



(11)

EP 1 650 513 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.04.2006 Bulletin 2006/17

(51) Int Cl.:
F25D 23/08 (2006.01)

(21) Application number: **05104583.9**

(22) Date of filing: **27.05.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

(72) Inventor: **An, Jae Koog**
Seo-Gu
Gwangju-City (KR)

(30) Priority: **20.10.2004 KR 2004084184**

(74) Representative: **Geary, Stuart Lloyd et al**
Venner Shipley LLP
20 Little Britain
London EC1A 7DH (GB)

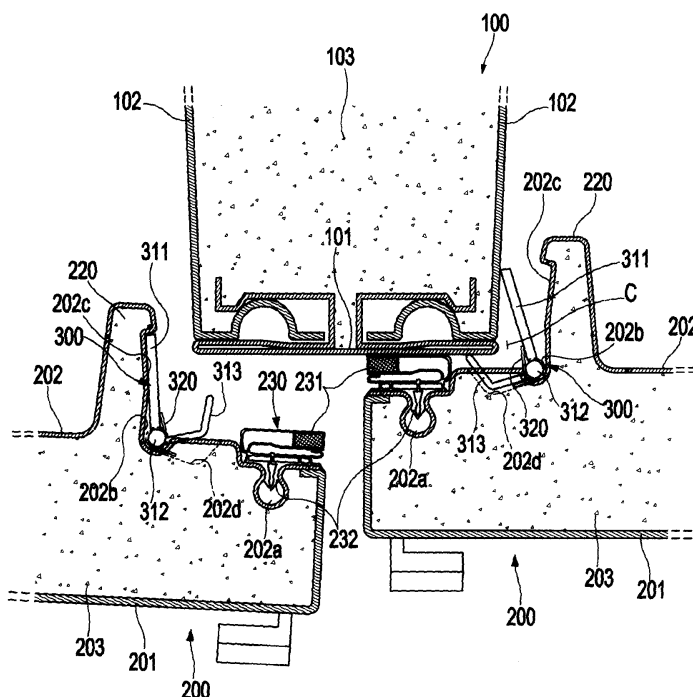
(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**
Suwon-si,
Gyeonggi-do (KR)

(54) **Refrigerating apparatus**

(57) A refrigerator with a chilled air leakage preventing device (300) that has high insulating efficiency and an aesthetically pleasing appearance and that is not easily damaged is provided. The refrigerator with the chilled air leakage preventing device (300) includes a cabinet (100) for forming a storage compartment (110), a door

(200) for opening and closing the storage compartment (110), a gasket (230) provided to the circumference of the door (200) to seal a gap between the cabinet (100) and the door (200), and a chilled air leakage preventing member (310) for sealing the gap (C) between the cabinet (100) and the door (200) when the door (200) is closed.

FIG 3.



Description

[0001] The present invention relates to a refrigerating apparatus having a door and a door seal, pivotable between retracted and sealing positions, for sealing the door.

[0002] In general, a refrigerator is an apparatus for keeping food fresh for a long time. The refrigerator includes a freezing cycle for supplying chilled air to storage compartments in which the food is stored, and doors, each of which has one side hinged to the front of a cabinet that forms the storage compartments. The cabinet and the doors have a dual-panel structure and the space between the two panels is filled with an insulating material to prevent the chilled air circulating around the storage compartments from leaking to the outside.

[0003] Gaskets that seal the gaps between the cabinet and the doors when the doors are closed are provided around the inner circumference of the doors. The gaskets, made of hollow rubber, are attached to both the cabinet and the doors to prevent the chilled air from leaking to the outside.

[0004] The amount of the chilled air that leaks through the gaps between the cabinet and the doors accounts for a considerable part of the overall amount of lost chilled air.

[0005] In order to solve such a problem, KR-A-2000-0028481 discloses a door sealing device for a refrigerator that operates in accordance with a change in temperature in the refrigerator to prevent the chilled air from leaking and to prevent outside air from entering.

[0006] The door sealing device of the refrigerator disclosed in the above patent publication includes a shape memory alloy that contracts and expands in accordance with change in temperature. Also provided is a supporting shaft around one side of which the shape memory alloy is wound so that the shape memory alloy is supported, and a sealing plate combined with the other side of the shape memory alloy to seal up gaps between the cabinet and doors in accordance with the contraction and expansion of the shape memory alloy.

