the outdoor unit is disposed to penetrate the panel main body in the knockout portion, only a part of the knockout portion can be removed from the panel main body according to a diameter of the piping. Therefore, it is possible to reduce a gap between the piping and the panel main body and to prevent the casing of the inside of the panel main body from being exposed to the outside.

[0008] In addition, it is possible to easily remove the region partitioned by the outer peripheral groove and the inner groove, which is the region of a part of the knockout portion by partitioning the knockout portion by the inner groove and by notching the groove.

[0009] In addition, in the outer surface panel according to a second aspect of the invention, in the outer surface panel according to the first aspect, the inner groove may have a longitudinal groove and a lateral groove crossing the longitudinal groove so that the inner groove may be provided in a lattice shape.

[0010] As described above, it is possible to finely partition the region of the knockout portion by providing the inner groove in the lattice shape. Therefore, it is possible to further easily remove a part of the knockout portion according to the diameter of the piping connecting the indoor unit and the outdoor unit.

[0011] In addition, in the outer surface panel according to a third aspect of the invention, in the outer surface panel according to the second aspect, a groove width of the inner groove may be smaller than a groove width of the outer peripheral groove.

[0012] As described above, for example, first, the knockout portion is cut along the outer peripheral groove and then a part of the knockout portion partitioned by the outer peripheral groove and the inner groove is gripped to apply a force by providing the inner groove. Therefore, the stress concentrates on the inner groove having the smaller groove width. Therefore, it is possible to easily

remove a part of the knockout portion partitioned by the outer peripheral groove and the inner groove.

[0013] In addition, an indoor unit of an air conditioner according to a fourth aspect of the invention includes the outer surface panel according to any one of the first to third aspects; a casing to which the outer surface panel is attached; and a blower fan and a heat exchanger that are accommodated in the casing.

[0014] According to such an indoor unit, in a state where the outer surface panel is attached to the casing, the outer peripheral groove and the inner groove cannot be visually recognized from the outside and the aesthetic appearance of the indoor unit is not degraded by providing the outer surface panel. Furthermore, not only the entire knockout portion but also only the region partitioned by the outer peripheral groove and the inner groove, which is a part of the knockout portion, can be removed. Therefore, only a part of the knockout portion is removed from the panel main body according to the diameter of the piping, it is possible to reduce the gap between the diameter of the piping and the panel main body, and it is possible to prevent the casing of the inside of the panel main body from being exposed to the outside. In addition, it is possible to easily remove a part of the knockout portion by partitioning the knockout portion by the inner groove.

[0015] In addition, a method of knocking out of a knockout portion according to a fifth aspect of the invention includes a cutting step of cutting the outer peripheral groove of the panel main body in the outer surface panel according to any one of the first to third aspects; a notching step of notching the inner groove; and a removing step of removing a region partitioned between the outer peripheral groove and the inner groove in the knockout portion by gripping the region after the cutting step and the notching step.

[0016] Furthermore, according to such a method of knocking out, not only the entire knockout portion but also only the region partitioned by the outer peripheral groove and the inner groove, which is a part of the knockout portion, can be removed. Therefore, only a part of the knockout portion is removed from the panel main body according to the diameter of the piping, it is possible to reduce the gap between the diameter of the piping and the panel main body, and to prevent the casing of the inside of the panel main body from being exposed to the outside. In addition, the knockout portion is partitioned by the inner groove and the cutting step and the notching step are executed. Therefore, it is possible to easily remove a part of the knockout portion.

[0017] In addition, a method of installing an indoor unit of an air conditioner according to a sixth aspect of the invention includes a panel removing step of removing the outer surface panel from the indoor unit of the air conditioner; the method of knocking out according to the fifth aspect executed after the panel removing step; and a panel attaching step of attaching the outer surface panel to the indoor unit after executing the method of knocking

out.

[0018] Therefore, according to such a method of installing the indoor unit, when the piping connecting the indoor unit and the outdoor unit to each other is disposed to penetrate the panel main body disposed to penetrate the knockout portion during installation of the indoor unit, it is possible to remove only a part of the knockout portion from the panel main body according to the diameter of the piping. Therefore, it is possible to reduce the gap between the diameter of the piping and the panel main body. Therefore, it is possible to prevent the casing of the inside of the panel main body from being exposed to the outside. In addition, the knockout portion is partitioned by the inner groove and the cutting step and the notching step are executed. Therefore, it is possible to easily remove a part of the knockout portion.

