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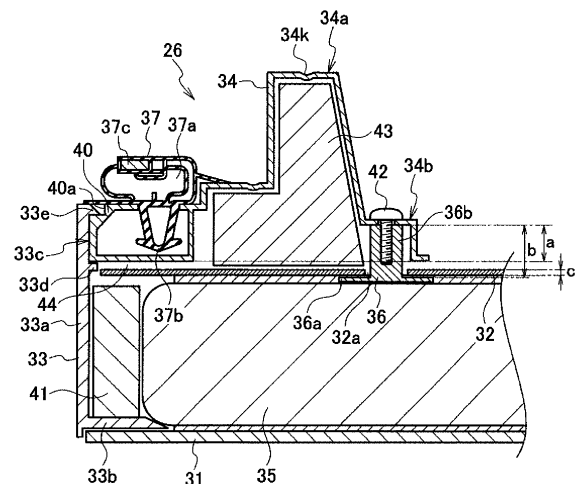
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(54) **REFRIGERATOR**

(57) A refrigerator, comprising: an insulating box (3) formed from a box plate material containing insulating material filled between an inner box and an outer box, and having an opening in the front surface; and a door (26) attached in the opening of the insulating box (3). The door (26) comprises an outer plate (31), an inner plate (32) disposed so as to face the outer plate (31), a vacuum insulation material (35) disposed so as to be held between the outer plate (31) and the inner plate (32), a gasket (37) attached in proximity to the inner side end of the door (26), a gasket-fitting member (40) in which the gasket (37) is fitted, and a throat member (34) for entering into the inner side of the insulating box and preventing cold air from flowing out when the door (26) is closed. The distance from the outer plate (31) to the gasket-fitting member (40) is fixed. A separating part (44) is formed between the front surface side end of the gasket-fitting member (40) and the back surface of the vacuum insulation material (35).

FIG. 5



Description

[Technical Field]

[0001] Embodiments of the present invention relate to a refrigerator.

[Background Art]

[0002] A refrigerator includes an insulating box body as a main body of the refrigerator for improving the thermal insulation and achieving the energy saving. The insulating box body includes an outer box, an inner box, and an insulating material sandwiched in a space between the outer and inner boxes. The refrigerator further includes a door that seals the opening of the insulating box body. The door similarly includes an outer plate; an inner plate, and an insulating material sandwiched between the outer plate and the inner plate. As the insulating materials, polyurethane foam is often used. In recent years, vacuum insulating materials are used instead of polyurethane foam in some cases.

[Citation List]

[Patent Literature]

[0003] [PTL 1] Japanese Patent Laid-open Publication No. 2006-90649

[Summary of Invention]

[0004] The vacuum insulating materials are formed such that a core material is vacuum-packed with a laminate film of aluminum foil and synthetic resin or with an aluminum-deposited laminate film of synthetic resin and are formed into panels. In some cases, the thickness of the panel of a vacuum insulating material varies from product to product. The doors of refrigerators always need to be formed with a fixed thickness. Thus, to use the panel of a vacuum insulating material as the insulating material, there is a need for a structure capable of accommodating varying thickness owing to individual differences of products of the vacuum insulating material.

[0005] An object of the present invention is to provide a refrigerator including a door having a structure capable of accommodating the thickness of the vacuum insulating material varying from product to product.

[0006] A refrigerator according to embodiments includes: an insulating box body in which a space between an inner box and an outer box is filled with an insulating material and an opening is provided at the front; and a door configured to close the opening at the front of the insulating box body. The door includes: an outer plate; an inner plate opposed to the outer plate; a vacuum insulating material sandwiched between the outer plate and the inner plate; a gasket attached to an entire circumference of the door in the vicinity of an edge on an

inner side of the door; a frame-shaped gasket fitting member to which the gasket is fitted; and a frame-shaped throat member configured to enter an inside of the insulating box body to prevent cold air from flowing out when the door is closed. The distance between the outer plate and the gasket fitting member is fixed. Between a front end of the gasket fitting member and a back surface of the vacuum insulating material, a separating space is formed.

[Brief Description of Drawings]

[0007]

[Fig. 1]

Fig. 1 is a perspective view of a refrigerator of first to fifth embodiments.

[Fig. 2]

Fig. 2 is a perspective view of the refrigerator with the door removed.

[Fig. 3]

Fig. 3 is a cross-sectional view of a second freezing compartment door of the first embodiment.

[Fig. 4]

Fig. 4 is an exploded perspective view of the second freezing compartment door.

[Fig. 5]

Fig. 5 is an enlarged cross-sectional view of the second freezing compartment door.

[Fig. 6]

Fig. 6 includes cross-sectional views of a plurality of examples concerning the structure of an elastic portion.

[Fig. 7]

Fig. 7 is an enlarged cross-sectional view illustrating a modification of the second freezing compartment door of the first embodiment.

[Fig. 8]

Fig. 8 is an enlarged cross-sectional view of a second freezing compartment door of the second embodiment.

[Fig. 9]

Fig. 9 is an enlarged cross-sectional view of a second freezing compartment door of the third embodiment.

[Fig. 10]

Fig. 10 is an enlarged cross-sectional view of a second freezing compartment door of the fourth embodiment.

[Fig. 11]

Fig. 11 is an enlarged cross-sectional view illustrating a modification of the second freezing compartment door of the fourth embodiment.

[Fig. 12]

Fig. 12 is an enlarged cross-sectional view of a second freezing compartment door of the fifth embodiment.

[Description of Embodiments]

[0008] Hereinafter, a description is given of embodiments in detail with reference to the drawings.

[First Embodiment]

[0009] As illustrated in Figs. 1 and 2, a refrigerator 1 of a first embodiment includes an insulating box body 3 and plural doors 21 to 26. The insulating box body 3 is opened at the front, and the inside thereof is partitioned into plural compartments. The plural doors 21 to 26 seal front openings of the respective compartments. For convenience of the following description, the side where the doors 21 to 26 are provided are referred to as a front side, and the side where the insulating box body 3 is located is referred to as a back side (see Fig. 1).

[0010] The insulating box body 3 includes an inner box, an outer box, and vacuum insulating materials 35 sandwiched between the inner and outer boxes as an insulating material. The vacuum insulating materials 35 are sandwiched between the substantially entire opposing surfaces of the outer and inner boxes. In Fig. 2, only the vacuum insulating material 35 of the right-side plate of the refrigerator 1, which is located to the observer's right, is indicated by a dotted line for explanation, but actually, the vacuum insulating material 35 is provided for each of the top, bottom, left-side, and back plates.

[0011] The insulating box body 3 is partitioned into five compartments, for example. The five compartments are used as a refrigerating compartment 11, a vegetable compartment 12, an ice compartment 13 and a first freezing compartment 14, that are arranged side by side, and a second freezing compartment 15, which are sequentially arranged from above, for example. On the front opening of the refrigerating compartment 11, double door-type refrigerating compartment first and second doors 21 and 22 are attached. On the front openings of the vegetable compartment 12, ice compartment 13, first freezing compartment 14, and second freezing compartment 15, a vegetable compartment door 23, an ice compartment door 24, a first freezing compartment door 25, and a second freezing compartment door 26, which are drawer-type, are attached, respectively.

[0012] The doors of the refrigerator 1 also include the vacuum insulating materials 35. Each of the vacuum insulating materials 35 is formed in such a manner that an inorganic core material, such as grass wool, is vacuum-packed with a laminate film of aluminum foil and synthetic resin or an aluminum-deposited laminate film of synthetic resin. The vacuum insulating materials formed by the aforementioned manufacturing method are difficult to form into strictly fixed thickness because of the manufacturing difficulties and cause individual differences in thickness of products. However, the doors of the refrigerator 1 need to be surely closed air-tightly, and the distance between the outer plate and a gasket fitting member needs to be always fixed. Accordingly, in order to

manufacture doors of a same size using a vacuum insulating material whose thickness varies from product to product, there is a demand for a structure capable of accommodating the varying thickness of the vacuum insulating material. Hereinafter, a description is given of a door structure capable of accommodating varying thickness of a vacuum insulating material.