[0007] However, since the sealing plate operates such that the gaps (passages) between the cabinet and the doors are opened when the temperature of storage compartments is low, the efficiency of the air leakage prevention deteriorates. In other words, when the temperature of the storage compartments is low, chilled air is prevented from leaking only by the gaskets which reduces the insulation of the seal.

[0008] Also, when the doors are opened, the temperature around the shape memory alloy is raised such that the shape memory alloy expands. Therefore, the sealing plate moves to seal the gaps between the cabinet and the doors, which makes the refrigerator less aesthetically pleasing. Also, a food container may collide with the sealing plate which could cause damage thereto while inserting the food container into, or withdrawing the food container from, the storage compartments.

[0009] The present invention has been made in view of the above-mentioned problems, and an aspect of the invention is to provide a chilled air leakage preventing device that exhibits high insulating efficiency and aesthetically pleasing appearance, but is not easily damaged.

[0010] The present invention relates to a refrigerating apparatus having a door and a door seal, pivotable between retracted and sealing positions, for sealing the door.

[0011] A refrigerating apparatus according to the present invention is characterised in that the door seal is pivoted to its sealing position by the action of closing the door.

[0012] Additional other and/or preferred features are set forth in claims 14 to 17 appended hereto.

[0013] An embodiment of the present invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a perspective view illustrating an air leakage preventing device of a refrigerator according to an embodiment of the present invention;

Figure 2 is a planar sectional view of the refrigerator in Figure 1;

Figure 3 is an enlarged view of the portion A in Figure 2;

Figure 4 is a front view illustrating the inside of the refrigerator door in Figure 1; and

Figure 5 is an exploded perspective view illustrating the inner plate of the door and the chilled air leakage preventing device of the refrigerator of Figure 1.

[0014] As illustrated in Figures 1 and 2, a refrigerator according to an embodiment of the present invention includes a rectangular cabinet 100 having an open front side and right and left doors 200 for opening and closing the open front side of the cabinet 100. The internal space of the cabinet 100 is divided in two by an intermediate partition wall such that two storage compartments 110 are formed on the right and left sides, and the two doors 200 open and close the respective storage compartments 110.

[0015] A plurality of shelves 120 is provided for partitioning the storage compartments 110 into upper storage spaces and lower storage spaces. Generally, the shelves 120 are detachable so that their installation height (and corresponding gap between consecutive shelves) can be altered allowing food containers to be placed on the shelves 120. Box-shaped storage containers 130 are provided in the lower sides of the storage compartments 110 so that vegetables and fruits can be easily stored.

[0016] Door guards 210 for storing bottles and containers are provided inside each of the doors 200. The door guards 210 are installed on door guard rails 220 that longitudinally protrude from both sides of each of the doors 200 into each of the storage compartments 110.

[0017] As illustrated in Figures 2 and 3, the cabinet

100 includes an outer plate 101 made of metal that forms the exterior of the cabinet 100 and an inner plate 102 made of plastic resin and provided along the inside the outer plate 101 so as to be spaced apart from the outer plate 101. A urethane foam insulating material 103 is filled in the gap between the outer plate 101 and the inner plate 102. The outer plate 101 is bent from the side to the front to cover the front side of the cabinet 100. The metal outer plate 101 is provided on the front of the intermediate partition wall formed between the two inner plates 102 to be connected to the two inner plates 102 (see Figure 3).

[0018] The outer upper and lower sides of each of the doors 200 are hinged to the cabinet 100 so that the doors 200 are provided towards the front of the cabinet 100. The doors 200 cover the front of the cabinet 100. The doors 200 include outer plates 201 made of a metal plate that forms the exterior of the doors 200 and inner plates 202 made of plastic resin that are spaced apart from the outer plates 201. The inner plates 202 face the storage compartments 110 in the cabinet 100. A urethane foam insulating material 203 is filled between these outer plates 201 and inner plates 202.

[0019] Gaskets 230 of a known structure which seal the gaps between the cabinet 100 and the doors 200 are provided around the inner circumference of the doors 200. The gaskets 230 are made of elastic rubber and have hollow insides to buffer shocks generated when the doors 200 are opened and closed. Magnets 231 are inserted into the gaskets 230 so that the doors 200 are held closed by magnetic force between the gaskets 230 and the metal plate that is bent to the front of the cabinet 100. In order to fix the gaskets 230 to the doors 200, concave pockets 202a are formed within the inner plates 202 in positions where the gaskets 230 are provided. Locking pieces 232 are inserted into the pockets 202a provided in the gaskets 230.