Advantageous Effects of Invention

[0019] According to the outer surface panel, the indoor unit of the air conditioner, the method of knocking out, and method of installing the indoor unit of the air conditioner, it is possible to easily set the region to be knocked out by the knockout portion provided in the outer surface panel without degrading aesthetic appearance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a perspective view of an entire indoor unit of an air conditioner of an embodiment of the invention.

FIG. 2 is a perspective view of a bottom surface panel of the indoor unit of the embodiment of the invention. FIG. 3 is an enlarged view of a main portion of the bottom surface panel of the indoor unit of the embodiment of the invention.

FIG. 4 is a flowchart showing steps of a method of installing the indoor unit of the embodiment of the invention.

FIG. 5 is a view showing a state where a part of a knockout portion of the bottom surface panel of the indoor unit of the embodiment of the invention is removed.

DETAILED DESCRIPTION OF THE INVENTION

[0021] An indoor unit 1 of an air conditioner 100 of an embodiment of the invention will be described. The air conditioner 100 includes the indoor unit 1 that is provided in a room and an outdoor unit (not shown) that is connected to the indoor unit 1 by piping and is provided outside the room. The indoor unit 1 sucks air, performs adjustment of temperature and humidity, and then blows out air to perform air conditioning in the room.

[0022] The indoor unit 1 includes a casing 2, a blower fan 3 and a heat exchanger 4 accommodated in the cas-

ing 2, and an outer surface panel 5 that covers an entirety of the casing 2.

[0023] The casing 2 has a substantially rectangular parallelepiped shape and is provided with a blowout port 2a of air in the casing 2 at a position which is a lower portion when the indoor unit 1 is installed at a predetermined position in the room. Here, in a state where the indoor unit 1 is installed at the predetermined position, a longitudinal direction of the casing 2 is a lateral direction of the indoor unit 1. In addition, a direction orthogonal to the lateral direction and a height direction is a forward and rearward direction. Hereinafter, a state where the indoor unit 1 is installed is described as a reference.

[0024] The blower fan 3 is a cross flow fan extending in the lateral direction. The heat exchanger 4 is provided so as to enclose the blower fan 3 from an outer periphery.

[0025] The outer surface panel 5 covers the entire casing 2. The outer surface panel 5 is provided with a pair of side surface panels 5a that covers both side surfaces of the casing 2 in the longitudinal direction, a bottom surface panel 5b that is provided in a lower portion (bottom portion) of the casing 2, a flap 5c that is provided in the lower portion of the casing 2 so as to cover the blowout port 2a on a front side of the bottom surface panel 5b, a front surface panel 5d that covers the front surface of the casing 2, and a top surface panel 5e that covers a top surface of the casing 2. The flap 5c covers the blowout port 2a and adjusts the opening direction of the blowout port 2a.

[0026] Hereinafter, the bottom surface panel 5b in the outer surface panel 5 will be described in detail. As shown in FIGS. 2 and 3, the bottom surface panel 5b includes a plate-like panel main body 10 that extends along the bottom surface of the casing 2 and a pair of support portions 11 that is provided in both end portion of the panel main body 10 in the lateral direction and extends upward.

[0027] Each of the support portions 11 is a portion which is fixed to face a rear surface of the casing 2 in a state where the bottom surface panel 5b is attached to the casing 2.

[0028] The panel main body 10 is provided with outer peripheral grooves 15 and inner grooves 20 which are recessed from the inside (casing 2 side) to the outside of the panel main body 10 at positions close to the both end portions in the lateral direction and at positions adjacent to the support portions 11 in the lateral direction.

[0029] Each of the outer peripheral grooves 15 includes a pair of first straight line portions 16 that linearly extends forward from a rear end edge 10a of the panel main body 10 at positions close to the both end portions on the panel main body 10 in the lateral direction, a second straight line portion 17 that linearly extends along the lateral direction at a substantially center portion of the panel main body 10 in the forward and rearward direction, and a pair of curved portions 18 that connects the pair of the first straight line portions 16 and the second straight line portion 17. The curved portion 18 has a substantially arcuate shape and is curved so as to be convex

forward. The first straight line portions 16, the second straight line portion 17, and the curved portions 18 are continuously provided. As described above, each of the outer peripheral grooves 15 is provided so as to enclose a knockout portion A1 that is a region on the panel main body 10.