[0013] For explanation of the door structure, the second freezing compartment door 26 is described as a representative door. As illustrated in Figs. 3 to 5, the second freezing compartment door 26 includes an outer plate 31, an inner plate 32, a side frame 33, a gasket fitting member 40, a throat member 34, the vacuum insulating material 35, fasteners 36, a gasket 37, and a handle 39. In the second freezing compartment door 26, the throat member 34 is joined to the inside of the frame of the gasket fitting member 40 to be integrally formed with the same.

[0014] The outer plate 31 of the second freezing compartment door 26 is fixed near the front end of the side frame 33. The gasket fitting member 40 and throat member 34 are fixed near the back end of the side frame 33. Moreover, the inner plate 32 of the second freezing compartment door 26 is provided on the front side of the throat member 34. The vacuum insulating material 35 is provided between the outer plate 31 and the inner plate 32. The vacuum insulating material 35 has such an area (size) that occupies the substantially entire opposing surfaces of the outer plate 31 and the inner plate 32. The gasket 37 is fitted to the back side of the gasket fitting member 40. The handle 39 is attached to the front surface of the outer plate 31.

[0015] A soft tape 41 is wound around the circumference of the vacuum insulating material 35. The soft tape 41 is made of a material having a heat insulating effect such as sponge tape. The front surface of the vacuum insulating material 35 is fixed to the outer plate 31 by bonding or the like. On the back surface of the vacuum insulating material 35, the plural fasteners 36 are fixed by bonding or the like.

[0016] As illustrated in Fig. 5, each fastener 36 includes a base plate 36a formed into a plate and a cylindrical portion 36b extending backward from the center of the base plate 36a. The cylindrical portion 36b includes a threaded hole, in which a later-described screw 42 is screwed. The base plate 36a is fixed to the vacuum insulating material 35 by bonding. The cylindrical portion 36b penetrates the inner plate 32 and abuts on the edge portion of the throat member 34. The screw 42 fixes the edge portion of the throat member 34 to the cylindrical portion 36b. When the throat member 34 is fixed to the fastener 36, there is a separating space 44 formed between the vacuum insulating material 35 and the front end of the gasket fitting member 40 integrally formed with the throat member 34.

[0017] Specifically, the throat member 34, cylindrical portion 36b, and inner plate 32 are provided to satisfy: $b-c > a$ where a is a distance between the portion of the

throat member 34 abutting on the fastener 36 and the front end of the gasket fitting member 40; b is a height of the cylindrical portion 36b of the fastener 36; and c is the thickness of the inner plate 32.

[0018] The space within the throat member 34 is previously filled with an insulating material 43 such as polystyrene foam. At least one place near the insulating material 43 in the throat member 34, an elastic portion 34k is formed. As illustrated in Fig. 6 (a), the elastic portion 34k is formed into a thin circular shape and is more deformable than the other part around the same. When the vacuum insulating material 35 is thicker or thinner than designed, the fastener 36 is displaced a little forward or backward, and the fixing position of the edge portion of the throat member 34 (a fastener fixing portion 34b) moves forward or backward. Even in such a case, because of provision of the elastic portion 34k, the elastic portion 34k can deform to move the edge portion of the throat member 34. In the drawings of Figs. 6(a) to (c), reference symbols A show examples of deformation of the edge portion of the throat member 34 when the vacuum insulating material 35 is thick, and reference symbols B show examples of deformation of the edge portion of the throat member 34 when the vacuum insulating material 35 is thin.

[0019] Specifically, the deformation (displacement) caused at the edge portion of the throat member 34 is absorbed by the elastic portion 34k and is not transmitted to the gasket fitting member 40. Accordingly, the distance between the outer plate 32 and gasket fitting member 40 is kept fixed. In the second freezing compartment door 26 of the first embodiment, the elastic portion 34k of the throat member 34 can accommodate varying thickness of the vacuum insulating material 35. It is therefore possible to manufacture a door with fixed thickness even by using a vacuum insulating material, whose thickness is more likely to vary from product to product.

[0020] The shape of the elastic portion 34k is not limited to the thin circular recess illustrated in Fig. 6(a). For example, the elastic portion 34k may be formed into a V-shaped recess as illustrated in Fig. 6(b) or may include plural recesses as illustrated in Fig. 6(c). The elastic portion 34k may be made of a material deformable more easily than the other part of the throat member.

[0021] Hereinafter, the structure of the second freezing compartment door 26 is described in more detail. As illustrated in Figs. 3 to 5, the outer plate 31 is a rectangular plate and is fixed to the side frame 33 by bonding or the like. The inner plate 32 is a rectangular plate and includes plural through-holes 32a through which the fasteners 36 penetrate.

[0022] The side frame 33 is a rectangular frame to which the outer plate 31 and gasket fitting member 40 are fixed. The side frame 33 includes: a sidewall 33a forming the side surface of the second freezing compartment door 26; an outer plate attachment portion 33b which is formed near the front end of the sidewall 33a in such a manner as to protrude into the frame; and a fixing

portion 33c that is formed near the back end of the sidewall 33a, to which the gasket fitting member 40 is fixed. The fixing portion 33c includes: a front protrusion portion 33d that abuts on a front corner of the gasket fitting member 40; and a back protrusion portion 33e that holds and sandwiches the gasket fitting member 40 in cooperation with the front protrusion portion 33d. The front and back protrusion portions 33d and 33e protrude from the sidewall 33a toward the inside of the frame and extend along the sidewall 33a.

[0023] The gasket fitting member 40 is a frame joined to the outside of the throat member 34. The gasket fitting member 40 is formed into a hollow box having an opening into which a later-described insertion portion 37b of the gasket 37 is inserted. At the back corner of the gasket fitting member 40, a step portion 40a is formed. The step portion 40a is engaged with the back protrusion portion 33e of the side frame 33.

[0024] When the second freezing compartment door 26 is closed, the throat member 34 enters the inside of the insulating box body 3 to be laid on the inner surface of the insulating box body 3. The throat member 34 thereby prevents leakage of cold air within the insulating box body 3. The throat member 34 has a rectangular frame shape and is integrally formed with the gasket fitting member 40 so that the gasket fitting member 40 is joined to the circumference of the throat member 34.

[0025] The throat member 34 includes: a protruding portion 34a protruding backward (toward the inside of the insulating box body 3); and the fastener fixing portion 34b located to the inside of the frame of the protruding portion 34a. The protruding portion 34a is hollow, and the space within the protruding portion 34a is filled with the insulating material 43 such as styrene foam. The aforementioned elastic portion 34k is formed at a proper place in the back end face (back surface) of the protruding portion 34a. The fastener fixing portion 34b includes plural threaded holes through which the screws 42 penetrate.

[0026] The gasket 37 is a frame including a hollow sealed air cushion portion 37a and includes the insertion portion 37b, which has an arrowhead shape. The gasket 37 further includes a magnet 37c to the back side of the air cushion portion 37a. The magnet 37c is configured to be magnetically attached to the peripheral surface of the opening of the insulating box body 3. The gasket 37 is made of a flexible material, and by using the flexibility the gasket 37, the insertion portion 37b is pressed into the gasket fitting member 40 to be attached to the gasket fitting member 40.

[0027] The outer plate 31 of the second freezing compartment door 26 is fixed to the outer plate attachment portion 33b of the side frame 33, and the gasket fitting member 40 integrally formed with the throat member 34 is fitted to the fixing portion 33c of the side frame 33. In other words, the thickness of the second freezing compartment door 26, which is the distance between the outer plate 31 and the back surface of the gasket fitting member

40, is fixed. In the second freezing compartment door 26, the vacuum insulating material 35 is provided on the back side of the outer plate 31, and to the back side of the vacuum insulating material 35, the inner plate 32 is provided with the fasteners 36 interposed therebetween. The inner plate 32 is bonded to the back surface of the vacuum insulating material 35. To the back side of the inner plate 32, the gasket fitting member 40 and throat member 34 are located with the separating space 44 interposed therebetween. The fastener fixing portion 34b of the throat member 34 is fixed to the fasteners 36 with the screws 42.

[0028] According to the first embodiment, the elastic portion 34k is provided in the throat member 34 as described above. Accordingly, even when the position of any of the fasteners 36 is moved up or down according to the thickness of the vacuum insulating material 35, the elastic portion 34k deforms as indicated by A or B in Fig. 6 to move the fastener fixing portion 34b forward or backward and can thereby absorb the displacement of the fastener 36. This can facilitate manufacturing the second freezing compartment door 26 with the thickness always fixed.

