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(54) **REFRIGERATOR**

(57) A refrigerator (100) includes a heat-insulating main body (150) including a first body (151) and a second body (152) that are adjacently arranged side by side, and further includes a right reinforcing member (200) having a right raised portion (203) and a left reinforcing member (210) having a left raised portion (213), with a right end portion of a front reinforcing member (220) joined to the right raised portion (203), and a left end portion of the front reinforcing member (220) joined to the left raised portion (213).

This diagram shows an exploded perspective view of a display device assembly. The main components include a front panel (141) and a rear panel (156) which together form a display housing (190). A display panel (156) is positioned between these panels. A base assembly (191) is shown below the housing, featuring a central rectangular cutout. Two mounting brackets (200) are shown at the bottom, each with a screw (165) for securing the base to a surface. A sliding mechanism (220) is also depicted, consisting of a track (210) and a slider (165) that fits into the track. The diagram uses dashed lines to indicate the alignment and assembly path of the various parts.

Description**Technical Field**

5 [0001] The present invention relates to refrigerators, and relates particularly to a configuration for reinforcing a refrigerator in which a freezer compartment and a refrigerator compartment are arranged side by side.

Background Art

10 [0002] Conventionally, there is a refrigerator which is a vertically long rectangular cuboid in shape and includes storage compartments of types different between right and left, with a wall partitioning a middle portion of the refrigerator in a width direction. Such a refrigerator is called, for example, a side-by-side (SBS) refrigerator. In the SBS refrigerator, for example, one of the storage compartments is a refrigerator compartment, and the other storage compartment is a freezer compartment.

15 [0003] In addition, in recent years, the capacity of the refrigerator has been expected to increase. Thus, in recent years, walls of a body forming the refrigerator tend to be thinner.

[0004] Accordingly, it is necessary to increase rigidity of the body included in the refrigerator to a level that is commensurate with a weight, size, and so on of the refrigerator.

20 [0005] Thus, a technique for increasing the rigidity of the body included in the refrigerator is disclosed (for example, see Patent Reference 1).

[0006] The refrigerator described in Patent Reference 1 includes a reinforcing member which extends in a front-rear direction in lower right and left portions of the refrigerator and has its front and rear ends folded upward, and also includes a reinforcing member which extends in a horizontal direction at a front end portion of a top face. This is intended to prevent a deformation of the body included in the refrigerator.

25 Patent Reference 1: Japanese Unexamined Patent Application Publication No. 2003-222466.

Disclosure of Invention**Problems that Invention is to Solve**

[0007] Here, as with refrigerators of other types, it is expected to further increase capacity of the SBS refrigerator described above, so that the walls of the body included in the refrigerator tend to be thinner.

35 [0008] Furthermore, the SBS refrigerator needs to have a sufficient horizontal width for including a refrigerator compartment and a freezer compartment that are to be adjacently arranged side by side, and each of the refrigerator compartment and the freezer compartment needs to have a sufficient width for placing food and so on.

[0009] On the other hand, since an installation area of the refrigerator approximately is expected to remain at a conventional level, the SBS refrigerator, as a result, tends to be longer in a height direction.

40 [0010] In other words, when intended to increase its capacity, the SBS refrigerator, has a unique problem of having a dimension increased in the height direction due to the layout in which the refrigerator compartment and the freezer compartment are adjacently arranged side by side.

[0011] Thus, it is necessary to provide the SBS refrigerator with rigidity so as to prevent deformation in a right-left direction and a front-rear direction, to say nothing of providing rigidity to an entire body that forms the refrigerator.

45 [0012] Thus, considering the conventional refrigerator as described above, the rigidity is increased against a front-rear deformation by the reinforcing member which is located along each of lower right and left edges and extends in the front-rear direction. In addition, the rigidity of the top face is increased by the reinforcing member that is provided in the top face and extends in the right-left direction.

[0013] However, these reinforcing members cannot sufficiently increase rigidity against right-left deformation in the refrigerator.

50 [0014] An object of the present invention which is conceived in view of the problem above is to provide a refrigerator including a refrigerator compartment and a freezer compartment that are adjacently arranged side by side, and having its rigidity increased along with increased capacity of these storage compartments.

Means to Solve the Problems

55 [0015] To solve the above conventional problem, a refrigerator according to an aspect of the present invention is a refrigerator including a heat-insulating main body which includes (i) a first body having an opening in a front face, forming a refrigerator compartment, and being long in a vertical direction, (ii) a second body having an opening in front, forming

a freezer compartment, and being long in a vertical direction, (iii) and an outer case which covers the first body and the second body that are adjacently arranged side by side, and the refrigerator includes: a right reinforcing member which integrally includes: a lower right edge portion provided along a lower right edge of the heat-insulating main body, from a front end portion to a rear end portion of the lower right edge; a rear right edge portion provided along a rear right edge of the heat-insulating main body, from the rear end portion to a predetermined point in the rear right edge; and a right raised portion provided in a raised state from the front end portion of the lower right edge portion; a left reinforcing member which integrally includes: a lower left edge portion provided along a lower left edge of the heat-insulating main body, from a front end portion to a rear end portion of the lower left edge; a rear left edge portion provided along a rear left edge of the heat-insulating main body, from the rear end portion to a predetermined point in the rear left edge; and a left raised portion provided in a raised state, from the front end portion of the lower left edge portion; and a front reinforcing member provided along a lower front edge of the heat-insulating main body, from a right end portion to a left end portion of the lower front edge, and the front reinforcing member has a right end portion joined to the right raised portion, and a left end portion joined to the left raised portion.

[0016] With this configuration, each of the right reinforcing member for reinforcing the lower right portion of the refrigerator and the left reinforcing member for reinforcing the lower left portion is connected to the front reinforcing member at a raised portion included in the front end portion of each of the right and left reinforcing members.

[0017] Accordingly, the right reinforcing member and the left reinforcing member which have a function to suppress the front-rear deformation are less likely to be inclined in the right-left direction. In other words, the configuration including the right reinforcing member, the left reinforcing member, and the front reinforcing member increase the rigidity of the refrigerator against deformation in the front-rear and right-left directions. Thus, even when it is intended to increase the capacity of the refrigerator by increasing a dimension of the refrigerator in a height direction, it is possible to maintain a sufficient rigidity for protecting the refrigerator from deformation.

[0018] In addition, the front reinforcing member may include: a lower face portion which is parallel to a bottom face of the heat-insulating main body; and a front raised portion provided in a raised state from the lower face portion, along the lower edge of the front face of the heat-insulating main body, from a right end to a left end of the lower edge, and the front raised portion may have a right end portion joined to the right raised portion, and a left end portion joined to the left raised portion.

[0019] With this configuration, the front reinforcing member when cut off in a front-rear direction has an L-shaped cross section, which increases rigidity against deformation. In other words, the front reinforcing member can reliably protect the refrigerator from deformation, in conjunction with the right and left reinforcing members connected to the front reinforcing member itself.

[0020] In addition, further in the front reinforcing member, the lower face portion may have a right end portion joined to the lower right edge portion, and a left end portion joined to the lower left edge portion.

[0021] With this configuration, a joint force between the right reinforcing member and the left reinforcing member increases, and as a result, a strength for protecting the refrigerator from deformation increases as an entirety of the right reinforcing member, the left reinforcing member, and the front reinforcing member.

[0022] In addition, the refrigerator according to the aspect of the present invention may further include: a door which covers one of the opening of the first body and the opening of the second body, to allow opening and closing; and an axis supporting member which supports a lower end portion of an axis member which forms an axis of the door, and the axis supporting member is attached to the refrigerator by one of: a joint member joining the right end portion of the front reinforcing member and the right raised portion; and a joint member joining the left end portion of the front reinforcing member and the left raised portion.

[0023] With this configuration, along with the front reinforcing member, and one of the right reinforcing member and the left reinforcing member, an axis supporting member is attached to the refrigerator.