[0020] Referring to Figure 3, the gaskets 230 seal the gaps between the doors 200 and the cabinet 100 when the doors 200 are closed. However, if only the known gaskets are used, as the doors 200 and the cabinet 100 are spaced apart from each other, chilled air leaks through the gaps C between the doors 200 and the cabinet 100. When the refrigerator is designed so that the doors 200 fully contact the cabinet 100 (and so gaps C are not present), it is possible to prevent the chilled air from leaking. For example, the refrigerator may be designed such that the door guard rails 220 closely contact the corresponding inner plate 102 or the door inner parts, adjacent to regions of the door with which the gaskets 230 are coupled, closely contact the corresponding outer plate 101. In this case, when the door is opened, the door guard rails 220 which pivot when the door is opened, damage the corresponding inner plate 102. Also when the door is closed, the door guard rails 220 and the inner part impact on the corresponding inner and outer plates with a load which corresponds to the weight of the door. Thus, the corresponding inner and outer plates may be

damaged. Therefore, it is inevitable that the cabinet 100 and the doors 200 are spaced apart from each other.

[0021] The refrigerator according to an embodiment of the present invention includes chilled air leakage preventing devices 300 for closing the gaps C between the cabinet 100 and the doors 200 in order to prevent the chilled air from leaking through the gaps C between the cabinet 100 and the doors 200.

[0022] As illustrated in Figure 4, the chilled air leakage preventing devices 300 are provided on the upper and lower, and, right and left sides on the outer circumference of the door guard rails 220. The structure of the air leakage preventing devices 300 will be described with reference to Figures 3 and 5.

[0023] Firstly, referring to Figure 5, the chilled air leakage preventing devices 300 each include a chilled air leakage preventing member 310 for blocking the gap C between the cabinet 100 and the door 200. A restoring spring 320 for restoring the chilled air leakage preventing member 310 to a predetermined position is also provided in the device 300. The chilled air leakage preventing member 310 includes a longitudinal rectangular plate-shaped wing 311, a rotating shaft 312 provided on one side of the side of the wing 311, and a plurality of locking hooks 313 extended from the rotating shaft 312 and having leading ends bent toward the wing 311. The restoring spring 320 is a coil spring having opposite ends that extend outwardly and a cylindrically winding intermediate portion. One end of the restoring spring 320 is supported by the wing 311 and the other end of the restoring spring 320 is supported by the inner plate 202. The restoring spring 320 may be installed at both ends and/or an intermediate portion of the rotating shaft 312.

[0024] Referring to Figures. 3 and 5, the installation and operation of the chilled air leakage preventing device 300 will be described as follows.

[0025] The chilled air leakage preventing devices 300 are provided outside the door guard rails 220. Arch-shaped rotating shaft accommodating grooves 202b, into which the rotating shafts 312 of the chilled air leakage preventing members 310 are accommodated, are formed in the elbow where the door guard rails 220 of the inner plates 202 of the doors 200 begin protruding. Wing accommodating grooves 202c for accommodating wings 311 of the chilled air leakage preventing members 310 are provided toward the outside of the door guard rails 220 so as to be connected to the rotating shaft accommodating grooves 202b. A plurality of locking hook accommodating grooves 202d are formed in the inner plates 202 which extend from the rotating shaft accommodating grooves 202b towards the gaskets 230 such that locking hooks 313 can be accommodated in the positions corresponding to the locking hooks 313. The rotating shaft supporting grooves 202e are formed in each of the inner plates 202 of the doors 200 so that both ends of each of rotating shafts 312 are inserted thereinto.

[0026] The chilled air leakage preventing members 310 are provided in the outside of the door guard rails

220 so that both ends of the rotating shafts 312 are inserted into the rotating shaft supporting grooves 202e when the rotating shafts 312 are inserted into the rotating shaft accommodating grooves 202b. One end of each of the restoring springs 320 is supported by each of the wings 311 and the other end of each of restoring springs 320 is supported by each of the inner plates 202 of the doors 200. The support is such that the wings 311 are pushed toward the wing accommodating grooves 202c formed in the outside of the door guard rails 220. Therefore, when the doors 200 are opened, as illustrated in the left door 200 of Figure 3, the wings 311 are placed in the wing accommodating grooves 202c.