[0029] Moreover, the gasket fitting member 40 is integrally formed with the throat member 34. It is therefore possible to reduce the number of steps for assembling the door and reduce the manufacturing cost.

[0030] The method of fixing the fasteners 36 and the vacuum insulating material 35 is not limited to bonding and may include using a hook-and-loop fastener or the like. The second freezing compartment door 26 is described as the representative door of the refrigerator 1, but the same configuration is applicable to the other doors.

[0031] Moreover, the elastic portion 34k is provided in the back end face of the throat member 34 in the above-described embodiment. However, the elastic portion 34k may be provided in the face connecting the gasket fitting member 40 and the throat member 34 as illustrated in Fig. 7. The thickness of the vacuum insulating material 35 varying from product to product can be absorbed by the forward or backward displacement of the whole throat member 34 without a change of the position of the gasket fitting member 40.

(Second Embodiment)

[0032] Next, a description is given of a second embodiment relating to the structure of the doors of the refrigerator 1. As illustrated in Fig. 8, in the second freezing compartment door 26 in the second embodiment, the gasket fitting member 40 is directly fixed to the outer plate 31. In the following description, the same members as those of the first embodiment are indicated by the same reference numerals.

[0033] The second freezing compartment door 26 includes the outer plate 31 formed into a flat box; the inner plate 32 formed into a plate; the vacuum insulating ma-

terial 35 sandwiched between the outer plate 31 and the inner plate 32; the gasket fitting member 40; the throat member 34; the fasteners 36; and the gasket 37. Herein, the gasket fitting member 40 and throat member 34 are integrally formed.

[0034] The outer plate 31 includes a fitting hole (a fitting recess, a fitting groove) 31a in the sidewall. In the fitting hole 31a, a later-described pawl 40c of the gasket fitting member 40 is fitted. The gasket fitting member 40 includes a sidewall 40b at the outer end, the sidewall 40b extending forward. The pawl 40c is formed in the vicinity of the front end of the sidewall 40b. Furthermore, the throat member 34 includes the elastic portion 34k in a similar manner to the first embodiment. The space within the throat member 34 is filled with the insulating material 43.

[0035] In the second freezing compartment door 26, the vacuum insulating material 35 is bonded to the back surface of the outer plate 31, and the inner plate 32 is provided on the back side of the vacuum insulating material 35 with the fasteners 36 interposed therebetween. The gasket fitting member 40 and throat member 34 are provided with the separating space 44 formed to the back side of the inner plate 32. Moreover, the pawl 40c is fitted into the fitting hole 31a of the outer plate 31 to fix the gasket fitting member 40 to the outer plate 31. The gasket fitting member 40 is fitted on the outer plate 31 in such a manner, so that the distance between the gasket fitting member 40 and the outer plate 31, that is, the thickness of the second freezing compartment door 26 is always fixed. The other configuration is the same as that of the first embodiment, and the detailed description thereof is omitted.

[0036] In the second freezing compartment door 26 of the second embodiment, similarly to the first embodiment, the separating space 44 is formed between the vacuum insulating material 35 and the front end of the gasket fitting member 40. Accordingly, the second freezing compartment door 26 with the thickness fixed can be easily manufactured even when the thickness of the vacuum insulating material 35 varies because of individual differences of products.

(Third Embodiment)

[0037] Next, a description is given of a third embodiment relating to the structure of the doors of the refrigerator 1. As illustrated in Fig. 9, in the second freezing compartment door 26 of the third embodiment, the gasket fitting member 40, throat member 34, and the inner plate 32 are integrally formed. To be specific, the second freezing compartment door 26 includes: the outer plate 31; the inner plate 32, gasket fitting member 40, and throat member 34, which are integrally formed; the vacuum insulating material 35 sandwiched between the outer plate 31 and the inner plate 32; the side frame 33; and the gasket 37.

[0038] The outer plate 31 is fixed to the front end of

the side frame 33, and the gasket fitting member 40 is fixed near the back end of the side frame 33. The elastic portion 34k is formed in the joint face of the gasket fitting member 40 and throat member 34. The front surface of the vacuum insulating material 35 is bonded to the outer plate 31, and the back surface thereof is bonded to the inner plate 32. The separating space 44 is formed between the vacuum insulating material 35 and the front end of the gasket fitting member 40.

[0039] In the second freezing compartment door 26 of the third embodiment, the inner plate 32 is pressed backward when the vacuum insulating material 35 is thick. However, the elastic portion 34k between the gasket fitting member 40 and throat member 34 deforms to absorb the change in thickness, and the gasket fitting member 40 is not displaced even when the inner plate 32 and throat member 34 are pressed backward. It is therefore possible to easily manufacture a door which has fixed distance between the outer plate 31 and gasket fitting member 40 and employs the vacuum insulating material 35 whose thickness varies from product to product.

[0040] In the case of the third embodiment, the inner plate 32, gasket fitting member 40, and throat member 34 are integrally formed, thus facilitating assembly of the door and reducing the manufacturing cost.

(Fourth Embodiment)

[0041] Next, a description is given of the fourth embodiment relating to the structure of the doors of the refrigerator 1. As illustrated in Fig. 10, the second freezing compartment door 26 of the fourth embodiment includes the inner plate 32, gasket fitting member 40, and throat member 34 which are integrally formed in a similar manner to the third embodiment. Moreover, the outer plate 31 is formed into a flat box and is directly fitted into the gasket fitting member 40.

[0042] Also in the second freezing compartment door 26 of the fourth embodiment, the separating space 44 is formed between the vacuum insulating material 35 and the front end of the gasket fitting member 40. Moreover, the elastic portion 34k is formed between the gasket fitting member 40 and throat member 34. The front surface of the vacuum insulating material 35 is bonded to the outer plate 31, and the back surface thereof is bonded to the inner plate 32.

[0043] Also in the fourth embodiment, it is possible to easily manufacture a door which has fixed distance between the outer plate 31 and gasket fitting member 40, that is, fixed door thickness and employs the vacuum insulating material 35, whose thickness varies from product to product.

[0044] As illustrated in Fig. 11, the gasket fitting member 40 may be fixed to the outer plate 31 with a screw 46 or the like. Alternatively, the gasket fitting member 40 may be joined to the outer plate 31 by a fitting means such as a pawl. In any of the above cases, the same effect as described above can be obtained by providing

the separating space 44 and elastic portion 34k.

(Fifth Embodiment)

[0045] Next, a description is given of a fifth embodiment relating to the structure of the doors of the refrigerator 1. As illustrated in Fig. 12, the second freezing compartment door 26 of the fifth embodiment, the inner plate 32 and throat member 34 are integrally formed. In other words, the second freezing compartment door 26 of the fifth embodiment includes the outer plate 31, the inner plate 32 integrally formed with the throat member 34, the gasket fitting member 40, the vacuum insulating material 35 sandwiched between the outer plate 31 and the inner plate 32, and the gasket 37.

[0046] The outer plate 31 is formed into a flat box. The gasket fitting member 40 is a rectangular frame including a sidewall 40d fitted on the circumference of the outer plate 31. The gasket fitting member 40 is fitted on the back end of the outer plate 31 and is joined by bonding or the like. The gasket fitting member 40 may be joined to the outer plate 31 using the screw 46 shown in Fig. 11.

[0047] In the second freezing compartment door 26, the vacuum insulating material 35 is bonded to the back surface of the outer plate 31, and the inner plate 32 is bonded to the back surface of the vacuum insulating material 35. The throat member 34 integrally formed with the inner plate 32 is located with a space from the gasket fitting member 40 and is joined to the gasket fitting member 40 with a screw 48, to which an elastic body 49 is attached. The elastic body 49 is configured to accommodate the variations in distance between the end of the throat member 34 and the gasket fitting member 40. In a similar manner to the first to fourth embodiments, the separating space 44 is formed between the front end of the gasket fitting member 40 and the vacuum insulating material 35.

[0048] Even with the thus-configured second freezing compartment door 26 or even when the vacuum insulating material 35 whose thickness varies from product to product is used as the insulating material, it is possible to manufacture a door having a fixed thickness by accommodating the varying thickness of the vacuum insulating material 35.