[0030] Here, a groove width [a] of the outer peripheral groove 15 may be equal to or greater than 2.0 [mm] and equal to or less than 3.0 [mm], more preferably equal to or greater than 2.2 [mm] and equal to or less than 2.8 [mm].

[0031] At least one end of the inner groove 20 is connected to the outer peripheral groove 15 and the inner groove 20 is provided in the knockout portion A1. In the embodiment, a plurality of the inner grooves 20 is provided so as to partition the knockout portion A1 into six regions. The inner groove 20 includes a longitudinal groove 21 that extends in the forward and rearward direction of the panel main body 10 and is provided at a center position of the knockout portion A1 in the lateral direction, and two lateral grooves 22 that extend in the lateral direction orthogonal to the longitudinal groove 21 and are provided with an interval in the forward and rearward direction of the knockout portion A1. Therefore, the inner groove 20 is provided in a lattice shape.

[0032] As described above, the knockout portion A1 on the right side (right side facing a paper surface in FIG. 2) in the lateral direction is partitioned into a first region A1a that is nearest to the support portion 11 in the lateral direction and is positioned at the most rear end of the panel main body 10, a second region A1b, a third region A1c, a fourth region A1d, a fifth region A1e, and a sixth region A1f in this order from the first region A1a in the clockwise direction.

[0033] A groove width [b] of the inner groove 20 is smaller than the groove width a of the outer peripheral groove 15. Specifically, the groove width b of the inner groove 20 may be equal to or greater than 0.2 [mm] and equal to or less than 1 [mm]. More preferably, the groove width b may be equal to or greater than 0.3 [mm] and equal to or less than 0.7 [mm].

[0034] Furthermore, in the first region A1a of the knockout portion A1, a region, which is continuous to the rear end edge 10a and extends to a midway position in the first region A1a in the forward and rearward direction, is a small knockout portion A2. The small knockout portion A2 is a quadrangular shape when viewed from above. The small knockout portion A2 is connected to the rear end edge 10a and is provided by partitioning a part of the first region A1a by a partition groove 30 extending to a substantially center position of the first region A1a in the forward and rearward direction. The groove width of the partition groove 30 is substantially the same as the groove width of the outer peripheral groove 15.

[0035] Next, a method of installing the indoor unit 1 of the air conditioner 100 and a method of knocking out the knockout portion A1 of the embodiment will be described. In the method of installing the indoor unit 1, as shown in

FIG. 4, first, a panel removing step S1 is executed. In the panel removing step S1, the bottom surface panel 5b is removed from the casing 2 of the indoor unit 1.

[0036] Thereafter, a cutting step S2 in which the outer peripheral groove 15 is cut is executed. In the cutting step S2, only a portion of the outer peripheral groove 15 corresponding to any region (from the first region A1a to the sixth region A1f) to be removed by the knockout portion A1 is cut with a saw blade or the like. In the embodiment, for example, as shown in FIG. 5, only the first region A1a is cut. After cutting, deburring is removed with a file or the like.

[0037] Thereafter, a notching step S3 is executed and makes a notch in the inner groove 20 which partitions, for example, the first region A1a to be removed.

[0038] Thereafter, a removing step S4 is executed and grips, for example, the first region A1a to be removed to remove the first region A1a from the panel main body 10. A tool may be used to remove the first region A1a, or the first region A1a may be performed by hand.

[0039] Finally, a panel attaching step S5 is executed and the bottom surface panel 5b from which, for example, the first region A1a is removed is again attached to the indoor unit 1.

[0040] According to the indoor unit 1 of the air conditioner 100 of the embodiment which is described above, the knockout portion A1 is provided in the panel main body 10 of the bottom surface panel 5b. The knockout portion A1 is provided with the outer peripheral groove 15 and the inner groove 20 which are grooves recessed from the inside to the outside of the panel main body 10.

[0041] Therefore, in a state where the panel main body 10 is attached to the casing 2, the outer peripheral groove 15 and the inner groove 20 cannot be visually recognized from the outside. Therefore, the aesthetic appearance of the indoor unit 1 is not degraded.