[0024] Thus, it is not necessary to separately use a joint member for attaching the axis supporting member to the refrigerator.

[0025] In addition, for example, when the members are stacked in order of, from front, the axis supporting member, the front reinforcing member, and the right reinforcing member and are joined with a joint member such as a bolt, the front reinforcing member receives fastening force with a wider area than in the case of not including the axis supporting member. Thus, the joint force between the front reinforcing member and the right reinforcing member is increased as compared to the case of not including the axis supporting member.

[0026] In addition, the axis supporting member may include an adjustment member which is provided to protrude downward and is for adjusting a distance between a bottom face of the refrigerator and a floor surface on which the refrigerator is installed.

[0027] With this configuration, the axis supporting member functions not only as part of the member which rotatably supports a door but also as an attachment member for attaching the adjustment member to adjust a height of the refrigerator. In other words, it is not necessary to provide a hole or the like for attaching the adjustment member at the bottom of the refrigerator, or in the front reinforcing member and the like.

[0028] In addition, the axis supporting member may include a wheel which facilitates movement of the refrigerator on a floor surface.

[0029] With this configuration, the axis supporting member functions not only as part of the member that rotatably supports a door but also as an attachment member for attaching a wheel for moving the refrigerator. In other words, it is not necessary to provide a hole or the like for attaching the wheel at the bottom of the refrigerator, or in the front reinforcing material and the like.

[0030] In addition, the outer case may be a member of which a top face, a left lateral face, and a right lateral face are formed by folding a metal plate, and the right reinforcing member may be joined to a lower end portion of the right lateral face, and the left reinforcing member may be joined to a lower end portion of the left lateral face of the outer case.

[0031] Thus, the rigidity of the refrigerator is further increased against deformation in the right-left direction, by combining an outer case formed by folding a board, the right reinforcing member, the left reinforcing member, and the front reinforcing member.

Effects of the Invention

[0032] According to the present invention, it is possible to provide a refrigerator which includes a refrigerator compartment and a freezer compartment that are adjacently arranged side by side, and which has rigidity increased along with increased capacities of these storage compartments.

Brief Description of Drawings

[0033]

[FIG. 1] FIG. 1 is a perspective view showing an appearance of a refrigerator according to an embodiment of the present invention.

[FIG. 2] FIG. 2 is a perspective view showing an appearance of the refrigerator according to the present embodiment, with a first door and a second door open.

[FIG. 3] FIG. 3 is a perspective view showing an appearance of the refrigerator according to the present embodiment, from which a first door and a second door are omitted.

[FIG. 4] FIG. 4 is a perspective view showing an appearance of an inner case according to the present embodiment.

[FIG. 5] FIG. 5 is a perspective view showing an appearance of an outer case according to the present embodiment.

[FIG. 6] FIG. 6 is a perspective view showing a layout of a right reinforcing member, a left reinforcing member, and a front reinforcing member according to the present embodiment.

[FIG. 7] FIG. 7 is a diagram showing a joint relationship between a front reinforcing member, a right reinforcing member, and an axis supporting member according to the present embodiment.

FIG. 8 is a perspective view showing an appearance of an axis supporting member including a roller.

Numerical References

[0034]

100	Refrigerator
111	First door
112	Third door
113	Through hole
115	Axis member
121	Second door
122	Fourth door
123	Opening
141	Vacuum insulation material
150	Heat-insulating main body
151	First body
152	Second body
153	Partition
156	Outer case
157	Inner case
158	Board cover
162	Container

163	Shelf
165, 168	Axis supporting member
165a, 204, 205, 223, 224	Fastening hole
166	Adjuster attachment hole
5 167	Axis hole
168a	Joint hole
170	Adjuster bolt
171	Bottom reinforcing member
172	Roller
10 180, 181	Bolt
190	Back panel
191	Bottom panel
200	Right reinforcing member
201	Lower right edge portion
15 202	Rear right edge portion
203	Right raised portion
210	Left reinforcing member
211	Lower left edge portion
212	Rear left edge portion
20 213	Left raised portion
220	Front reinforcing member
221	Lower face portion
222	Front raised portion

25 Best Mode for Carrying Out the Invention

[0035] Hereinafter, an embodiment of the refrigerator according to the present invention will be described with reference to the drawings.

30 [0036] FIG. 1 is a perspective view showing an appearance of a refrigerator 100 according to the embodiment of the present invention.

[0037] The refrigerator 100 is an apparatus which chills or freezes to store a storage item that is to be stored inside. The refrigerator 100 includes: a heat-insulating main body 150, a first door 111, a second door 121, a third door 112, a through hole 113, and a fourth door 122. In addition, the refrigerator 100 is a rectangular body having a height that is largest among the height, width, and depth.

35 [0038] The first door 111 is a door that covers, to allow opening and closing, an opening on the right with respect to the heat-insulating main body 150. In the present embodiment, the first door 111 is attached to the heat-insulating main body 150 using a hinge (not shown in FIG. 1) so as to rotate centering on an axis that vertically extends in front of a right wall of the heat-insulating main body 150. In addition, the first door 111 has a vertically long rectangular shape, and is provided from top to bottom of the refrigerator 100, with the axis passing through a right-end rim portion of the first door 111.

40 [0039] The second door 121 is a door that covers, to allow opening and closing, an opening on the left with respect to the heat-insulating main body 150. In the present embodiment, the second door 121 is attached to the heat-insulating main body 150 using a hinge (not shown in FIG. 1) so as to rotate centering on an axis that vertically extends in front of a left wall of the heat-insulating main body 150. In addition, the second door 121 has a vertically long rectangular shape, and is provided from top to bottom of the refrigerator 100, with the axis passing through a left-end rim portion of the second door 121.

[0040] The through hole 113 is a hole penetrating through the first door 111 in a thickness direction. The through hole 113 is a hole through which to take out a storage item that is stored behind the first door 111 and to insert to store an item behind the first door 111, without opening the first door 111.

50 [0041] The third door 112 is a door that covers the through hole 113 to allow opening and closing. In the present embodiment, the third door 112 is attached to the first door 111 using a hinge (not shown) so as to rotate centering on an axis that horizontally extends along a lower end rim of the through hole 113. In addition, the axis passes through a lower-end rim portion of the third door 112.

[0042] The fourth door 122 is a door that covers, to allow opening and closing, an opening 123 for receiving ice that is supplied from inside of the refrigerator.

[0043] In addition, an upper part of the heat-insulating main body 150 houses a control board for controlling an operation of the refrigerator, and a board cover 158 for covering the housing space is attached.

[0044] FIG. 2 is a perspective view showing an appearance of the refrigerator 100 with the first door 111 and the

second door 121 open.

[0045] FIG. 3 is a perspective view showing an appearance of the refrigerator 100, from which the first door 111 and the second door 121 are omitted.

[0046] As shown in these figures, the refrigerator 100 includes a first body 151, a second body 152, and an outer case 156.

[0047] The first body 151 is a vertically long body made of resin, having an opening in a front face, and forms the refrigerator compartment. In the present embodiment, the first body 151 is provided in a right side of the refrigerator 100 in an entire vertical direction of the refrigerator 100. Note that the refrigerator compartment is a compartment which keeps a temperature within a range that is lower than a temperature outside the refrigerator 100 and higher than a water-freezing temperature, and is for storing a storage item such as vegetables.

[0048] The second body 152 is a vertically long body made of resin, having an opening in a front face, and forms the freezer compartment. In the present embodiment, the second body 152 is provided in a left side of the refrigerator 100 in the entire vertical direction of the refrigerator 100. Note that the freezer compartment keeps a temperature lower than the temperature in the refrigerator compartment and stores a storage item such as frozen food.

[0049] In addition, inside the first body 151 and the second body 152, a plurality of containers 162 and shelves 163 on which the food and so on are placed are attached.