[0049] Some of the embodiments of the present invention are described above but are presented by way of example. The embodiments are not intended to limit the scope of the invention. These novel embodiments can be carried out in other various modes and can be variously omitted, replaced, and changed without departing from the gist of the invention. The embodiments and modifications thereof are included in the scope and gist of the invention and also included in the invention described in claims and equivalents thereof.

Claims**1.** A refrigerator, comprising:

an insulating box body in which a space between an inner box and an outer box is filled with an insulating material and an opening is provided at the front; and
a door configured to close the opening at the front of the insulating box body, wherein the door includes:

an outer plate;
an inner plate opposed to the outer plate;
a vacuum insulating material sandwiched between the outer plate and the inner plate;
a gasket attached to an entire circumference of the door in the vicinity of an edge on an inner side of the door;
a frame-shaped gasket fitting member to which the gasket is fitted; and
a frame-shaped throat member configured to enter an inside of the insulating box body to prevent cold air from flowing out when the door is closed, and
the distance between the outer plate and the gasket fitting member is fixed, and
a separating space is formed between a front end of the gasket fitting member and a back surface of the vacuum insulating material.

2. The refrigerator according to claim 1, wherein the throat member and the gasket fitting member are integrally formed.**3.** The refrigerator according to claim 1 or 2, wherein the throat member and gasket fitting member are provided on the back side of the inner plate, and a protrusion at a top of an attachment portion with a base portion fixed to the back surface of the vacuum insulating material is penetrated through the inner plate and is connected to an edge portion of the throat member.**4.** The refrigerator according to any one of claims 1 to 3, wherein an easily deformable elastic portion is provided between the throat member and gasket fitting member or in the throat member.**5.** The refrigerator according to any one of claims 1 to 4, wherein the throat member is filled with an insulator, and the insulator is spaced from the back-surface of the vacuum insulating material.**6.** The refrigerator according to any one of claims 1 to

5, wherein

the throat member and the inner plate are movable relative to the gasket fitting member.

7. The refrigerator according to claim 1, wherein the throat member and the inner plate are integrally formed, and the gasket fitting member is separated from the throat member, and an edge portion of the throat member is connected to an edge portion of the gasket fitting member with an elastic body.**8.** The refrigerator according to claim 1, wherein the gasket fitting member, the throat member, and the inner plate are integrally formed, and an elastic portion easily deformable is formed between the gasket fitting member and the throat member or in the throat member.