[0042] Furthermore, the inner groove 20 is provided in the panel main body 10 in addition to the outer peripheral groove 15. Therefore, not only the entire knockout portion A1 but also only the region partitioned by the outer peripheral groove 15 and the inner groove 20, which is a part of the knockout portion, can be removed. Therefore, for example, in a case where the piping connecting the indoor unit 1 and the outdoor unit are disposed to penetrate the panel main body 10 in the knockout portion A1, only a part of the knockout portion A1 can be removed from the panel main body 10 according to the diameter of the piping.

[0043] Therefore, it is possible to reduce the gap between the diameter of the piping and the panel main body 10 and to avoid degrading aesthetic appearance due to exposition of the casing 2 on the inside of the panel main body 10 to the outside.

[0044] In addition, the knockout portion A1 is partitioned into a plurality of regions by the inner groove 20. Therefore, notching is performed in the inner groove 20 and it is possible to easily remove only a region of a part of the knockout portion A1 which is partitioned by the

outer peripheral groove 15 and the inner groove 20.

[0045] In addition, it is possible to finely partition the region of the knockout portion A1 by providing the inner groove 20 in the lattice shape. Therefore, it is possible to further easily remove a part of the knockout portion A1 according to the diameter of the piping connecting the indoor unit 1 and the outdoor unit.

[0046] Furthermore, the inner groove 20 having the groove width smaller than that of the outer peripheral groove 15 is provided. Therefore, first, the knockout portion A1 is cut along the outer peripheral groove 15, and then a part of the knockout portion A1 partitioned by the outer peripheral groove 15 and the inner groove 20 is gripped to apply a force, so that a large stress concentration occurs in the inner groove 20 having the small groove width. Therefore, it is possible to easily remove a part of the knockout portion A1 partitioned by the outer peripheral groove 15 and the inner groove 20 without using a tool.

[0047] Furthermore, the partition groove 30 is cut by providing the small knockout portion A2 and it is possible to remove only the small knockout portion A2. Therefore, it is possible to provide a member having a diameter smaller than that of the piping such as wiring by penetrating the region of the small knockout portion A2.

[0048] Although the embodiments of the invention have been described above in detail with reference to the drawings, each configuration and combination thereof in the respective the embodiments is a merely example, and additions and omissions, replacements, and other changes of the configuration are possible within the scope not departing from the gist of the invention. Further, the invention is not limited by the embodiments, but is limited only by the claims. For example, although the case where the knockout portion A1 is provided on the bottom surface panel 5b is described above, the knockout portion A1 may be provided on another outer surface panel 5 (for example, the side surface panel 5a).

[0049] In addition, the small knockout portion A2 is not necessarily provided. In addition, at least one of the inner grooves 20 may be provided. That is, one inner groove 20 may be provided such that the inner groove 20 does not have the longitudinal groove 21 and the lateral groove 22, and at least the knockout portion A1 is partitioned into two regions.

[0050] In the inner groove 20, the longitudinal groove 21 and the lateral groove 22 may not cross at right angle but may be cross diagonally. Furthermore, the outer peripheral groove 15 may not be continuous with the rear end edge 10a of the panel main body 10. That is, the knockout portion A1 may be provided on the inside of the panel main body in the forward and rearward direction, and the lateral direction.

[0051] While preferred embodiments of the invention have been described and shown above, it should be understood that these are exemplary of the invention and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made with-

out departing from the scope of the present invention. Accordingly, the invention is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

EXPLANATION OF REFERENCES

[0052]

1 ... indoor unit
 2 ... casing
 2a ... blowout port
 3 ... blower fan
 4 ... heat exchanger
 5 ... outer surface panel
 5a ... side surface panel
 5b ... bottom surface panel
 5c ... flap
 5d ... front surface panel
 5e ... top surface panel
 10 ... panel main body
 10a ... rear end edge
 11 ... support portion
 15 ... outer peripheral groove
 16 ... first straight line portion
 17 ... second straight line portion
 18 ... curved portion
 20 ... inner groove
 21 ... longitudinal groove
 22 ... lateral groove
 30 ... partition groove
 100 ... air conditioner
 A1 ... knockout portion
 A1a ... first region
 A1b ... second region
 A1c ... third region
 A1d ... fourth region
 A1e ... fifth region
 A1f ... sixth region
 A2 ... small knockout portion
 S1 ... panel removing step
 S2 ... cutting step
 S3 ... notching step
 S4 ... removing step
 S5 ... panel attaching step

