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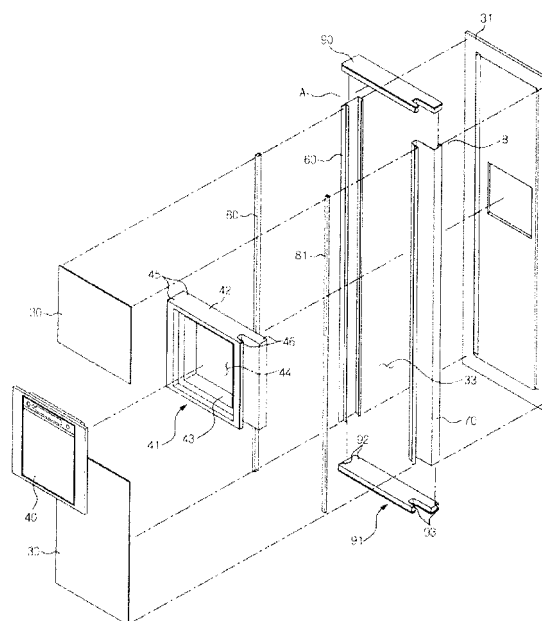
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(54) **Refrigerator**

(57) A structure of a door a refrigerator capable of reducing the manufacturing cost while providing a simplified manufacturing process and a simplified assembly. The door includes a front surface panel configured to form a front surface of the door and including tempered glass, a rear surface panel configured to form a rear surface of the door such that a foam space is provided between the rear surface panel and the front surface panel, a first frame and a second frame configured to form each side surface of the door and to which the front surface panel and the rear surface panel are supportedly attached, an upper cap and a lower cap configured to form an upper surface and a lower surface of the door, respectively, and thermal insulating material which is provided in the foam space to couple the front surface panel, the rear surface panel, the first frame, the second frame, the upper cap, and the lower cap to one another, wherein each of the first frame and the second frame is formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members.

FIG. 2



Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority benefit of Korean Patent Application No. 2011-0060102, filed on June 21, 2011 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND

1. Field

[0002] Embodiments relate to a door of a refrigerator.

2. Description of the Related Art

[0003] A refrigerator is an apparatus which is provided with a storage compartment, and configured to keep food fresh by providing cool air through a cooling cycle. The storage compartment has a front surface open. The front open surface is open/closed by a door that is rotatably installed on a body.

[0004] A front surface panel forming the external appearance of a door is formed using tempered glass to improve cognitive quality. Frames forming the framework of the door are configured to support the front surface panel. Each of the frames includes metal to stand the expansion pressure of a forming agent inside the door.

[0005] In general, frames are manufactured by extruding aluminum in a desired form, but the aluminum used in the extrusion is more expensive than other metals. In addition, a post treatment, such as a coating process, needs to be performed after the extrusion.

SUMMARY

[0006] In an aspect of one or more embodiments, there is provided a structure of a door frame for a refrigerator, capable of reducing the manufacturing cost while providing a simplified manufacturing process, and a method of manufacturing the same.

[0007] In an aspect of one or more embodiments, there is provided a door assembly structure capable of ensuring a simplified assembly and a method of manufacturing the same.

[0008] In accordance with a refrigerator includes a body and a door. The body has a storage compartment. The door is configured to open and close a front open surface of the storage compartment. The door includes a front surface panel, a rear surface panel, a first frame, a second frame, an upper cap, a lower cap and thermal insulating material. The front surface panel is configured to form a front surface of the door and includes tempered glass. The rear surface panel is configured to form a rear surface of the door such that a foam space is provided between the rear surface panel and the front surface panel. The first and the second frames are configured to form

each side surface of the door and to which the front surface panel and the rear surface panel are supportedly attached. The upper cap and the lower cap configured to form an upper surface and a lower surface of the door, respectively. The thermal insulating material is provided in the foam space to couple the front surface panel, the rear surface panel, the first frame, the second frame, the upper cap, and the lower cap to one another. Each of the first frame and the second frame is formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members.

[0009] The upper cap and the lower cap are manufactured through an injection molding.

[0010] The second frame has a grip groove, which recesses toward the foam space, to enable opening/closing of the door.

[0011] The steel plate coil includes a Pre-Coated Metal (PCM).

[0012] One side of the front surface panel is supportably attached to the first frame, and an opposite side of the front surface panel is supportably attached to the second frame.

[0013] The front surface panel has a width less than a width of the rear surface panel.

[0014] Each of the upper cap and the lower cap has a first frame insertion groove to which the first frame is inserted, and a second frame insertion groove to which the second frame is inserted.

[0015] The front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame, and the second frame are coupled to one another primarily through adhesive member, and secondarily through an adhesive force of the thermal insulating material.

[0016] The refrigerator further includes a first middle member and a second middle member. The first middle member is interposed between the front surface panel and the first frame to align a position of the front surface panel. The second middle member is interposed between the front surface panel and the second frame to align a position of the front surface panel.