FIG. 1

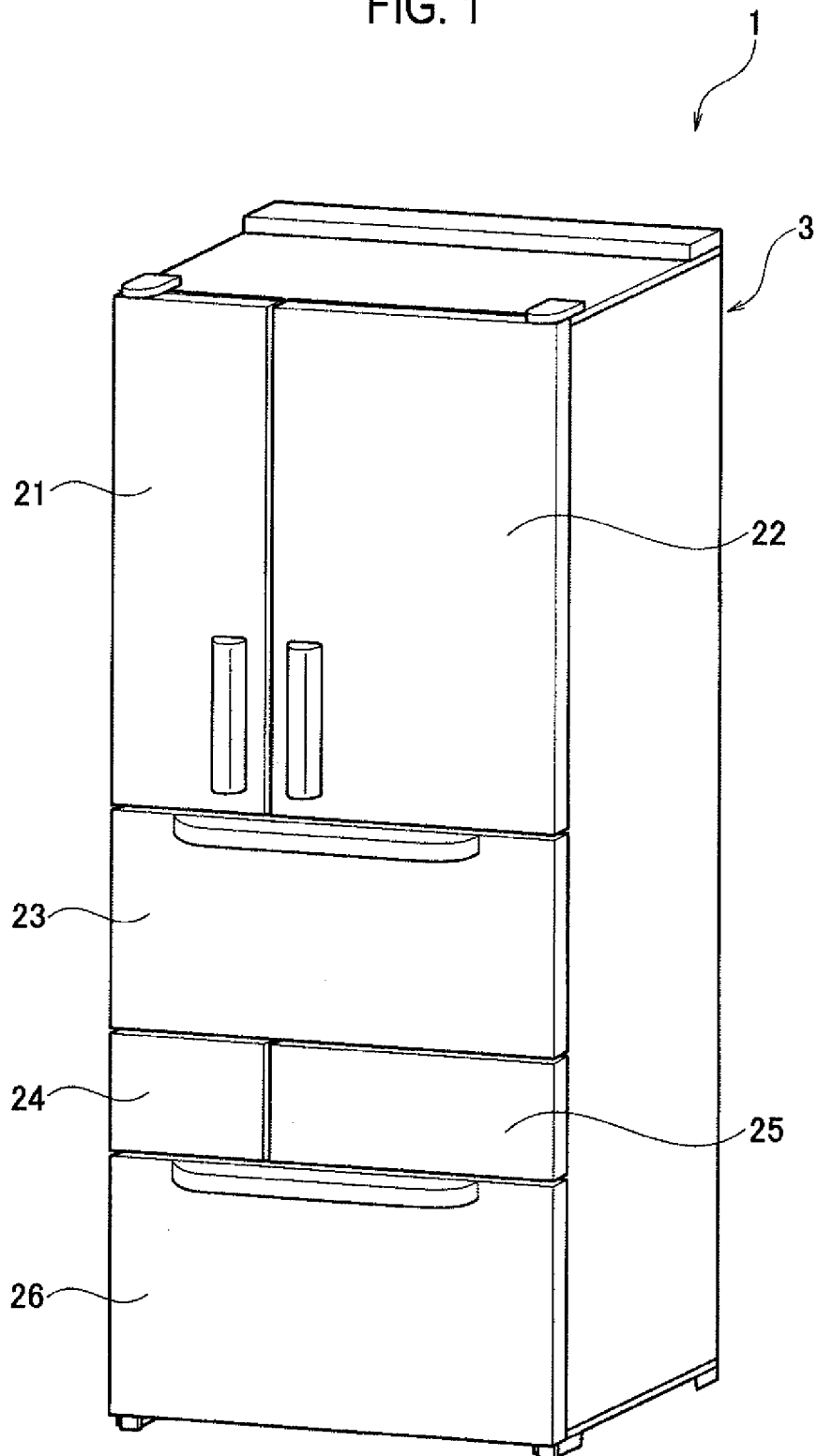


FIG. 2

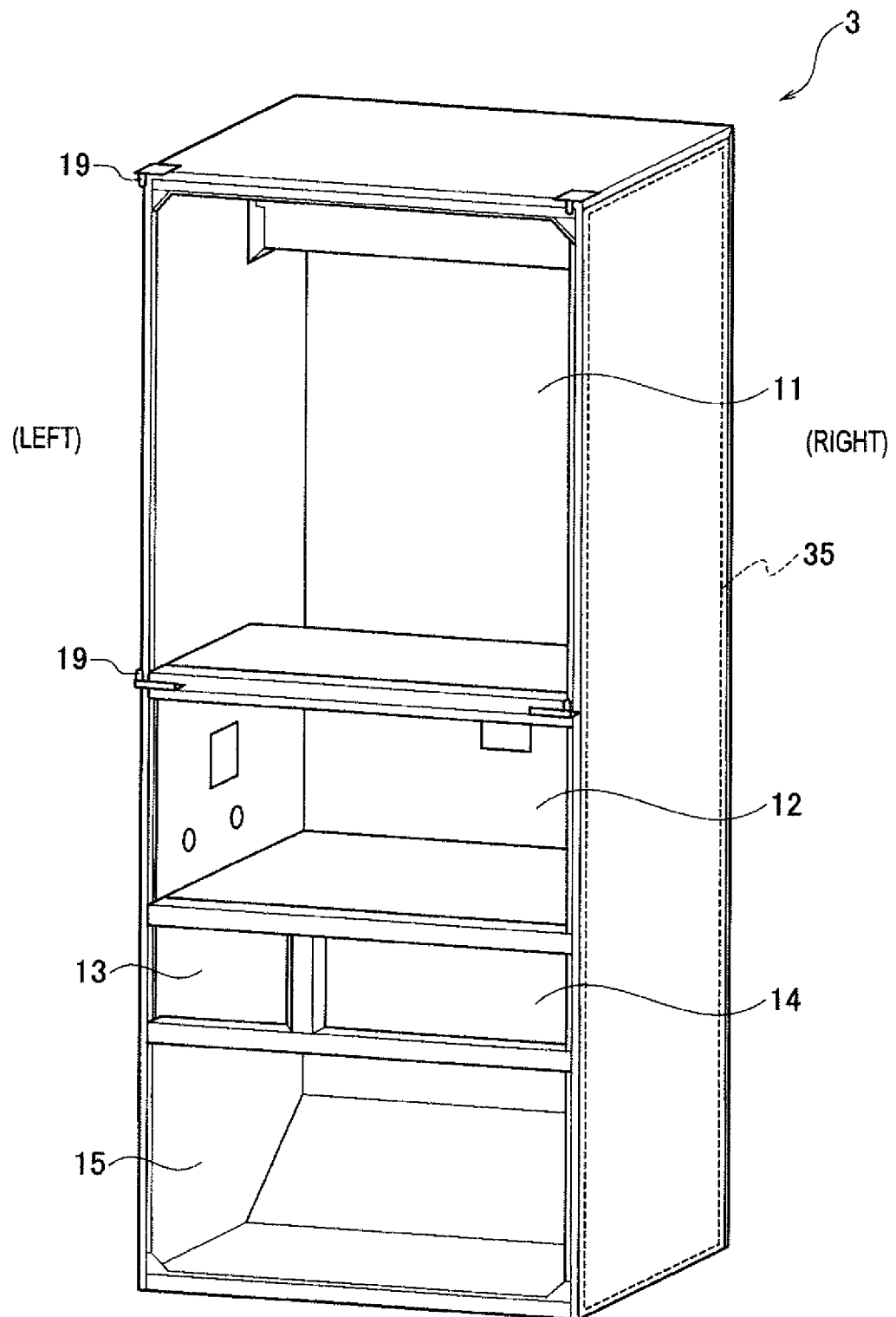


FIG. 3

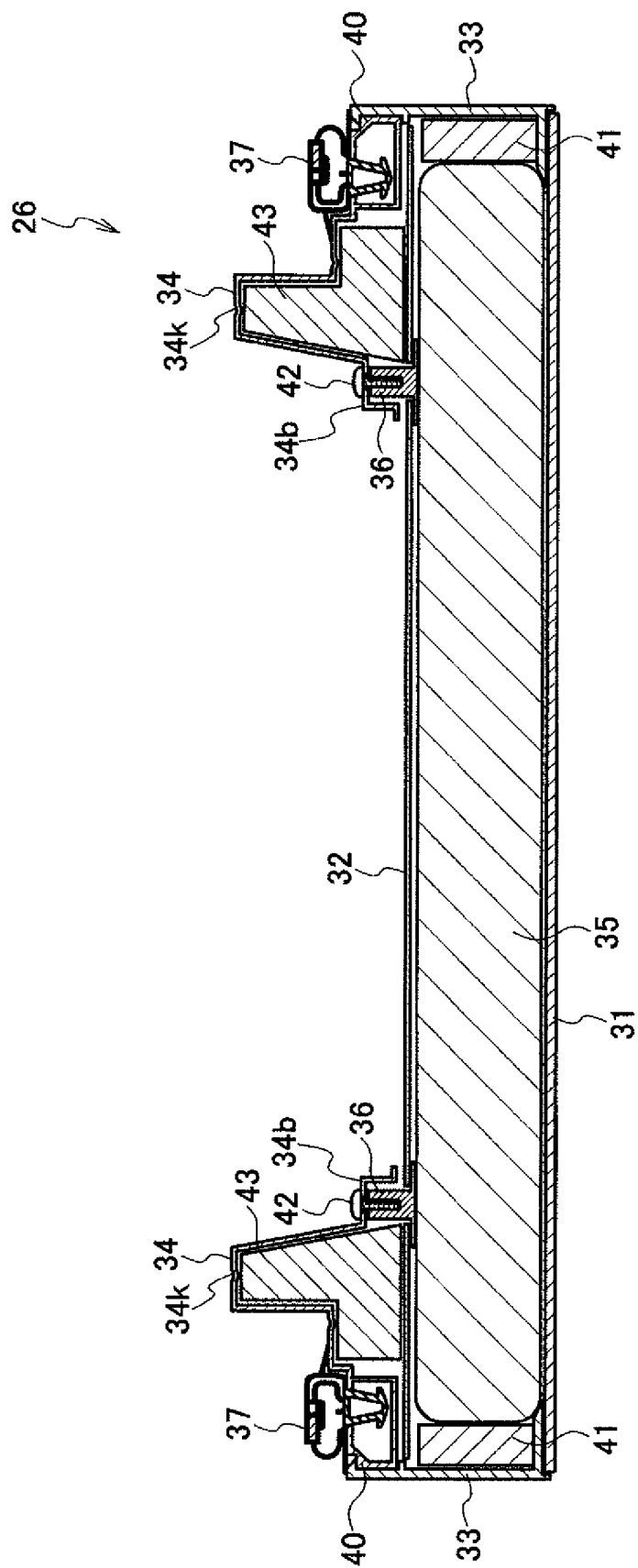


FIG. 4

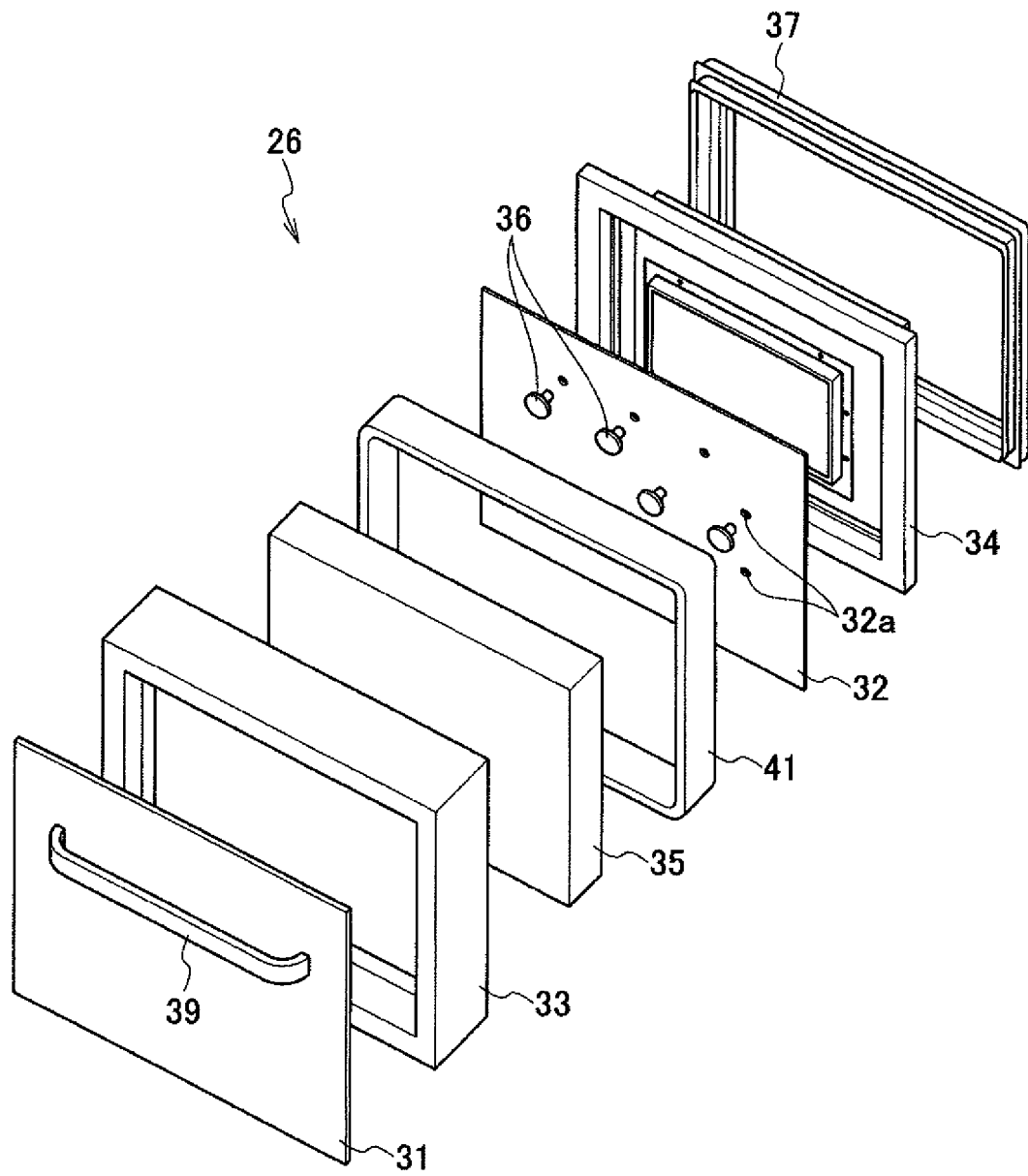


FIG. 5

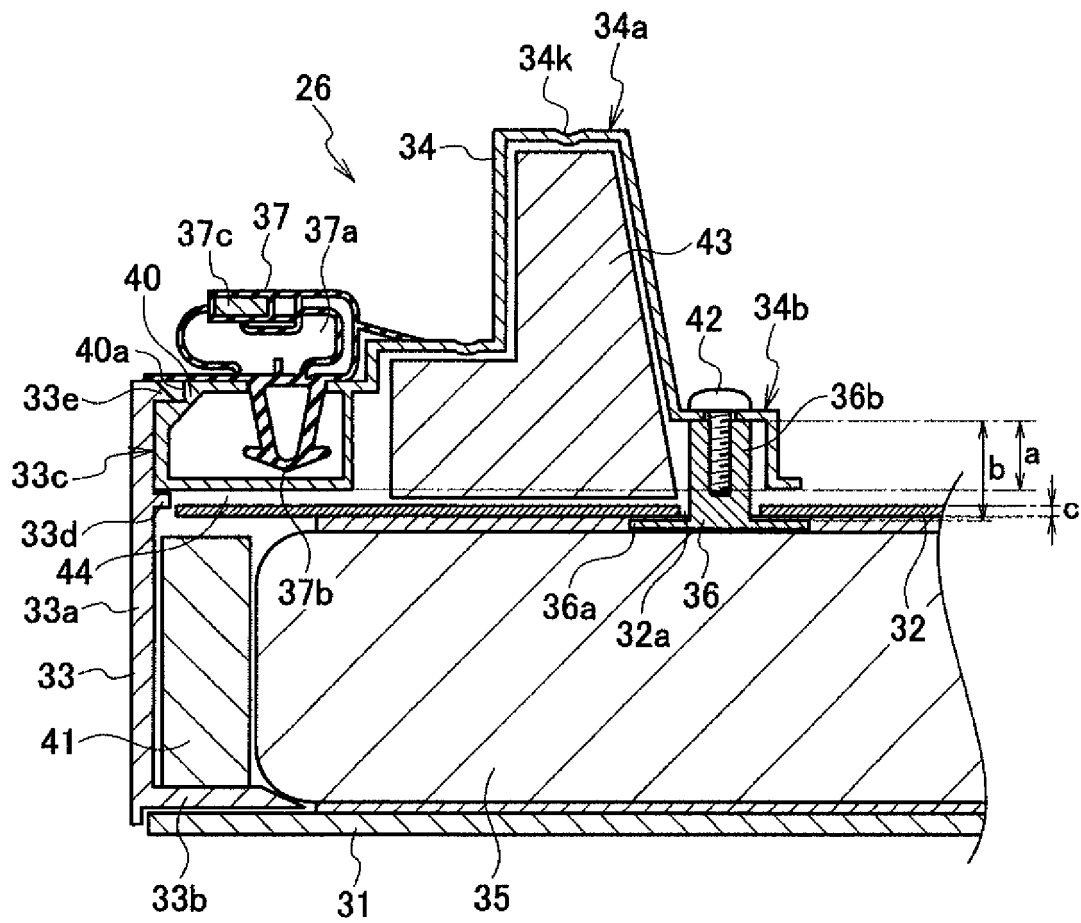


FIG. 6

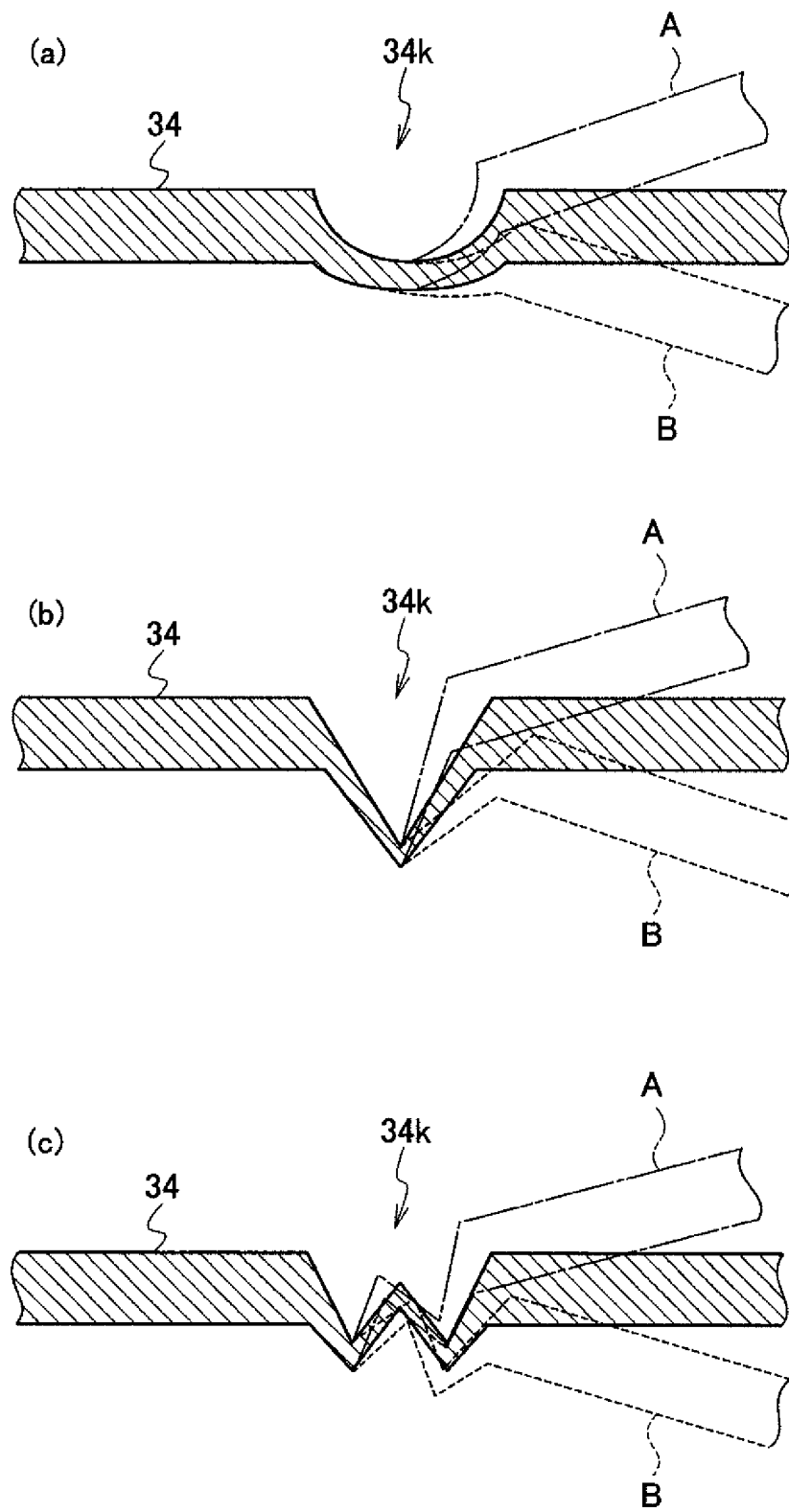


FIG. 7

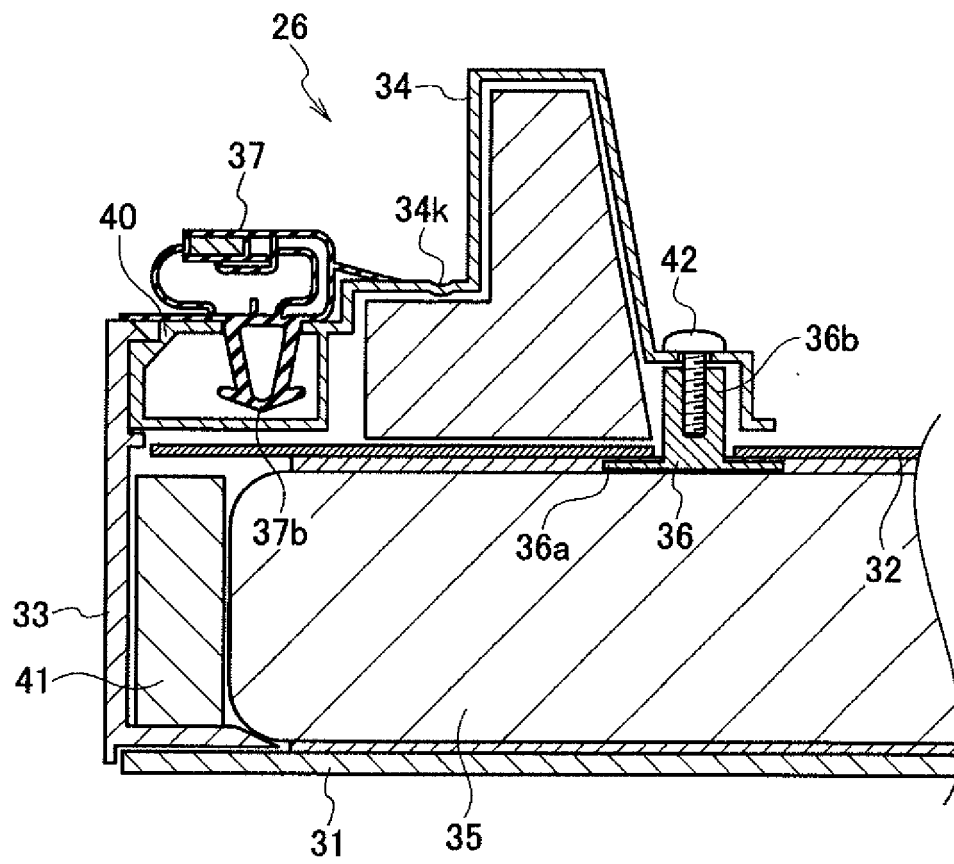


FIG. 8

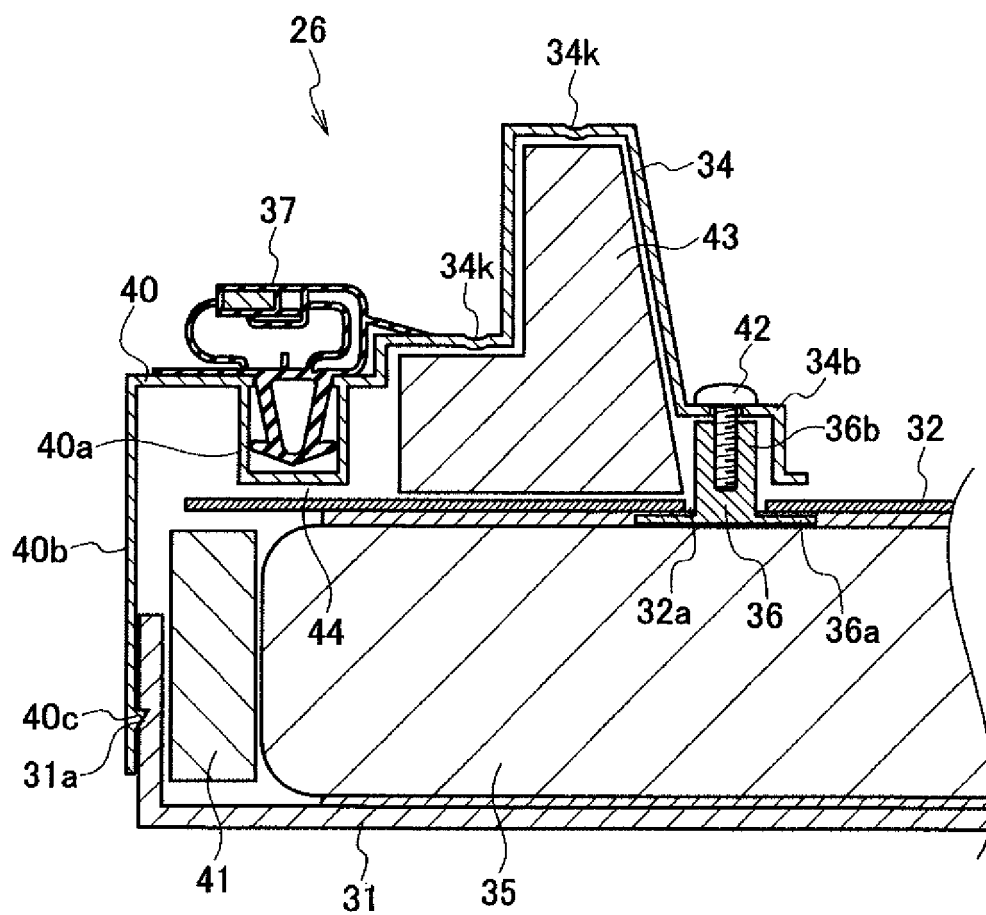


FIG. 9

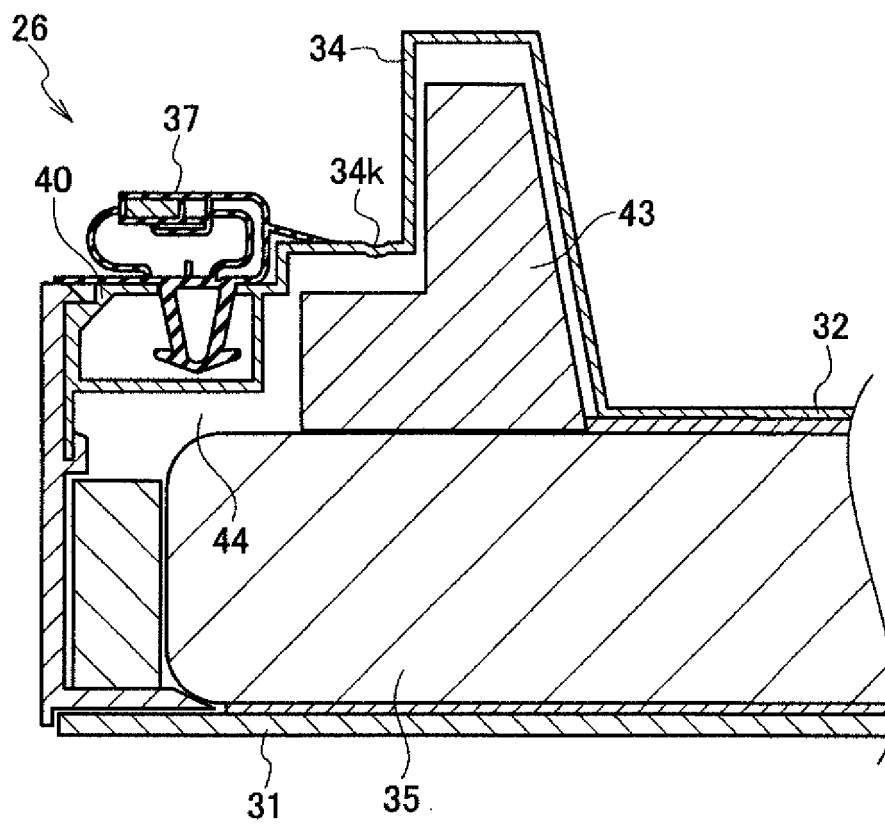


FIG. 10

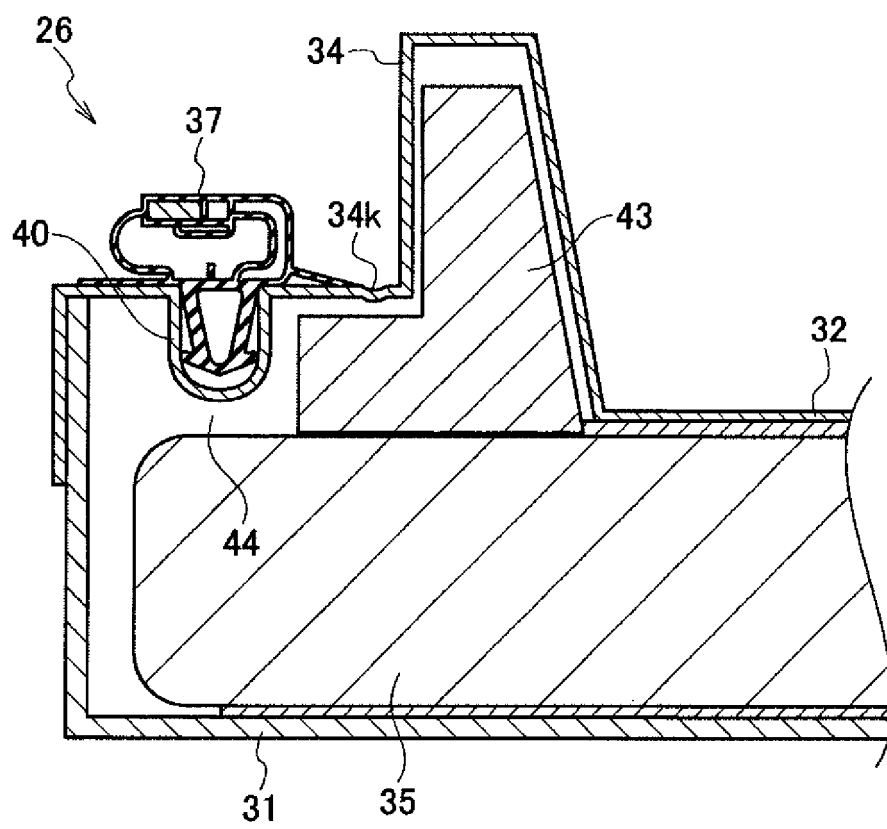


FIG. 11

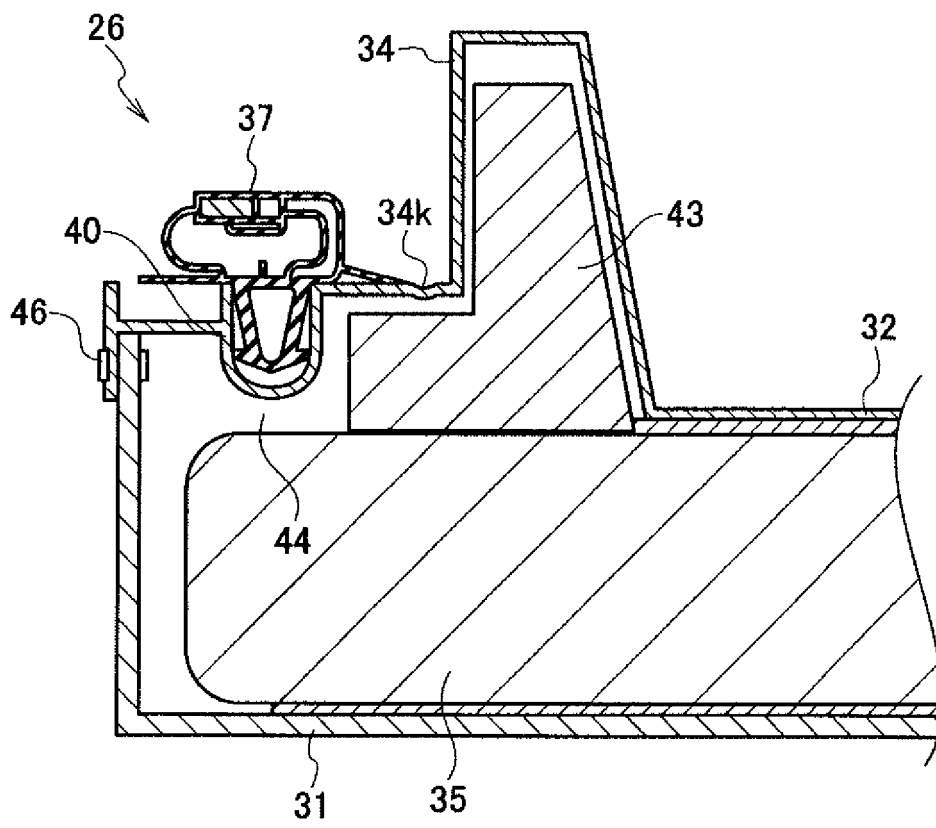
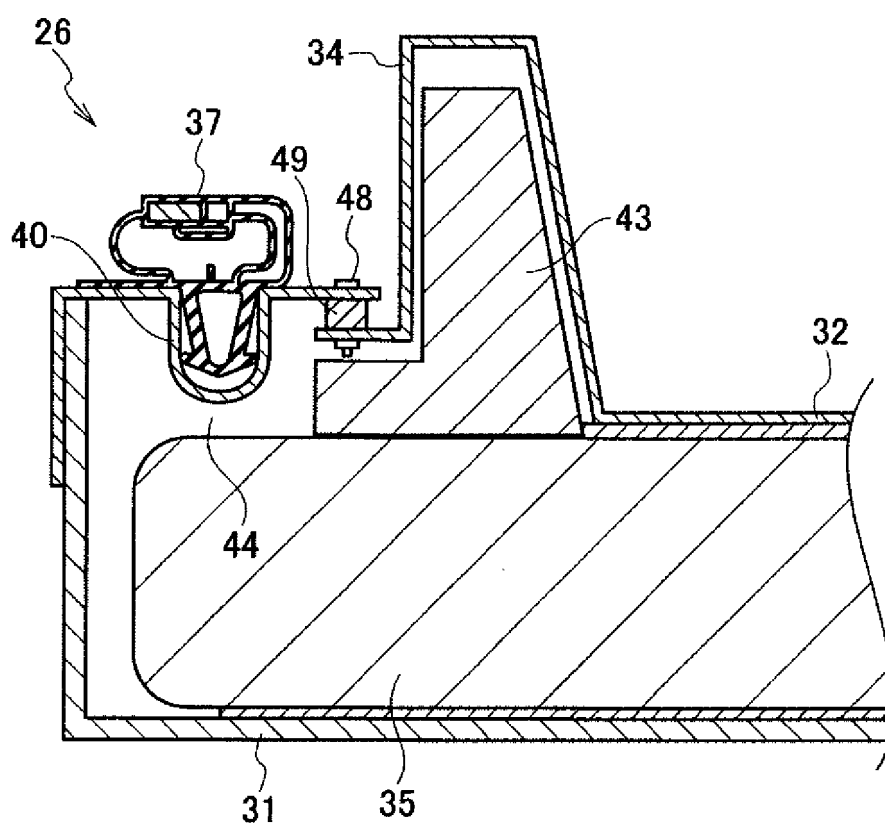