[0027] When the doors 200 are closed, as illustrated in the right door 200 of Figure 3, the leading end of each of the locking hooks 313 of the chilled air leakage preventing members 310 comes into contact with the front side of the cabinet 100 so that the chilled air leakage preventing members 310 are rotated in the counter-clockwise direction. The wings 311 protrude from the wing accommodating grooves 202c to seal the gaps C between the cabinet 100 and the inner plates 202 of the doors 200. As the locking hooks 313 are accommodated in the locking hook accommodating grooves 202d, the gaps between the cabinet 100 and the doors 200 are sealed by the gaskets 230 and are again sealed by the chilled air leakage preventing members 300 so that it is possible to prevent the chilled air in the storage compartments 110 from leaking.

[0028] When the doors 200 are opened, the chilled air leakage preventing members 310 are restored by the restoring springs 320 so that the wings 311 are placed in the wing accommodating grooves 202c. Therefore, the wings 311 do not protrude towards the outside when the doors 200 are opened. This ensures that the external appearance of the refrigerator does not deteriorate and such that it is possible to prevent a food container from colliding with, and being damaged by, the wings 311 when the food container is inserted into or withdrawn from the storage compartments 110.

[0029] As described above, the chilled air leakage preventing devices of the refrigerator according to the present invention seal the gaps between the cabinet and the doors, and are restored such that, when the doors are opened, the wings of the chilled air leakage preventing members are accommodated in the accommodating grooves.

[0030] Therefore, regardless of the temperature at the inside of the storage compartments, in a state where the doors are closed, the gaps between the cabinet and the doors are always sealed up such that it is possible to obtain excellent insulating efficiency. When the doors are opened, since the wings are accommodated in the accommodating grooves, the external appearance of the refrigerator is aesthetically pleasing and it is possible to prevent a food container from being damaged when the food container is inserted into or withdrawn from the storage compartments.

Claims

1. A refrigerator comprising:

a cabinet for forming at least one storage compartment;
at least one door for opening and closing the storage compartment;
a gasket, provided to the circumference of the door, for sealing a gap between the cabinet and the door; and
a chilled air leakage preventing device for further sealing the gap between the cabinet and the door when the door is closed.

2. The refrigerator as set forth in claim 1, wherein the chilled air leakage preventing device is provided on at least one of an upper and lower and right and left sides of the door.

3. The refrigerator as set forth in claim 1, wherein the chilled air leakage preventing device comprises a chilled air leakage preventing member having a plate-shaped wing for sealing the gap between the cabinet and the door.

4. The refrigerator as set forth in claim 3, wherein the chilled air leakage preventing device further comprises restoring springs for restoring the chilled air leakage preventing member from a position for sealing the gap between the cabinet and the door to a predetermined position, when the door is opened.

5. The refrigerator as set forth in claim 4, wherein the chilled air leakage preventing member further comprises:

a rotating shaft provided at one side of the plate-shaped wing; and
locking hooks extended from the rotating shaft and operative to contact the cabinet when the door is closed and to thus rotate the plate-shaped wing.

6. The refrigerator as set forth in claim 5, further comprising a wing accommodating groove, formed in an inner plate of the door, for accommodating the plate-shaped wing when the door is opened.

7. The refrigerator as set forth in claim 6, wherein the door comprises door guards, provided inside the door, adapted to accommodate bottles, and the inner plate of the door further comprises protruded door guardrails on which the door guards are installed, wherein the chilled air leakage preventing device is installed at the outside of the door guard rails.

8. A refrigerator having a chilled air leakage prevention

device, comprising:

a cabinet for forming a refrigerator compartment and a freezer compartment side by side;
two doors for opening and closing the refrigerator compartment and the freezer compartment, respectively;
gaskets provided at rims of the doors for sealing a gap between the cabinet and the doors;
door guards provided in an inner side of the doors adapted to accommodate bottles and food;
door guard rails installed to right and left sides of each door in a longitudinal direction of each door and on which the door guards are installed; and
a chilled air leakage preventing device for preventing chilled air from flowing from the refrigerator and freezer compartments to the gaskets by sealing the gap between the cabinet and the doors when the doors are closed, while being provided between the gaskets and the door guard rails.

9. The refrigerator as set forth in claim 8, wherein the chilled air leakage preventing device comprises a chilled air leakage preventing member having a plate-shaped wing for sealing the gap between the cabinet and a correspond one of the doors.