[0017] In an aspect of one or more embodiments, there is provided a refrigerator includes a body and a door. The body has a storage compartment. The door is configured to open and close a front open surface of the storage compartment. The door includes a front surface panel, a rear surface panel, a pair of caps and a pair of frames. The front surface panel is configured to form a front surface of the door and includes tempered glass. The rear surface panel is configured to form a rear surface of the door such that a foam space is provided between the rear surface panel and the front surface panel. The pair of caps is configured to upper and lower sides of the foam space and manufactured through an injection molding. The pair of frames each including a rear surface coupling part having the rear surface panel supportably attached thereto, a front surface coupling part having the front surface panel supportably attached thereto, and a connect-

ing part configured to connect the rear surface coupling part to the front surface coupling part. Each of the pair of frames is formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members.

[0018] One of the pair of frames has a grip groove, which recesses toward the foam space, to enable opening/closing of the door.

[0019] In an aspect of one or more embodiments, there is provided a method of manufacturing a door for a refrigerator is as follows. A front surface panel including tempered glass is provided. A rear surface panel is provided. The rear surface panel forms a foam space between the front surface panel and the rear surface panel. A first frame and a second frame are provided by introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members. Each of the first and the second frames includes a rear surface coupling part having the rear surface panel supportedly attached thereto, a front surface coupling part having the front surface panel supportedly attached thereto, and a connecting part configured to connect the rear surface coupling part to the front surface coupling part. A upper cap and a lower cap are formed through injection molding. The upper cap and the lower cap are insertedly coupled to the first frame and the second frame, and the front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame and the second frame are temporarily fixed to one another through adhesion member. Thermal heating material is formed in the foam space such that the front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame, and the second frame are coupled to one another through an adhesive force of the thermal heating material.

[0020] In the forming the first frame and the second frame, one of the first frame, and the second frame has a grip groove, which recesses toward the foam space, to enable opening/closing of the door.

[0021] In an aspect of one or more embodiments, the manufacturing cost is reduced by manufacturing a frame using a PCM steel plate instead of aluminum which is more expensive than PCB steel.

[0022] In addition, one or more embodiments may remove a post treatment that needs to be performed on a conventional aluminum frame after extrusion.

[0023] In addition, the process of manufacturing a frame is simplified, and the assembly structure of a door is simplified, thereby enhancing the reliability on the product quality.

[0024] In addition, a door frame may be integrally formed with a grip groove to open/close a door, thereby removing a need for a protruding knob.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] These and/or other aspects will become apparent and more readily appreciated from the following de-

scription of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is an assembled perspective view illustrating a refrigerator according to an embodiment;

FIG. 2 is an exploded perspective view illustrating the refrigerator according to an embodiment;

FIG. 3 is a view obtained by enlarging 'A' portion of FIG. 2;

FIG. 4 is a view obtained by enlarging 'B' portion of FIG. 2;

FIG. 5 is a cross-sectional view of a door of the refrigerator according to an embodiment; and

FIG. 6 is flowchart showing a method of manufacturing the door of the refrigerator according to an embodiment.

DETAILED DESCRIPTION

[0026] Reference will now be made in detail to embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0027] FIG. 1 is an assembled perspective view illustrating a refrigerator according to an embodiment.

[0028] Referring to FIG. 1, a refrigerator 1 includes a body 10 forming the external appearance of the refrigerator 1, storage compartments 11 and 12 formed inside the body 10, a cooling apparatus (not shown), for example, a compressor, configured to form a cooling cycle to provide the storage compartments 11 and 12 with a cool air, and doors 21 and 22 configured to open and close front surfaces of the storage compartments 11 and 12.

[0029] The body 10 includes an inner case forming the storage compartments 11 and 12, an outer case forming the exterior, and thermal heating material, which is provided between the inner case and the outer case to insulate the inside the storage compartment 11 and 12.

[0030] A vertical wall 15 is provided in the storage compartments 11 and 12 to divide the storage compartments 11 and 12 into a freezer compartment 11 and a cooling compartment 12, and a shelf 13 to place food thereon.

[0031] The freezer compartment 11 and the cooling compartment 12 are provided to be open to front surfaces thereof. In order to open and close the front open surfaces of the freezer compartment 11 and the cooling compartment 12, a freezer compartment door 21 and a cooling compartment door 22 are coupled to the body 10 through hinges 14, respectively. Accordingly, the freezer compartment door 21 and the cooling compartment door 22 open/close the freezer compartment 11 and the cooling compartment 12 while rotating forward.

[0032] The freezer compartment door 21 may be provided with a dispenser unit 23 that enables water or ice to be taken outside. The cooling compartment door 22 may be provided with a home bar 24 configured to keep a small amount of food according to size.