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/078960

A. CLASSIFICATION OF SUBJECT MATTER

F25D23/02 (2006.01) i, F25D23/06 (2006.01) 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)
F25D23/02, F25D23/06

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2013
Kokai Jitsuyo Shinan Koho	1971-2013	Toroku Jitsuyo Shinan Koho	1994-2013

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.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 87915/1984 (Laid-open No. 3389/1986) (Matsushita Refrigeration Co.), 10 January 1986 (10.01.1986), entire text; all drawings (particularly, fig. 2) (Family: none)	1-8

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search
25 January, 2013 (25.01.13)Date of mailing of the international search report
05 February, 2013 (05.02.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/078960

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 106567/1982 (Laid-open No. 11291/1984) (Matsushita Refrigeration Co.), 24 January 1984 (24.01.1984), entire text; all drawings (Family: none)	1
A	JP 8-14485 A (Sanyo Electric Co., Ltd.), 16 January 1996 (16.01.1996), entire text; all drawings (Family: none)	1
A	JP 2001-91147 A (Matsushita Refrigeration Co.), 06 April 2001 (06.04.2001), entire text; all drawings (particularly, fig. 8) (Family: none)	1
A	JP 59-66679 A (Hitachi, Ltd.), 16 April 1984 (16.04.1984), entire text; all drawings (Family: none)	1
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 79714/1984 (Laid-open No. 191889/1985) (Toshiba Corp.), 19 December 1985 (19.12.1985), entire text; all drawings (particularly, fig. 8 to 11) (Family: none)	4, 7, 8
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 149228/1983 (Laid-open No. 55976/1985) (Toshiba Corp.), 19 April 1985 (19.04.1985), entire text; all drawings (particularly, fig. 3) (Family: none)	5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006090649 A [0003]