[0050] The outer case 156 is a metal plate covering an inner case 157 including the first body 151 and the second body 152 that are adjacently arranged side by side.

[0051] Thus, the refrigerator 100 according to the present embodiment is an SBS refrigerator in which the refrigerator compartment and the freezer compartment are adjacently arranged side by side.

[0052] FIG. 4 is a perspective view showing an appearance of the inner case 157 in the present embodiment.

[0053] As shown in FIG. 4, the inner case 157 in the present embodiment includes the first body 151 and the second body 152.

[0054] In addition, the first body and the second body are separately molded, into a configuration in which a lateral portion of the first body 151 and another lateral portion of the second body 152 are previously fixed, through engagement, to each of right and left lateral side of the partition 153 that partitions the first body 151 and the second body 152 into right and left sides.

[0055] FIG. 5 is a perspective view showing an appearance of the outer case 156 of the present embodiment.

[0056] The outer case 156 shown in FIG. 5 is a member whose top face and right and left lateral faces are formed by folding a metal plate. In addition, the outer case 156 covers the right and left lateral faces and the top face of the inner case 157.

[0057] In addition, the outer case 156 is joined to each of a back panel 190 and a bottom panel 191. Note that in some cases a body formed by combining the outer case 156, the back panel 190, and the bottom panel 191 is described as an "outer case".

[0058] Here, the heat-insulating main body 150 in the present embodiment is manufactured as below. Specifically, outside the inner case 157 having a shape as shown in FIG. 4, the outer case 156, the back panel 190, and the bottom panel 191 are placed to cover the inner case 157 at a predetermined space from the inner case 157.

[0059] A space provided between the inner case 157 and the outer case 156, the back panel 190, and the bottom panel 191, and a space provided inward the partition are filled with an insulation material, for example, rigid urethane foam. Thus, the heat-insulating main body 150 is manufactured.

[0060] Note that, as shown in FIG. 5, according to the present embodiment, a vacuum insulation material 141 is provided between a left lateral face of the second body 152 and the outer case 156. In addition, dotted rectangles drawn in the top and the right lateral face of the outer case 156 and the back panel 190 indicate that the vacuum insulation material is provided therein.

[0061] Such vacuum insulation materials have higher thermal insulation performance than such an insulation material as rigid urethane foam. Thus, even a smaller thickness (for example, approximately 15 mm) can produce a sufficient thermal insulation effect.

[0062] Accordingly, it is possible to reduce the thickness of the wall of the heat-insulating main body 150 by providing the vacuum insulation material at each position in the refrigerator 100, thus increasing the capacity inside the refrigerator.

[0063] In addition, a lower part of the refrigerator 100 includes a right reinforcing member 200, a left reinforcing member 210, and a front reinforcing member 220. These reinforcing members increase the rigidity of the refrigerator 100.

[0064] FIG. 6 is a perspective view showing a layout of the right reinforcing member 200, the left reinforcing member 210, and the front reinforcing member 220 in the present embodiment.

[0065] The right reinforcing member 200 is a member which integrally includes: the lower right edge portion 201 provided along a lower right edge of the heat-insulating main body 150, from a front end portion to a rear end portion of the lower right edge; a rear right edge portion 202 provided along a rear right edge of the heat-insulating main body, from the rear end portion to a predetermined point in the rear right edge; and a right raised portion 203 provided in a raised state from a front end portion of the lower right edge portion 201.

[0066] The left reinforcing member 210 is a member which integrally includes: the lower left edge portion 211 provided along a lower left edge of the heat-insulating main body 150, from a front end portion to a rear end portion of the lower left edge; a rear left edge portion 212 provided along a rear left edge from the rear end portion to a predetermined point in the rear left edge; and a left raised portion 213 provided in a raised state from a front end portion of the lower left edge portion 211.

[0067] The front reinforcing member 220 is a member provided along a lower front edge, from a right end portion to a left end portion of the lower front edge of the heat-insulating main body 150.

[0068] Note that the right reinforcing member 200 is incorporated into the heat-insulating main body 150 by having the lower right edge portion 201 and the rear right edge portion 202 joined to the outer case by a bolt and so on. In addition, for example, when joining the lower right edge portion 201 with the outer case 156 using the bolt, the bottom panel 191 is also joined to the outer case by the bolt.

[0069] In addition, for example, when joining the rear right edge portion 202 with the outer case 156 by a bolt, the back panel 190 is also joined to the outer case 156 by the bolt.

[0070] Thus, the right reinforcing member 200 is incorporated into the heat-insulating main body 150. In addition, the left reinforcing member 210 is integrated into a lower left part of the heat-insulating main body 150 as with the right reinforcing member 200.

[0071] In addition, as shown in FIG. 6, the axis supporting member 165 is provided on each side in a lower part of the front face of the refrigerator 100.

[0072] The axis supporting member 165 on the right is a member for supporting an axis member that forms an axis of the first door 111, and the axis supporting member 165 on the left is a member for supporting an axis member that forms an axis of the second door 112.

[0073] In addition, to each of the two axis supporting members 165, an adjuster bolt 170 that is an adjustment member for adjusting a distance between the bottom face of the refrigerator 100 and a surface on which the refrigerator 100 is installed.

[0074] In addition, as shown in FIG. 6, the refrigerator 100 includes a bottom reinforcing member 171 including two rollers.

[0075] Note that the right end portion of the front reinforcing member 220 and the right reinforcing member 200 are joined by a bolt 180, but the bolt 180 is also used for attachment of the axis supporting member 165 on the right to the refrigerator 100.

[0076] In addition, the left end portion of the front reinforcing member 220 and the left reinforcing member 210 are joined by a bolt 180, but the bolt 180 is also used for attachment of the axis supporting member 165 on the left to the refrigerator 100.

[0077] FIG. 7 is a diagram showing a joint relationship between the front reinforcing member 220, the right reinforcing member 200, and the axis supporting member 165 in the present embodiment. Note that in FIG. 7, the bottom reinforcing member 171 is omitted for simplifying the figure.

[0078] As shown in FIG. 7, the front reinforcing member 220 includes: a lower face portion 221 which is parallel to the bottom panel 191 that forms the bottom of the heat-insulating main body 150, and a front raised portion 222 provided in a raised state from the lower face portion 221.

[0079] In addition, the front raised portion 222 is provided along the lower front edge of the heat-insulating main body 150, from the right end portion to the left end portion of the lower front edge, and includes, in the right end portion, a fastening hole 223 for joining the right reinforcing member 200 and the right raised portion 203.

[0080] In addition, the right raised portion 203 of the right reinforcing member 200 includes a fastening hole 204 for joining the right reinforcing member 200 to the front raised portion 222.

[0081] Furthermore, the axis supporting member 165 also includes a fastening hole 165a. The axis supporting member 165, the front reinforcing member 220, and the right reinforcing member 200 are fastened together by the bolt 180 that penetrates through these fastening holes 165a, 223, and 204, and a nut that is not shown.

[0082] In other words, the axis supporting member 165 is attached to the refrigerator 100 by the bolt 180 that is a joint member that joins the right end portion of the front reinforcing member 220 and the right reinforcing member 200.

[0083] Note that FIG. 7 illustrates a joint relationship between the front reinforcing member 220, the right reinforcing member 200, and the axis supporting member 165 on the right. However, the same is applicable to the joint relationship between the front reinforcing member 220, the left reinforcing member 210, and the axis supporting member 165 on the left.

[0084] In other words, in the lower left part of the front face of the refrigerator 100, the axis supporting member 165 on the left is attached to the refrigerator by the bolt 180 that is a joint member that joins the left end portion of the front reinforcing member 220 and the left reinforcing member 210.

[0085] In addition, as shown in FIG. 7, the lower face portion 221 of the front reinforcing member 220 includes a fastening hole 224, and the lower right edge portion 201 of the right reinforcing member 200 includes a fastening hole 205.