[0033] A pair of door installation units 32 protrudes at

rear surfaces of the doors 21 and 22 such that a door guard 25 is installed on the door installation units 32.

[0034] Hereinbefore, the configuration of the door according to an embodiment has been described in brief with reference to FIG. 1. However, the above configuration is not only applicable for doors of a side-by-side refrigerator, but also for doors of other refrigerators that open and close (open/close) the front open surface of the storage compartment. For example, the above configuration is applicable for a French Door Refrigerator (FDR) refrigerator, a Bottom Mounted Freezer (BMF) refrigerator, and a Top Mounted Freezer (TMF) refrigerator.

[0035] FIG. 2 is an exploded perspective view illustrating the refrigerator according to an embodiment. FIG. 3 is a view obtained by enlarging 'A' portion of FIG. 2. FIG. 4 is a view obtained by enlarging 'B' portion of FIG. 2. FIG. 5 is a cross-sectional view of a door of the refrigerator according to an embodiment.

[0036] Hereinafter, the configuration of a door according to an embodiment will be described in detail.

[0037] The door includes a front surface panel 30 forming the external appearance of the door, a rear surface 31 providing a foam space 33 between the front surface 30 and the rear surface 31, a pair of frames 60 and 70 forming a framework of the door and supporting the front surface panel 30 and the rear surface panel 31, and a pair of caps 90 and 91 sealing the upper side and the lower side of the foaming space 33.

[0038] The front surface panel 30 may include tempered glass to improve the aesthetic quality of the door. A rear surface of the front surface panel 30 may be decorated with ornaments (not shown).

[0039] In addition, the front surface panel 30 has a width less than that of the rear surface panel 31 such that a grip groove 79 is provided. The grip groove 79 will be described later.

[0040] The rear surface panel 31 forms a foam space 33 in cooperation with the front surface panel 30. The door guard installation unit 32 protrudes from a rear surface of the rear surface panel 31. The rear surface panel 31 is manufactured in a vacuum environment

[0041] Meanwhile, the front surface panel 30 is divided into two parts that are spaced on top of one another while interposing an accessory part cover 40 therebetween. Alternatively, the front surface panel 30 may be provided in an integrated unit without having the accessory part cover 40 interposed therebetween.

[0042] The accessory part cover 40 is coupled to a front surface of an accessory part installation part 41 on which a dispenser or a home bar is installed. The accessory part cover 40 forms the external appearance and an entry of the door.

[0043] The accessory part installation unit 41 is provided in a form of a box in which an opening 44 is formed passing through the door in the middle. The accessory part installation 41 includes an upper wall 42 and a lower wall 43 that prevent thermal insulating material from being introduced to the opening 44 during the forming of

the thermal insulating material in the foam space 33.

[0044] The accessory part installation unit 41 is formed with a first frame installation groove 45 and a second frame installation groove 46, into which enable a first frame 60 and a second frame 70 to be inserted, respectively, so that the first frame 60 and the second frame 70 are insertedly coupled to the accessory part installation unit 41.

[0045] The one pair of frames 60 and 70 includes the first frame 60 and the second frame 70 that are longitudinally formed.

[0046] Each of the first frame 60 and the second frame 70 is formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members. In particular, by manufacturing the first and second frames 60 and 70 using a Pre-Coated Metal (PCM) completed with coloration painting, the first and second frames 60 and 70 do not need to be subject to a post treatment after a roll forming process, and are directly applied to the door, so that the manufacturing process for doors is simplified. In addition, the PCM is cheaper than aluminum used when a conventional frame is manufactured through an extrusion, so that the manufacturing cost for doors is reduced.

[0047] The first frame 60 is bently formed while including a rear surface coupling part 61 having the rear surface panel 31 supportedly attached thereto, front surface coupling part 63 and 64 having the front surface panel 30 supportedly attached thereto, and a connecting part 62 configured to connect the rear surface coupling part 61 to the front surface coupling parts 63 and 64.

[0048] In addition, the second frame 70 is bently formed while including a rear surface coupling part 71 having the rear surface panel 31 supportedly attached thereto, front surface coupling part 77 and 78 having the front surface panel 30 supportedly attached thereto, and a connecting part 72 configured to connect the rear surface coupling part 71 to the front surface coupling parts 77 and 78.

[0049] The connection part 72 of the second frame 70 has grip groove forming parts 73, 74, and 75 that are sequentially bent to form the grip groove 79. The grip groove forming parts 73, 74, and 75 are bent at each 90 degrees to form the grip groove 79.

[0050] Meanwhile, the front surface coupling parts 63 and 64 of the first frame 60 are coupled to a first middle member 80 which is interposed between the front surface panel 30 and the first frame 60 to align the position of the front surface panel 30.

[0051] The front surface coupling parts 77 and 78 of the second frame 70 are coupled to a second middle member 81 which is interposed between the front surface panel 30 and the second frame 70 to align the position of the front surface panel 30.