10. The refrigerator as set forth in claim 9, wherein the chilled air leakage preventing device further comprises elastic members for restoring the chilled air leakage preventing member from a position for sealing the gap between the cabinet and the corresponding door to a predetermined position, when the corresponding door is opened.

11. The refrigerator as set forth in claim 10, wherein the chilled air leakage preventing member further comprises:

a rotating shaft provided at one side of the plate-shaped wing; and
locking hooks extended from the rotating shaft and operative to contact the cabinet when the corresponding door is closed and to thus rotate the plate-shaped wing.

12. The refrigerator as set forth in claim 11, further comprising a wing accommodating groove, formed at the sides of the door guard rails adjacent to an inner plate of the corresponding door, for accommodating the plate-shaped wing when the corresponding door is opened.

13. A refrigerating apparatus (100) having a door (200) and a door seal (300), pivotable between retracted

and sealing positions, for sealing the door (200), **characterised in that** the door seal (300) is pivoted to its sealing position by the action of closing the door (200).

14. A refrigerating apparatus (100) according to claim 13, including spring means (320) for biasing the door seal (300) in its retracted position.

15. A refrigerating apparatus (100) according to claim 13 or 14, including a wall (101) and a door seal actuating lever (313) projecting from the door seal (300), wherein the actuating lever (313) is configured to be moved by contact with said wall (101), during closing of the door (200), so as to pivot the door seal (300) to its sealing position.

16. A refrigerating apparatus (100) according to claim 13, 14 or 15, comprising a ridge (220) having a recess (202c) configured to receive the door seal (300) therein when in the retracted position.

17. A refrigerating apparatus (100) according to any one of claims 13 to 16 comprising a gasket (230) around the circumference of the door (200) providing a further seal when said door (200) is closed.

FIG 1.