[0086] The front reinforcing member 220 and the right reinforcing member 200 are fastened together by the bolt 181

that penetrates through these fastening holes 224 and 205, and a nut that is not shown.

[0087] In other words, the right end portion of the front reinforcing member 220 is joined to the right raised portion 203 and the lower right edge portion 210 of the right reinforcing member 200.

[0088] In addition, likewise, the left end portion of the front reinforcing member 220 is joined to the left raised portion 213 and the lower left edge portion 211 of the left reinforcing member 210.

[0089] Note that when joining the front reinforcing member 220 and the right reinforcing member 200, whichever may be located in front in the positional relationship between the front raised portion 222 and the right raised portion 203. In addition, when joining the front reinforcing member 220 and the left reinforcing member 210, whichever may be located in front in the positional relationship between the front raised portion 222 and the left raised portion 213.

[0090] In addition, as shown in FIG. 7, the axis supporting member 165 includes an axis hole 167, and, to the axis hole 167, a lower end portion of the axis member 115 forming the axis of the first door 111 is attached. In addition, an upper end portion of the axis member 115 is attached to an upper portion supporting member (not shown) attached to an upper right part of the heat-insulating main body 150. In other words, the axis supporting member 165, the axis member 115, and the upper portion supporting member form a hinge that rotatably supports the first door 111.

[0091] In addition, a hinge that rotatably supports the second door 121 includes: an axis supporting member 165 on the left, an axis member that forms an axis of the second door 121, and an upper portion supporting member that supports the upper end portion of the axis member.

[0092] In addition, as shown in FIG. 7, the axis supporting member 165 includes an adjuster bolt 170. Specifically, the axis supporting member 165 includes an adjuster attachment hole 166, and a screw portion of the adjuster bolt 170 is screwed into the adjuster attachment hole 166.

[0093] Thus, the refrigerator 100 according to the present embodiment includes the right reinforcing member 200 and the left reinforcing member 210. The right reinforcing member 200, as shown in FIG. 5 and so on, is L-shaped as an entirety, and is incorporated into the heat-insulating main body 150 along the lower and rear right edges of the heat-insulating main body 150.

[0094] In addition, likewise, the left reinforcing member 210 is L-shaped as an entirety, and is incorporated into the heat-insulating main body 150 along the lower and rear left edges of the heat-insulating main body 150.

[0095] This increases rigidity of the refrigerator 100 against deformation in the front-rear direction.

[0096] In addition, the refrigerator 100 according to the present embodiment includes the front reinforcing member 220. The front reinforcing member 220 when cut off in a front-rear direction has an L-shaped cross section, and mainly functions as a member for increasing the rigidity of a lower part of the front face of the heat-insulating main body 150.

[0097] In addition, the right end portion of the front reinforcing member 220 is joined to the right raised portion 203 provided in the right end portion of the right reinforcing member 200, and the left end portion of the front reinforcing member 220 is also joined to the right raised portion 203 provided in the front end portion of the left reinforcing member 210.

[0098] Here, the right reinforcing member 200 and the left reinforcing member 210 are members attached in parallel in the front-rear direction as shown in FIG. 5 and so on. Accordingly, when, for example, a load is added to the top portion of the refrigerator in a right or left direction, only the right reinforcing member 200 and the left reinforcing member 210 cannot sufficiently perform the function to suppress deformation caused by the load.

[0099] However, the right reinforcing member 200 is joined to the front reinforcing member 220 via the right raised portion 203, and the left reinforcing member 210 is joined to the front reinforcing member 220 via the left raised portion 213.

[0100] Thus, each of the right reinforcing member 200 and left reinforcing member 210, when it is about to incline in the right-left direction, is provided with a reactive force by the front reinforcing member 220.

[0101] In other words, the right reinforcing member 200, the left reinforcing member 210, and the front reinforcing member 220 function, as an entirety, as a member to increase the rigidity of the refrigerator 100 against the deformation in the right-left direction.

[0102] Furthermore, according to the present embodiment, the lower right edge portion 210 of the right reinforcing member 200 is joined to the right end portion of the front raised portion 222 of the front reinforcing member 220, and the lower left edge portion 211 of the left reinforcing member 210 is joined to the left end portion of the front raised portion 222 of the front reinforcing member 220.

[0103] This increases the joint force among the right reinforcing member 200, the left reinforcing member 210, and the front reinforcing member 220, thus further increasing rigidity.

[0104] In addition, the bolt 180 used for joining the right reinforcing member 200 and the front reinforcing member 220 also functions as a joint member for attaching the axis supporting member 165 to the refrigerator 100.

[0105] This allows, for example, reducing the number of components required for the refrigerator 100. In addition, for example, when the axis supporting member 165, the front reinforcing member 220, and the right reinforcing member 200 are stacked in order of, from front, the axis supporting member 165, the front reinforcing member 220, and the right reinforcing member 200 and are joined with a bolt 180, the front reinforcing member 220 receives a fastening force with a wider area than in the case of not including the axis supporting member 165. Thus, the joint force of the front reinforcing member 220 and the right reinforcing member 200 is increased as compared to the case of not including the axis

supporting member 165.

[0106] In addition, the outer case 156 according to the present embodiment is a member formed by folding a metal plate as shown in FIG. 5.

[0107] In other words, the outer case 156 is not a member formed by, for example, connecting a top plate and two side boards that are separately manufactured.

[0108] Thus, such a combination of the outer case 156, the right reinforcing member 200, the left reinforcing member 210, and the front reinforcing member 220 further increases the rigidity of the refrigerator 100 against the deformation in the right-left direction.

[0109] In addition, the axis supporting member 165 includes the adjuster bolt 170. In other words, the axis supporting member 165 functions not only as a member that rotatably supports the first door 111 but also as an attachment member for attaching a height-adjusting member that supports the refrigerator 100.

[0110] With this, for example, a member having the function to increase the rigidity of the refrigerator 100, such as the front reinforcing member 220 or the bottom reinforcing member 171, need not be provided with a hole for attaching the adjuster bolt 170. In other words, it is not necessary to provide, in these reinforcing members, an extra hole for reducing the rigidity.

[0111] Note that a joint member for joining the axis supporting member 165, the front reinforcing member 220, and the right reinforcing member 220 also functions as a joint member for joining these three members and the heat-insulating main body 150.

[0112] For example, the bolt 180 also functions as a joint member for joining these three members and the bottom panel 191.

[0113] This is also applicable to the other joint members such as the bolt 180 which joins the axis supporting member 165, the front reinforcing member 220, and the left reinforcing member 210.

[0114] In addition, these joint members can also be used as joint members for joining the bottom reinforcing member 171 to the bottom panel 191.

[0115] Note that the bottom reinforcing member 171 can function as part of the front reinforcing member 220 by being joined to the front reinforcing member 220 by the bolt or the like.

[0116] Note that the bottom reinforcing member 171 may be omitted by increasing a front-rear width of the lower face portion 221 of the front reinforcing member 220 and attaching two rollers thereto.

[0117] In this case, the cross-sectional area of the front reinforcing member 220 when cut off in the front-rear direction is increased, thus increasing the rigidity of the front reinforcing member 220.

[0118] In addition, the type of the joint member used for assembling the refrigerator 100 is not limited to bolt but may be a rivet, a screw, or the like.

[0119] In addition, in the present embodiment, the axis supporting member 165 has been described as including the adjuster bolt 170. However, the axis supporting member 165 may include a roller, in addition to or instead of the adjuster bolt 170.

[0120] FIG. 8 is a perspective view showing an appearance of the axis supporting member 168 including a roller.

[0121] As shown in FIG. 8, the axis supporting member 168 includes a joint hole 168a for joining the front reinforcing member 220 and the right reinforcing member 200, an axis hole 167 to which a lower end portion of the axis member 115 is attached, and an adjuster attachment hole 166 to which the adjuster bolt 170 is attached. The axis supporting member 168 further includes a roller 172.