[0052] The first middle member 80 is provided in a predetermined size that enables the front surface panel 30 to be supportedly attached to a side of the first frame 60, that is, to an outer side end of the front surface coupling

part 63 of the first frame 60.

[0053] In addition, the second middle member 81 is provided in a predetermined size that enables the front surface panel 30 to be supportedly attached to a side of the second frame 70, that is, to an outer side end of the front surface coupling part 77 of the second frame 70.

[0054] Accordingly, referring to FIG. 5, the front surface panel 30 is supportedly attached to the sides of the first frame 60 and the second frame 70. In addition, lateral sides of the front surface panel 30 are not exposed to outside, thereby improving the aesthetic quality of the doors.

[0055] The grip groove 79 is a groove providing a grip on the door for opening/closing the door. The grip groove 79 is formed by partially recessing the second frame 70 to a side of the foaming space 33. A user pulls or pushes the door with the fingers inserted to the grip groove 79, thereby opening/closing the door.

[0056] The grip groove 79 is integrally formed with the second frame 70, so the door does not require a knob protruding forward. Accordingly, the manufacturing cost for doors is reduced, and the esthetic quality for doors is improved.

[0057] Meanwhile, the one pair of caps 90 and 91 sealing the upper side and the lower side of the foaming space 33 includes an upper cap 90 and a lower cap 91.

[0058] Each of the upper cap 90 and the lower cap 91 has a first frame insertion groove 92 to which the first frame 60 is inserted, and a second frame insertion groove 93 to which the second frame 70 is inserted. Accordingly, the first frame 60 and the second frame 70 are insertedly coupled to each of the upper cap 90 and the lower cap 91.

[0059] The upper cap 90 and the lower cap 91 are formed through an injection molding.

[0060] Hereinafter, a method for manufacturing a door according to an embodiment will be described. FIG. 6 is flowchart showing a method of manufacturing the door of the refrigerator according to an embodiment.

[0061] The front surface panel 30 and the rear surface panel 31 are provided (100). The front surface panel 30 and the rear surface panel 31 include tempered glass, and form the foam space 33 therebetween. The first frame 60 and the second frame 70 are formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a plurality number of roll forming members (200). The upper cap 90 and the lower cap 91 are formed through an injection molding (300).

[0062] The first frame 60 and the second frame 70 are insertedly coupled to each of the upper cap 90 and the lower cap 91. The front surface panel 30, the rear surface panel 31, the upper cap 90, the lower cap 91, the first frame 60 and the second frame 70 are temporarily fixed to one another through an adhesion member, such as a double-sided tape (400).

[0063] The thermal insulating material 34 is formed in the foam space 33 such that the front surface panel 30, the rear surface panel 31, the upper cap 90, the lower

cap 91, the first frame 60, and the second frame 70 are coupled to one another through the adhesive force of the thermal insulating material 34, thereby completing with manufacturing the door (500).

[0064] Although a few embodiments have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

Claims

1. A refrigerator comprising:

a body having a storage compartment; and
a door configured to open and close a front open surface of the storage compartment,

wherein the door comprises:

a front surface panel configured to form a front surface of the door and including tempered glass;
a rear surface panel configured to form a rear surface of the door such that a foam space is provided between the rear surface panel and the front surface panel;
a first frame and a second frame configured to form each side surface of the door and to which the front surface panel and the rear surface panel are supportedly attached;
an upper cap and a lower cap configured to form an upper surface and a lower surface of the door, respectively; and
thermal insulating material which is provided in the foam space to couple the front surface panel, the rear surface panel, the first frame, the second frame, the upper cap, and the lower cap to one another,
wherein each of the first frame and the second frame is formed by sequentially introducing a steel plate coil having a predetermined thickness and width into a predetermined number of roll forming members.

2. The refrigerator of claim 1, wherein the upper cap and the lower cap are manufactured through an injection molding.

3. The refrigerator of claim 1, wherein the second frame has a grip groove, which recesses toward the foam space, to enable opening and closing of the door.