Claims

1. An outer surface panel (5) comprising:

a panel main body (10) that is provided on a surface of a casing (2) of an indoor unit (1) of an air conditioner (100) accommodating a blower fan (3) and a heat exchanger (4) therein, wherein the panel main body (10) is provided with an outer peripheral groove (15) that is recessed

from an inside of the panel main body (10) and extends so as to enclose a knockout portion (A1) that is one region on the panel main body (10), and

an inner groove (20) that is recessed from the inside of the panel main body (10), is connected to the outer peripheral groove (15), and extends so as to partition the knockout portion (A1).

2. The outer surface panel (5) according to claim 1, wherein the inner groove (20) has a longitudinal groove (21) and a lateral groove (22) crossing the longitudinal groove (21) so that the inner groove (20) is provided in a lattice shape.

3. The outer surface panel (5) according to claim 2, wherein a groove width (b) of the inner groove (20) is smaller than a groove width (a) of the outer peripheral groove (15).

4. An indoor unit (1) of an air conditioner (100) comprising:

the outer surface panel (5) according to any one of claims 1 to 3;
 a casing (2) to which the outer surface panel (5) is attached; and
 a blower fan (3) and a heat exchanger (4) that are accommodated in the casing (2).

5. A method of knocking out a knockout portion (A1), comprising:

a cutting step (S2) of cutting the outer peripheral groove (15) of the panel main body (10) in the outer surface panel (5) according to any one of claims 1 to 3;
 a notching step (S3) of notching the inner groove (20); and
 a removing step (S4) of removing a region (A1a, A1b, A1c, A1d, A1e, A1f) partitioned between the outer peripheral groove (15) and the inner groove (20) in the knockout portion (A1) by gripping the region (A1a, A1b, A1c, A1d, A1e, A1f) after the cutting step (S2) and the notching step (S3).

6. A method of installing an indoor unit (1) of an air conditioner (100), comprising:

a panel removing step (S1) of removing an outer surface panel (5) from the indoor unit (1) of the air conditioner (100);
 the method of knocking out according to claim 5 which is executed after the panel removing step (S1); and
 a panel attaching step (S5) of attaching the outer surface panel (5) to the indoor unit (1) after ex-

ecuting the method of knocking out.