[0122] The roller 172 is a kind of a wheel which facilitates movement of the refrigerator 100 on a plane. In this case, the bottom reinforcing member 171 shown in FIG. 6 need not include a roller, thus increasing the rigidity of the bottom reinforcing member 171.

[0123] In addition, as described above, in the case of omitting the bottom reinforcing member 171 by increasing a front-rear width of the lower face portion 221 of the front reinforcing member 220 and providing the front reinforcing member 220 with a function to reinforce the bottom surface, the axis supporting member 168 including the roller is useful.

[0124] Note that the wheel included in the axis supporting member 168 may be of another type than the roller 172. For example, as a wheel that facilitates the movement of the refrigerator 100 on the plane, the axis supporting member 168 may include a ball rotatably held by a ball bearing.

Industrial Applicability

[0125] According to the present invention, it is possible to provide a refrigerator which includes a refrigerator compartment and a freezer compartment that are adjacently arranged side by side, and which has rigidity increased along with increased capacity of these storage compartments. Accordingly, the present invention is applicable to refrigerators or the like of various types and sizes for home and professional uses, and so on.

Claims

1. A refrigerator including a heat-insulating main body which includes (i) a first body having an opening in a front face, forming a refrigerator compartment, and being long in a vertical direction, (ii) a second body having an opening in front, forming a freezer compartment, and being long in a vertical direction, (iii) and an outer case which covers said first body and said second body that are adjacently arranged side by side, said refrigerator comprising:

a right reinforcing member which integrally includes: a lower right edge portion provided along a lower right edge of said heat-insulating main body, from a front end portion to a rear end portion of the lower right edge; a rear right edge portion provided along a rear right edge of said heat-insulating main body, from the rear end portion to a predetermined point in the rear right edge; and a right raised portion provided in a raised state from the front end portion of the lower right edge portion;

a left reinforcing member which integrally includes: a lower left edge portion provided along a lower left edge of said heat-insulating main body, from a front end portion to a rear end portion of the lower left edge; a rear left edge portion provided along a rear left edge of said heat-insulating main body, from the rear end portion to a predetermined point in the rear left edge; and a left raised portion provided in a raised state, from the front end portion of the lower left edge portion; and

a front reinforcing member provided along a lower front edge of said heat-insulating main body, from a right end portion to a left end portion of the lower front edge, wherein said front reinforcing member has a right end portion joined to said right raised portion, and a left end portion joined to said left raised portion.

2. The refrigerator according to Claim 1, wherein said front reinforcing member includes:

a lower face portion which is parallel to a bottom face of said heat-insulating main body; and a front raised portion provided in a raised state from said lower face portion, along the lower edge of the front face of said heat-insulating main body, from a right end to a left end of the lower edge, and said front raised portion has a right end portion joined to said right raised portion, and a left end portion joined to said left raised portion.

3. The refrigerator according to Claim 2, wherein further in said front reinforcing member, said lower face portion has a right end portion joined to the lower right edge portion, and a left end portion joined to the lower left edge portion.

4. The refrigerator according to Claim 1, further comprising:

a door which covers one of the opening of said first body and the opening of said second body, to allow opening and closing; and

an axis supporting member which supports a lower end portion of an axis member which forms an axis of said door,

wherein said axis supporting member is attached to said refrigerator by one of: a joint member joining the right end portion of said front reinforcing member and said right raised portion; and a joint member joining the left end portion of said front reinforcing member and said left raised portion.

5. The refrigerator according to Claim 4, wherein said axis supporting member includes an adjustment member which is provided to protrude downward and is for adjusting a distance between a bottom face of said refrigerator and a floor surface on which said refrigerator is installed.

6. The refrigerator according to Claim 4, wherein said axis supporting member includes a wheel which facilitates movement of said refrigerator on a floor surface.

7. The refrigerator according to Claim 1, wherein said outer case is a member of which a top face, a left lateral face, and a right lateral face are formed by folding a metal plate, and said right reinforcing member is joined to a lower end portion of the right lateral face, and said left reinforcing member

is joined to a lower end portion of the left lateral face of said outer case.