4. The refrigerator of claim 1, wherein the steel plate coil includes a Pre-Coated Metal (PCM).

5. The refrigerator of claim 1, wherein one side of the front surface panel is supportedly attached to the first frame, and an opposite side of the front surface panel is supportedly attached to the second frame. 5
6. The refrigerator of claim 1, wherein the front surface panel has a width less than a width of the rear surface panel. 10
7. The refrigerator of claim 1, wherein each of the upper cap and the lower cap has a first frame insertion groove to which the first frame is inserted, and a second frame insertion groove to which the second frame is inserted. 15
8. The refrigerator of claim 1, wherein the front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame, and the second frame are coupled to one another primarily through an adhesion member, and secondarily through an adhesive force of the thermal insulating material. 20
9. The refrigerator of claim 1, further comprising:
 - a first middle member which is interposed between the front surface panel and the first frame to align a position of the front surface panel; and 25
 - a second middle member which is interposed between the front surface panel and the second frame to align a position of the front surface panel. 30
10. The refrigerator of claim 1, wherein each of the first frame and the second frame includes a rear surface coupling part having the rear surface panel supportedly attached thereto, a front surface coupling part having the front surface panel supportedly attached thereto, and a connecting part configured to connect the rear surface coupling part to the front surface coupling part. 35 40
11. A method of manufacturing a door for a refrigerator, the method comprising:
 - providing a front surface panel, which includes tempered glass, and a rear surface panel, which forms a foam space between the front surface panel and the rear surface panel; 45
 - forming a first frame and a second frame, each including a rear surface coupling part having the rear surface panel supportedly attached thereto, a front surface coupling part having the front surface panel supportedly attached thereto, and a connecting part configured to connect the rear surface coupling part to the front surface coupling part, by introducing a steel plate coil, which has a predetermined thickness and width, into a predetermined number of roll forming mem-

bers;
 injection molding an upper cap and a lower cap; insertedly coupling the upper cap and the lower cap to the first frame and the second frame and temporarily fixing the front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame and the second frame to one another through adhesion member; and forming thermal heating material in the foam space such that the front surface panel, the rear surface panel, the upper cap, the lower cap, the first frame, and the second frame are coupled to one another through an adhesive force of the thermal heating material.