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FIG. 1

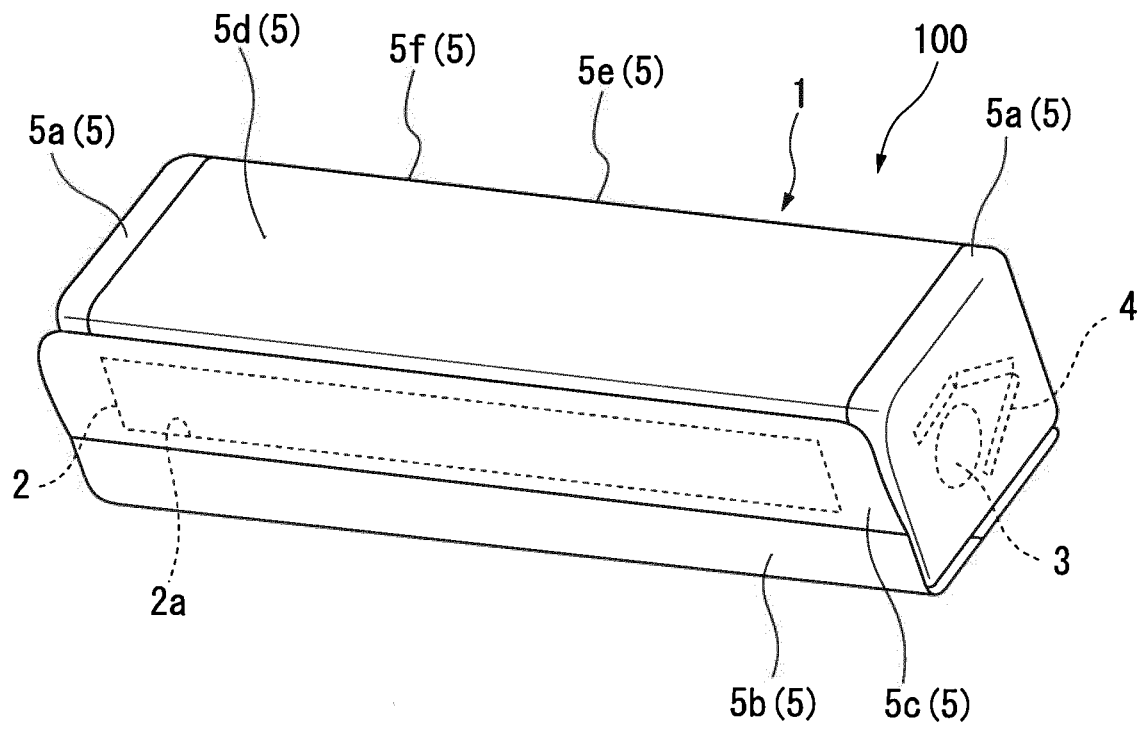


FIG. 2

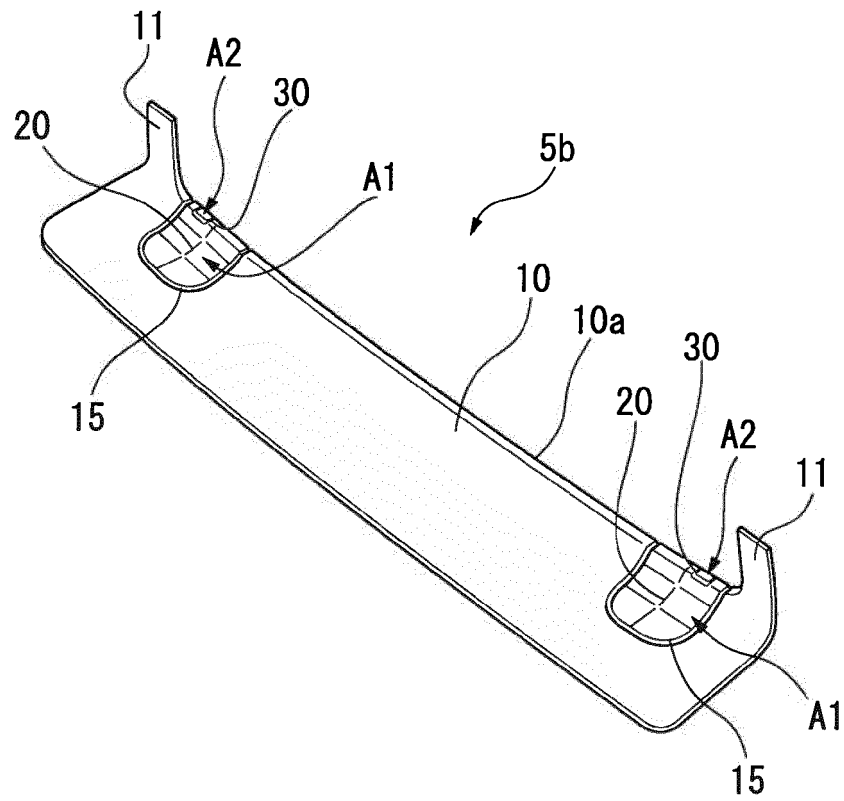


FIG. 3

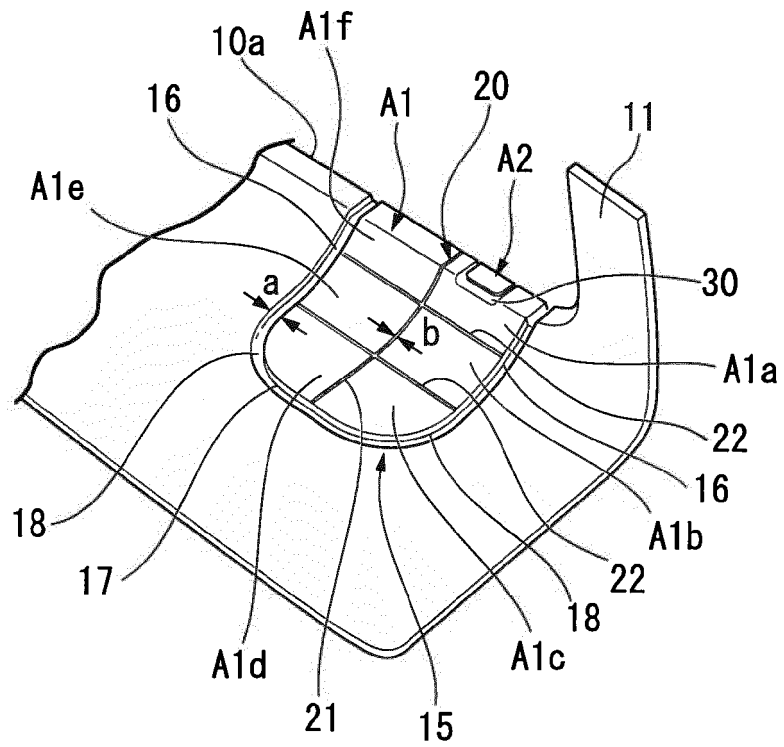


FIG. 4

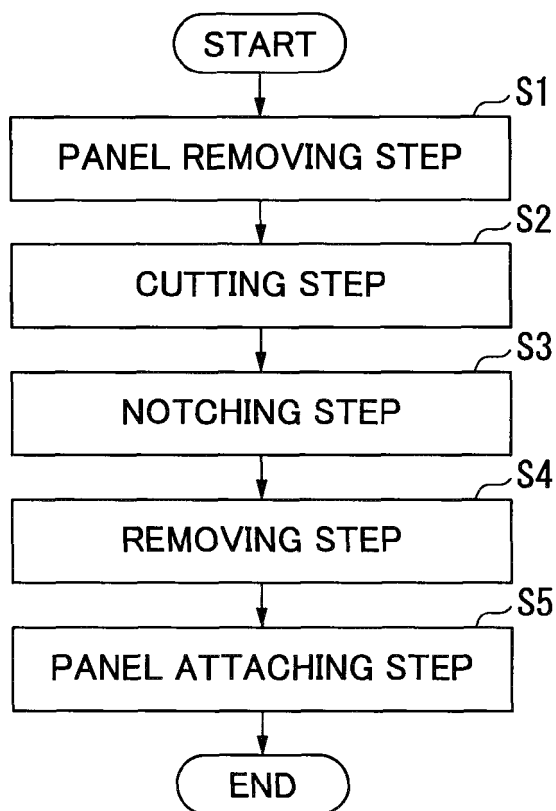
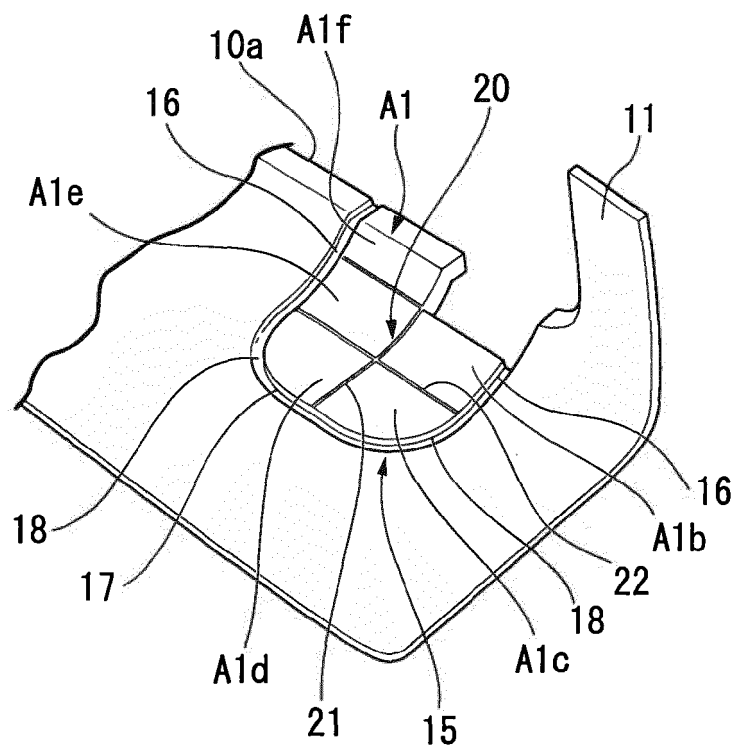


FIG. 5





EUROPEAN SEARCH REPORT

 Application Number
 EP 17 20 4182

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Place of search Munich		Date of completion of the search 6 April 2018	Examiner Lienhard, Dominique
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention 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 4182

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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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