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FIG. 1

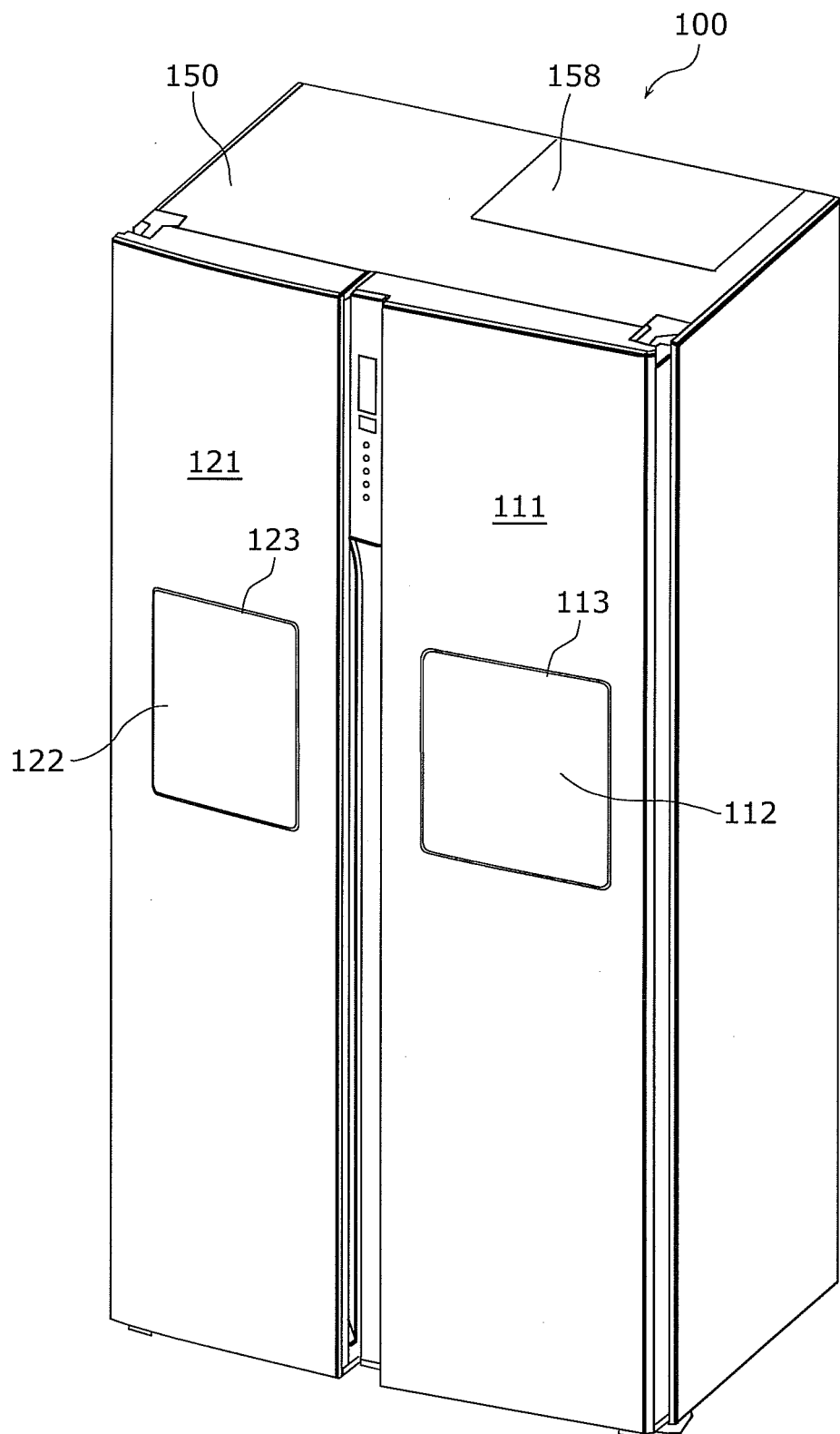


FIG. 2

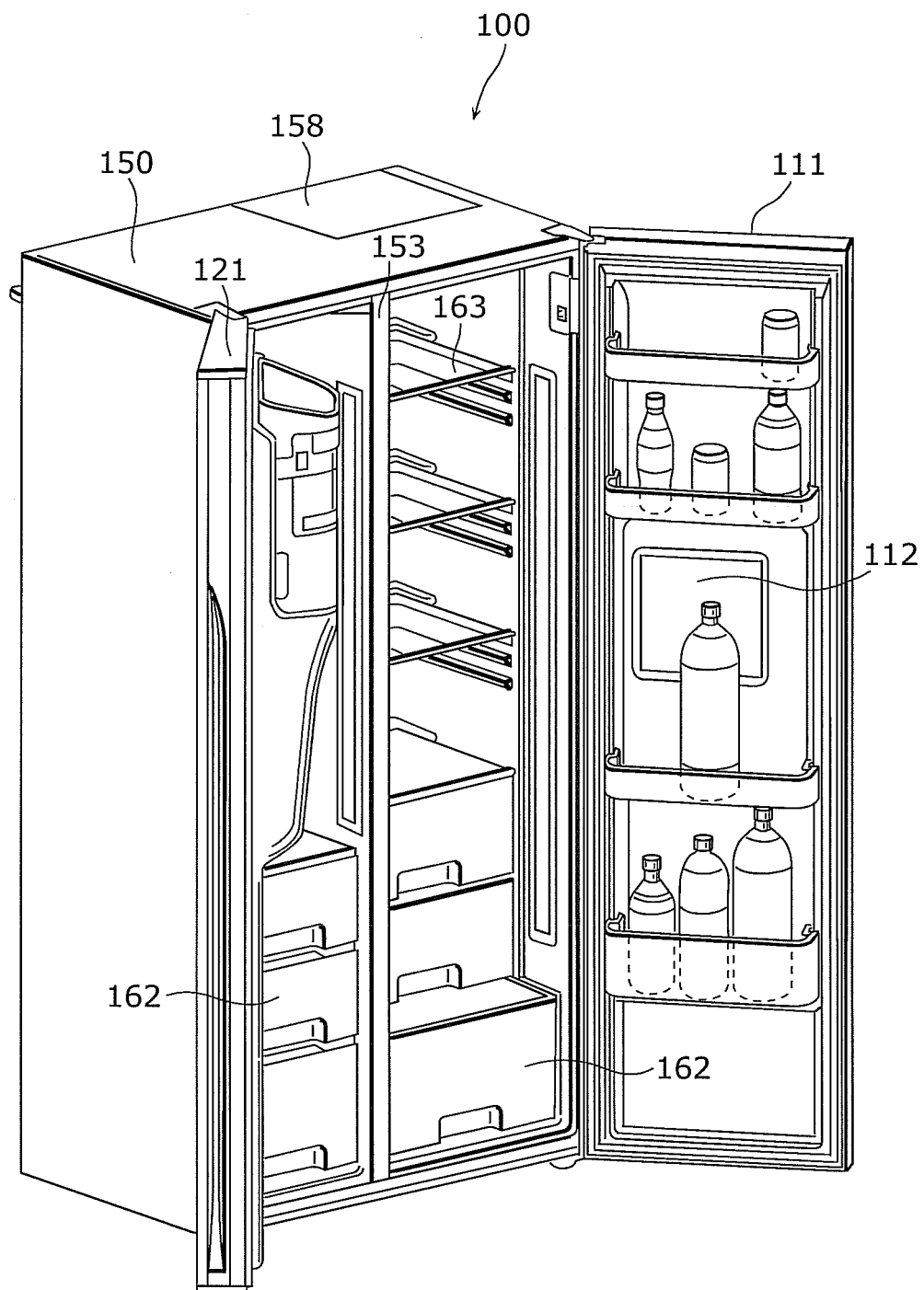


FIG. 3

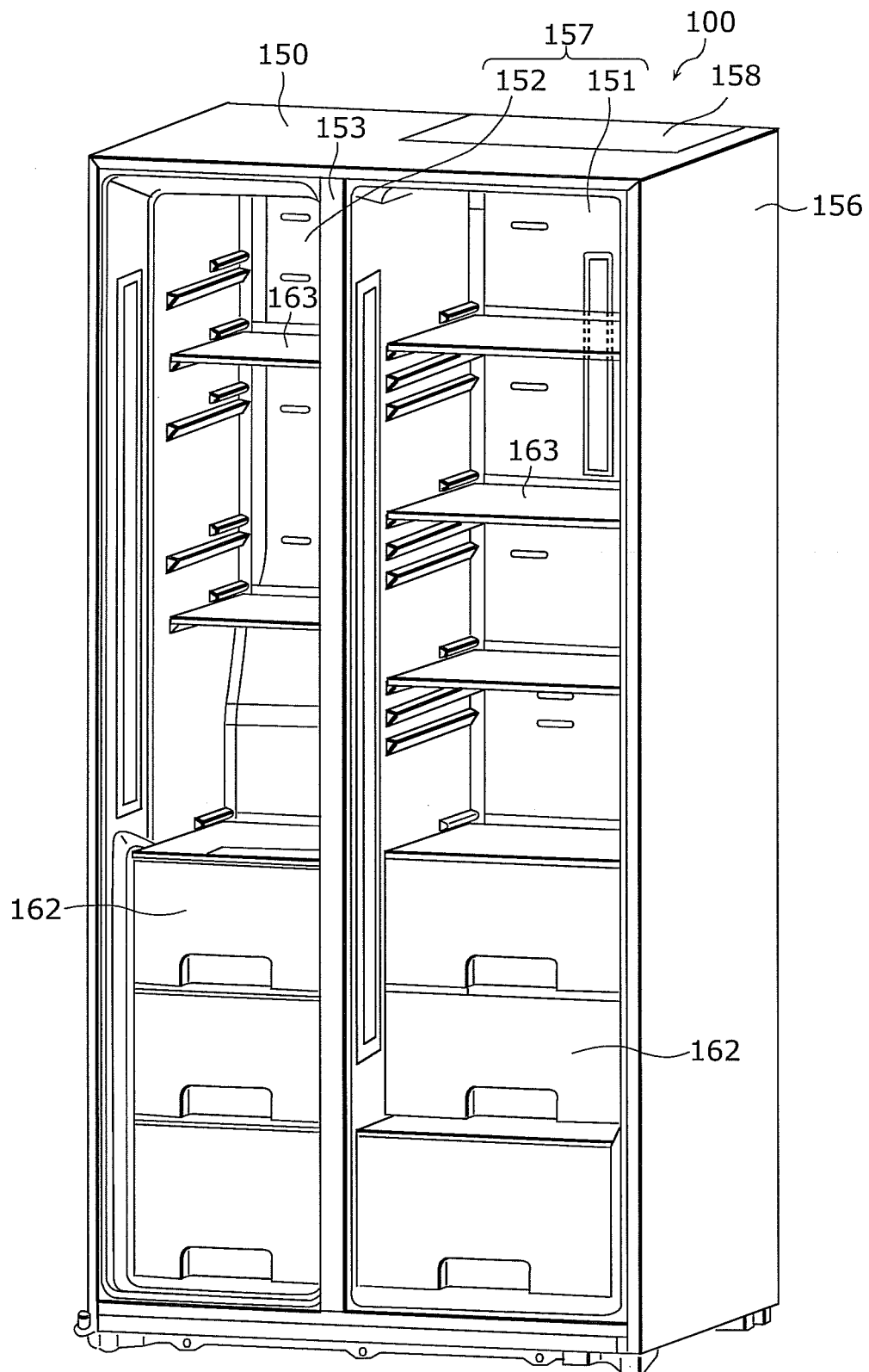


FIG. 4

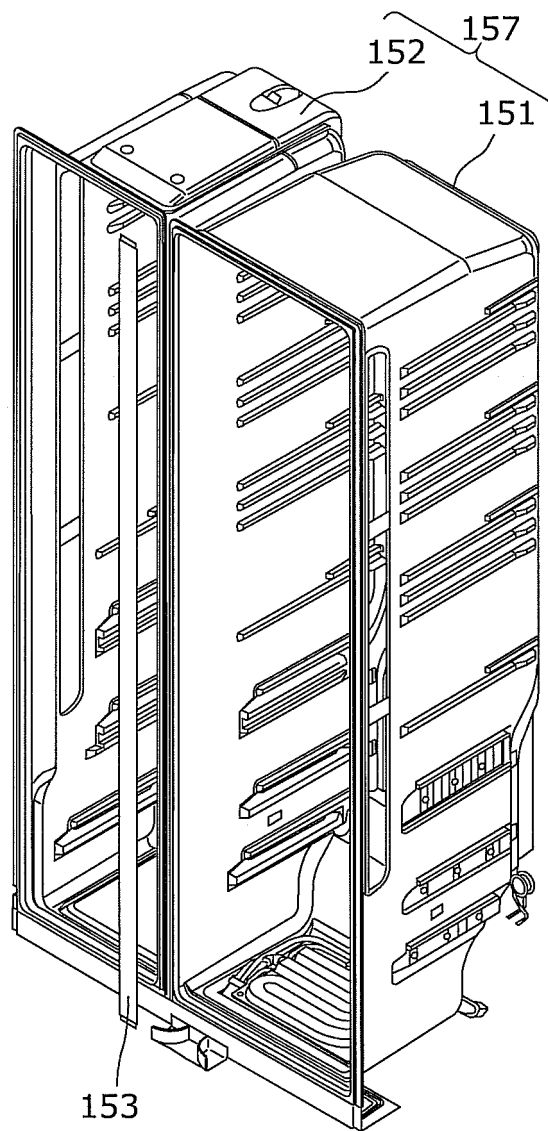


FIG. 5

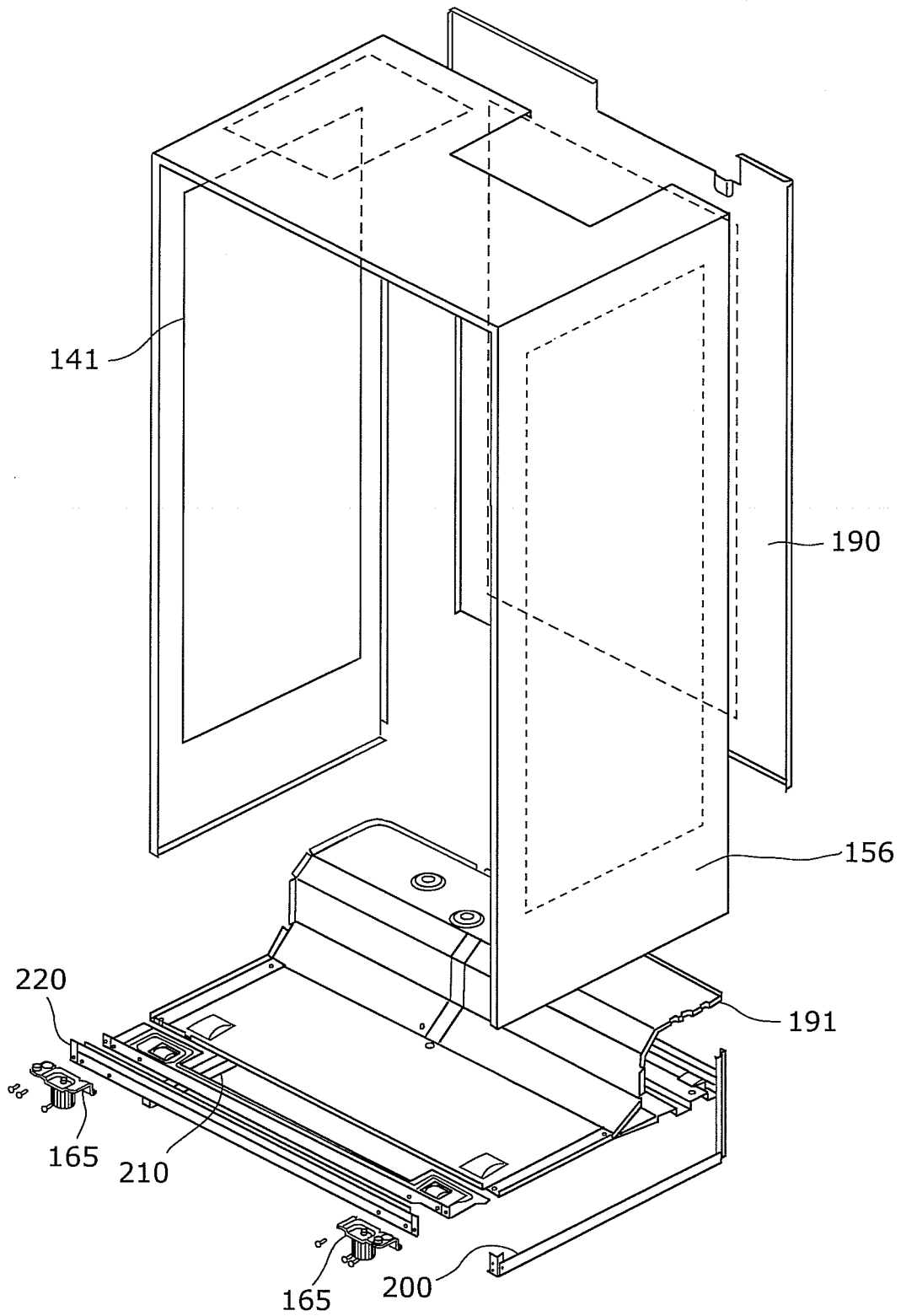


FIG. 6

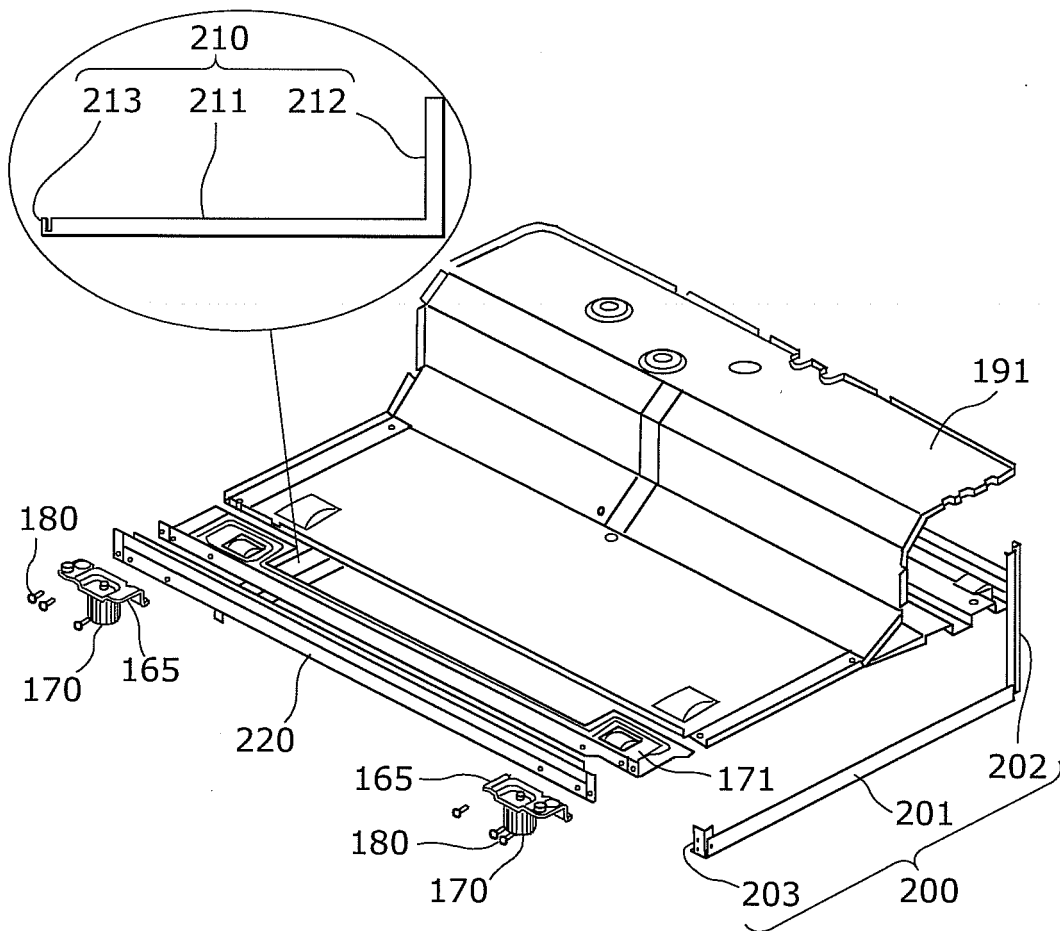


FIG. 7

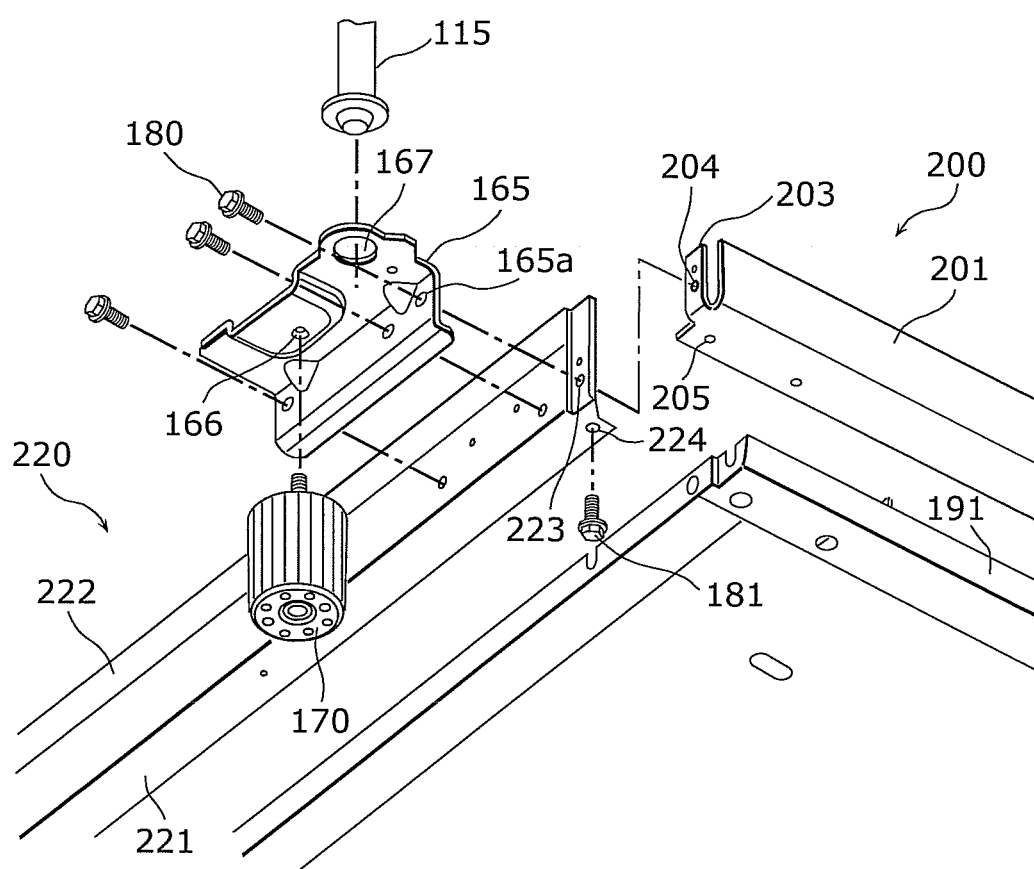
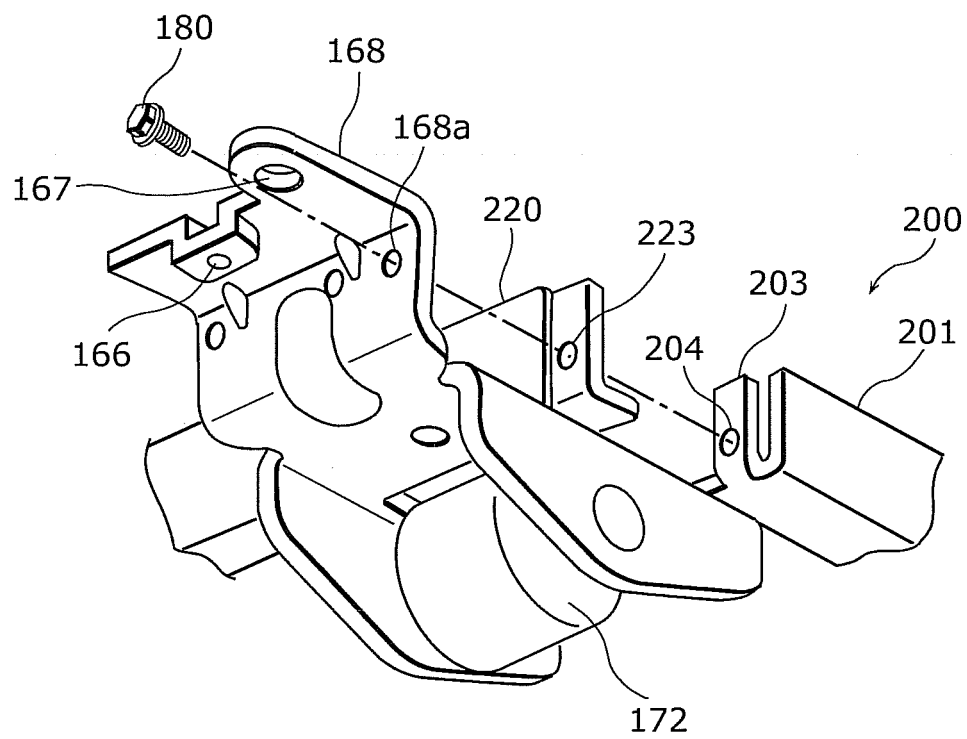


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/001042

A. CLASSIFICATION OF SUBJECT MATTER <i>F25D23/06(2006.01) i, F25D23/00(2006.01) i</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) <i>F25D23/06, F25D23/00</i>		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched <i>Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009</i> <i>Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009</i>		
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	US 4416119 A (Whirlpool Corp.), 22 November, 1983 (22.11.83), Column 3, lines 28 to 61; Figs. 1, 2 (Family: none)	1-7
Y	JP 2005-337542 A (Mitsubishi Electric Corp.), 08 December, 2005 (08.12.05), Par. Nos. [0001] to [0029]; Figs. 1 to 14 (Family: none)	1-7
☒ 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 "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 24 April, 2009 (24.04.09)		Date of mailing of the international search report 12 May, 2009 (12.05.09)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2009/001042

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 068218/1978 (Laid-open No. 170042/1979) (Tokyo Shibaura Electric Co., Ltd.), 19 May, 1979 (19.05.79), Full text; all drawings (Family: none)	4-6
Y	JP 9-26258 A (Toshiba Corp.), 28 January, 1997 (28.01.97), Full text; all drawings (Family: none)	6

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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