FIG. 1

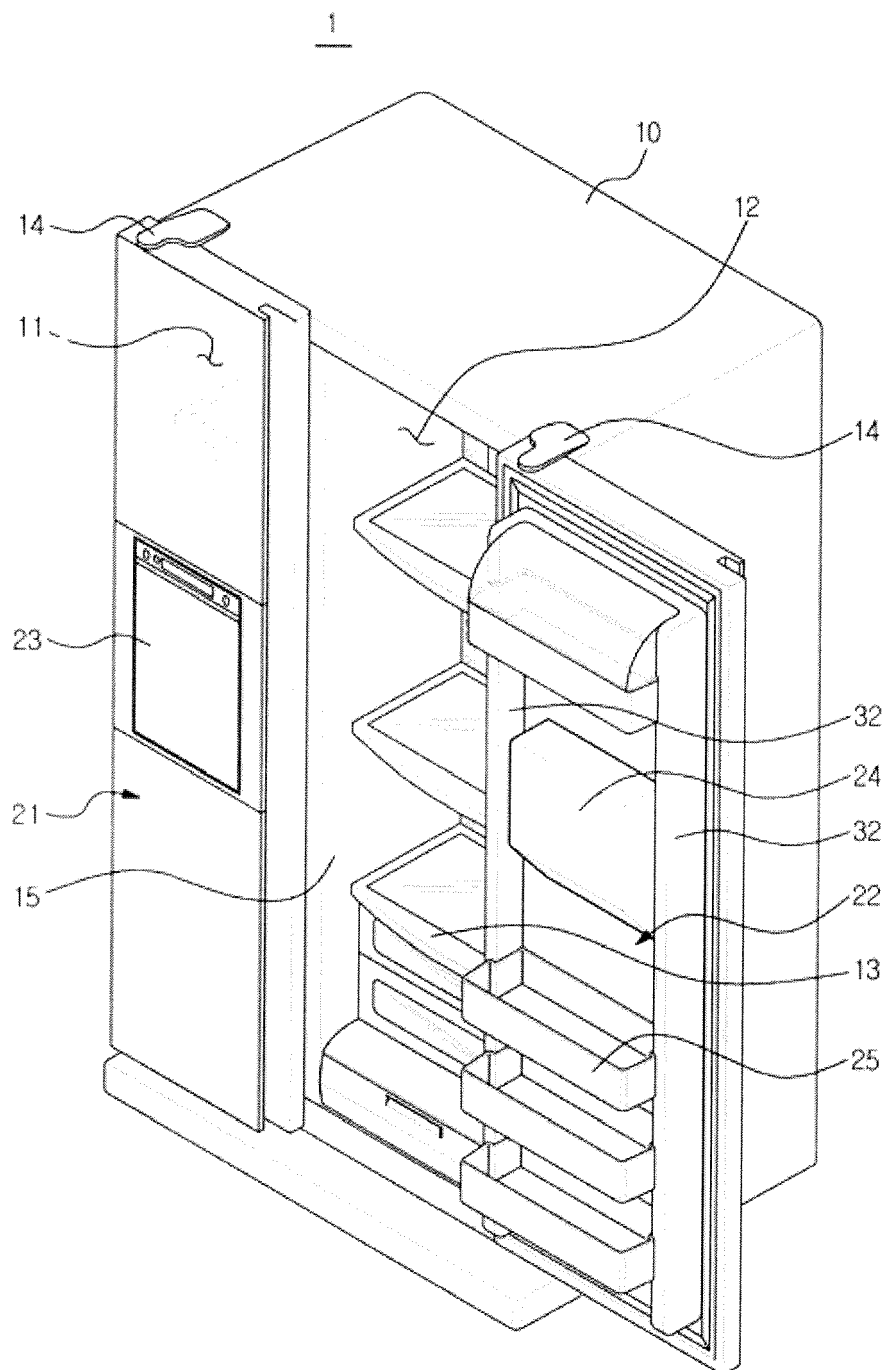


FIG. 2

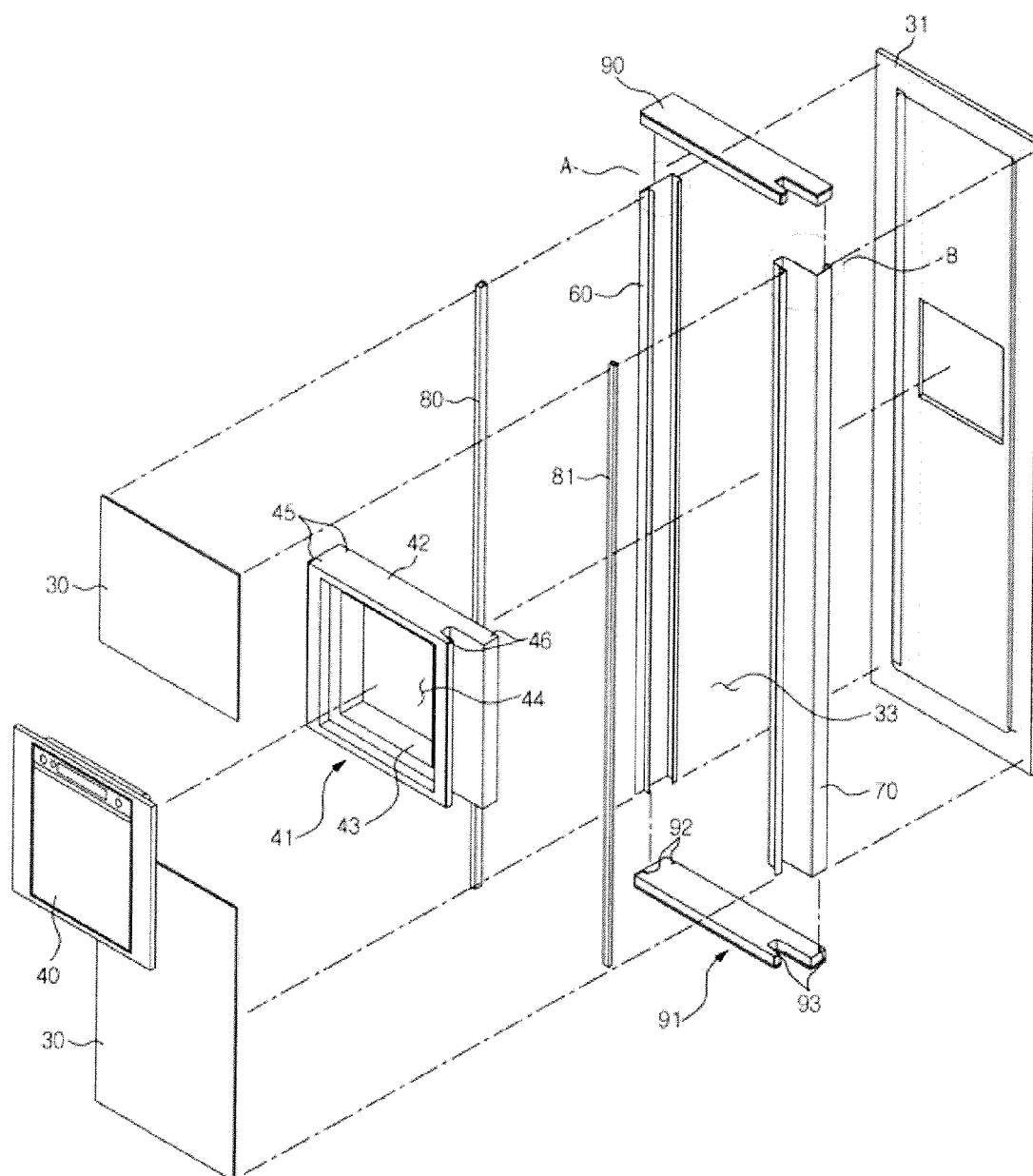


FIG. 3

60

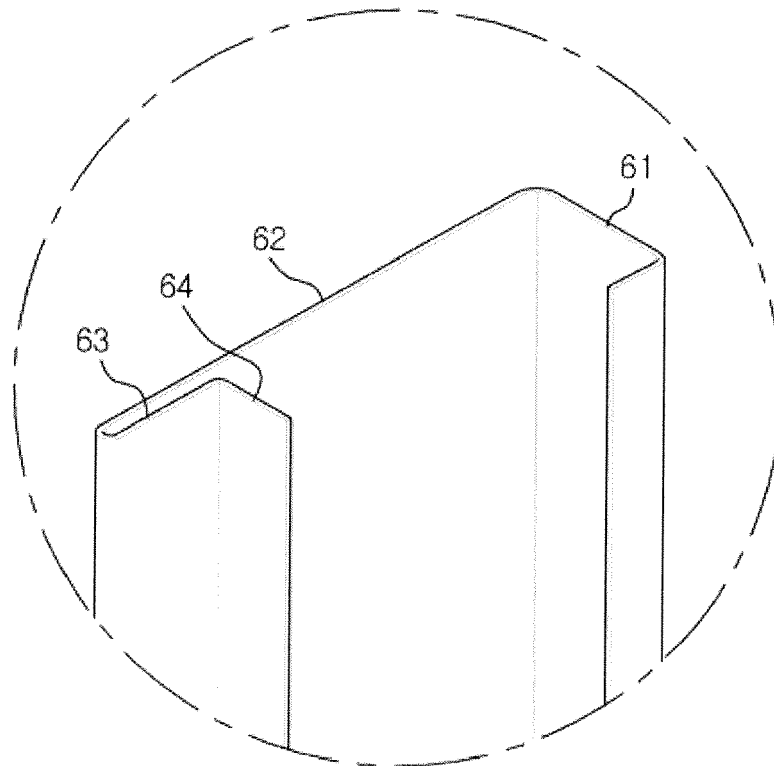


FIG. 4

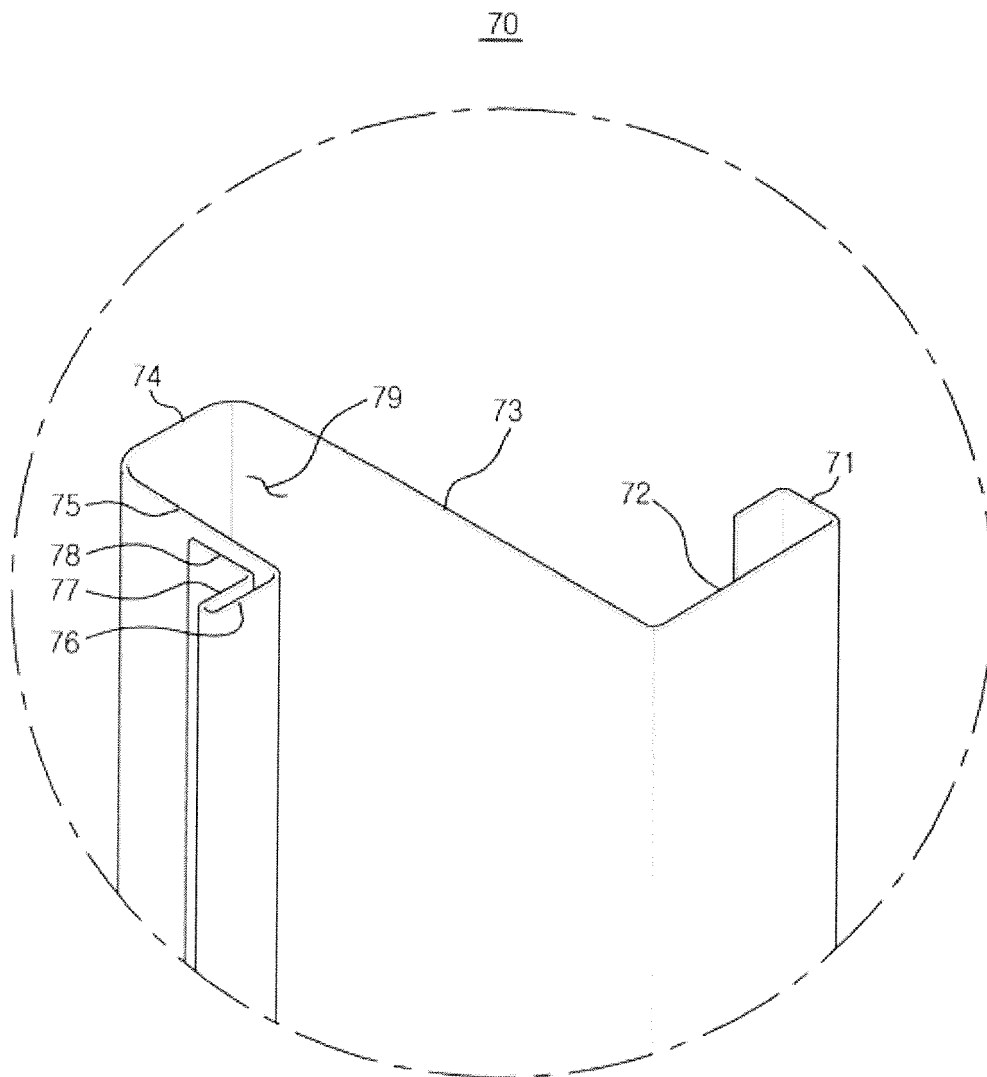


FIG. 5

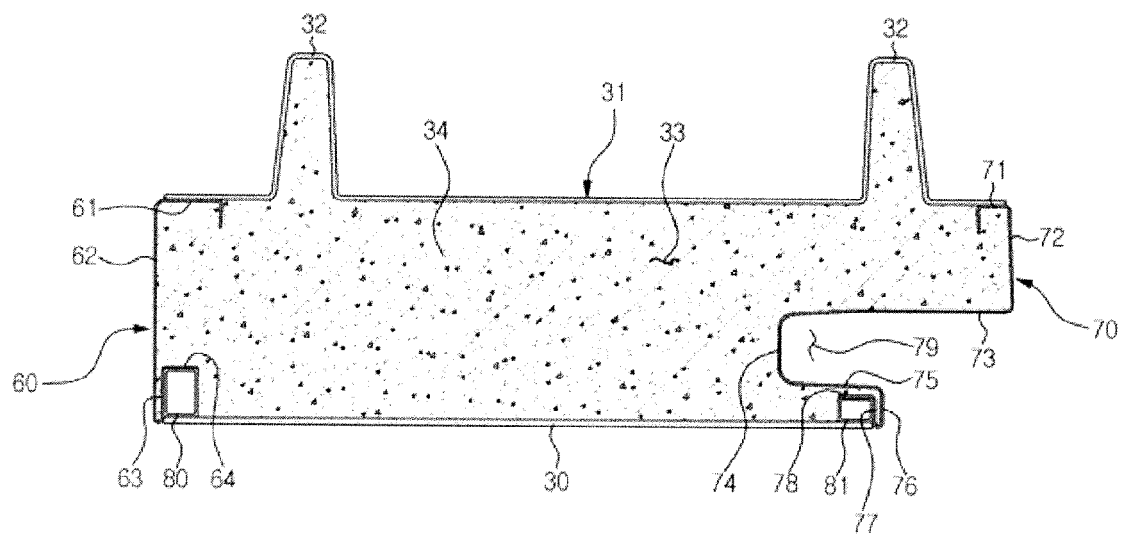
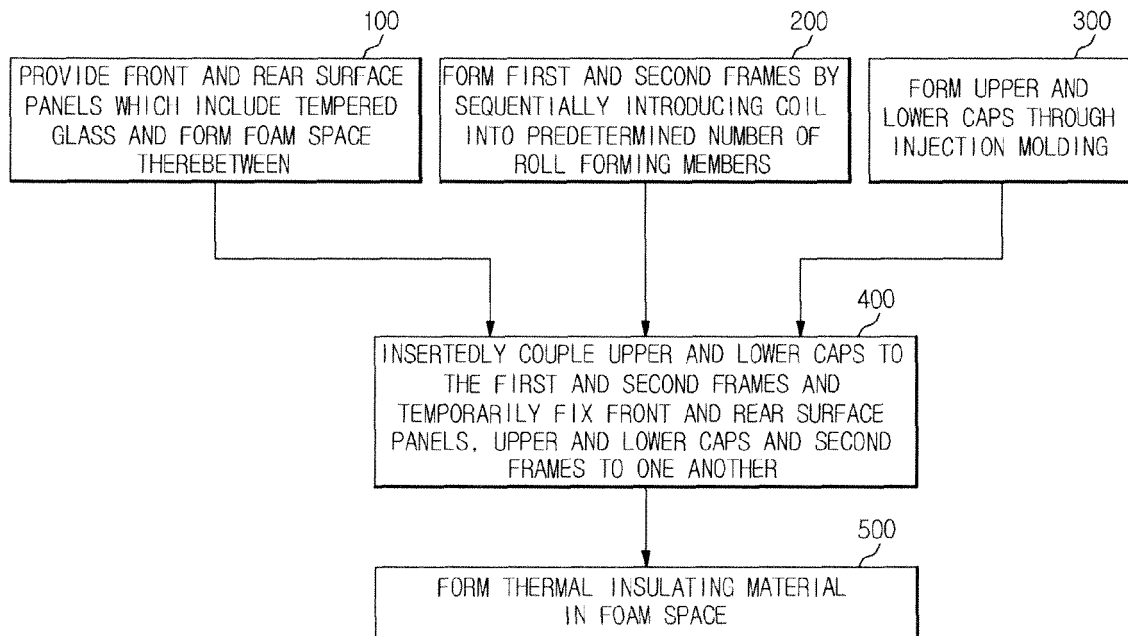


FIG. 6



REFERENCES CITED IN THE DESCRIPTION

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