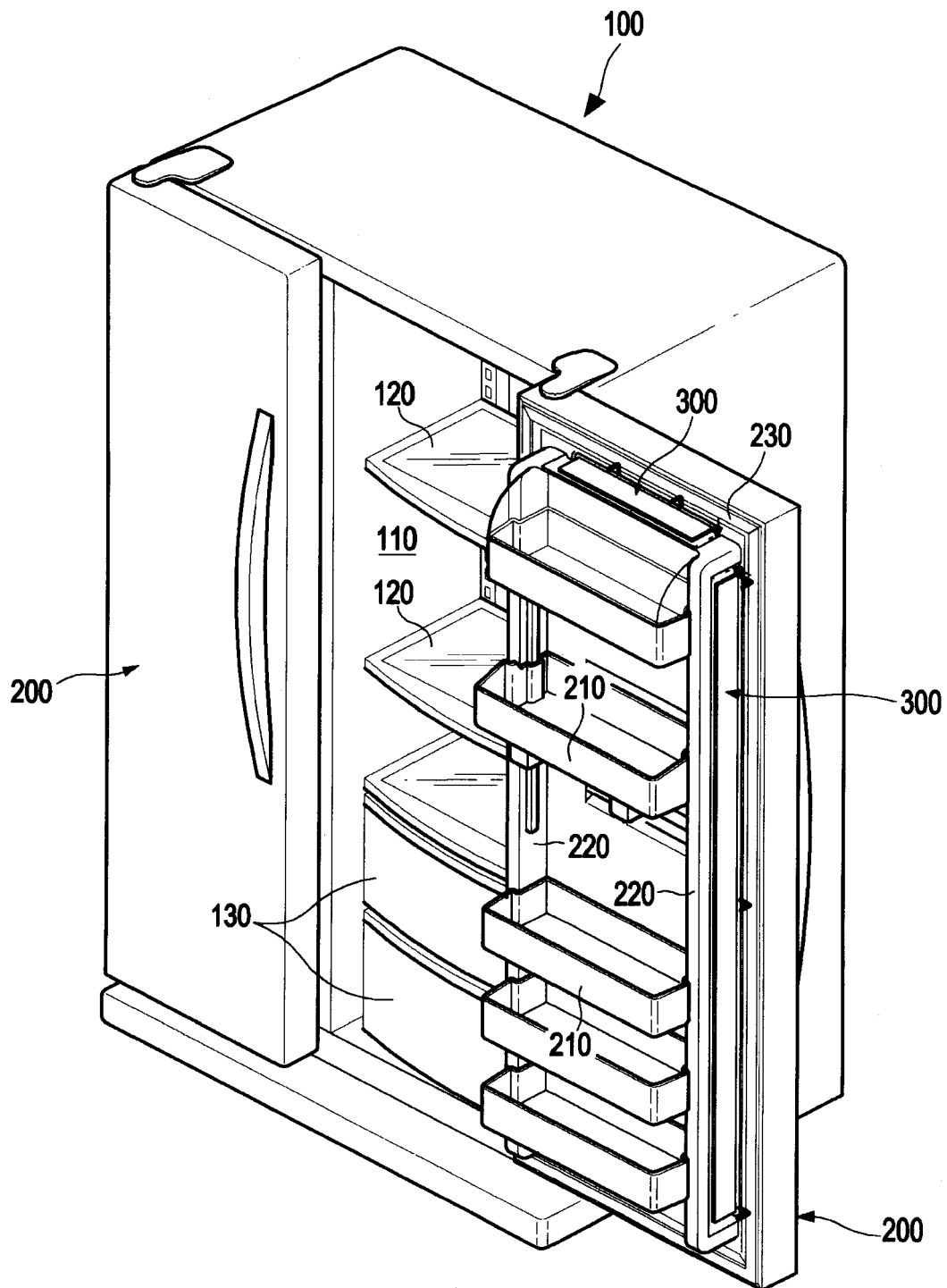


FIG 2.

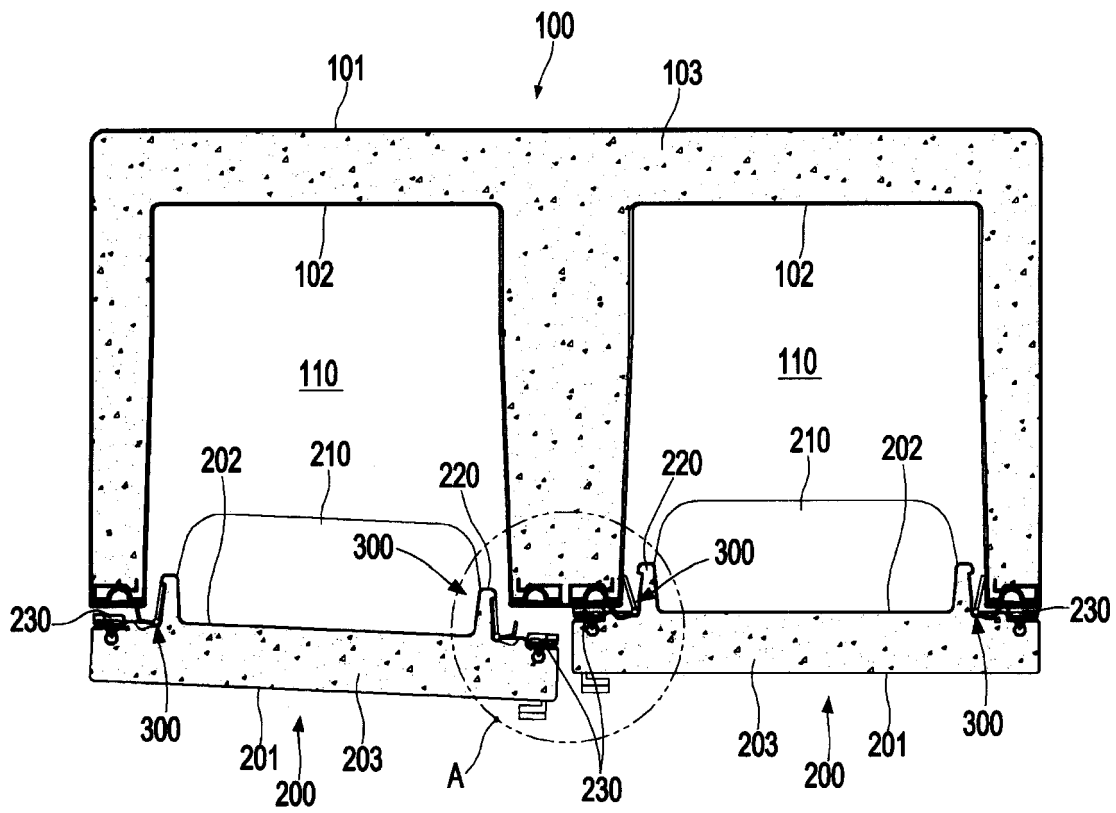


FIG 3.

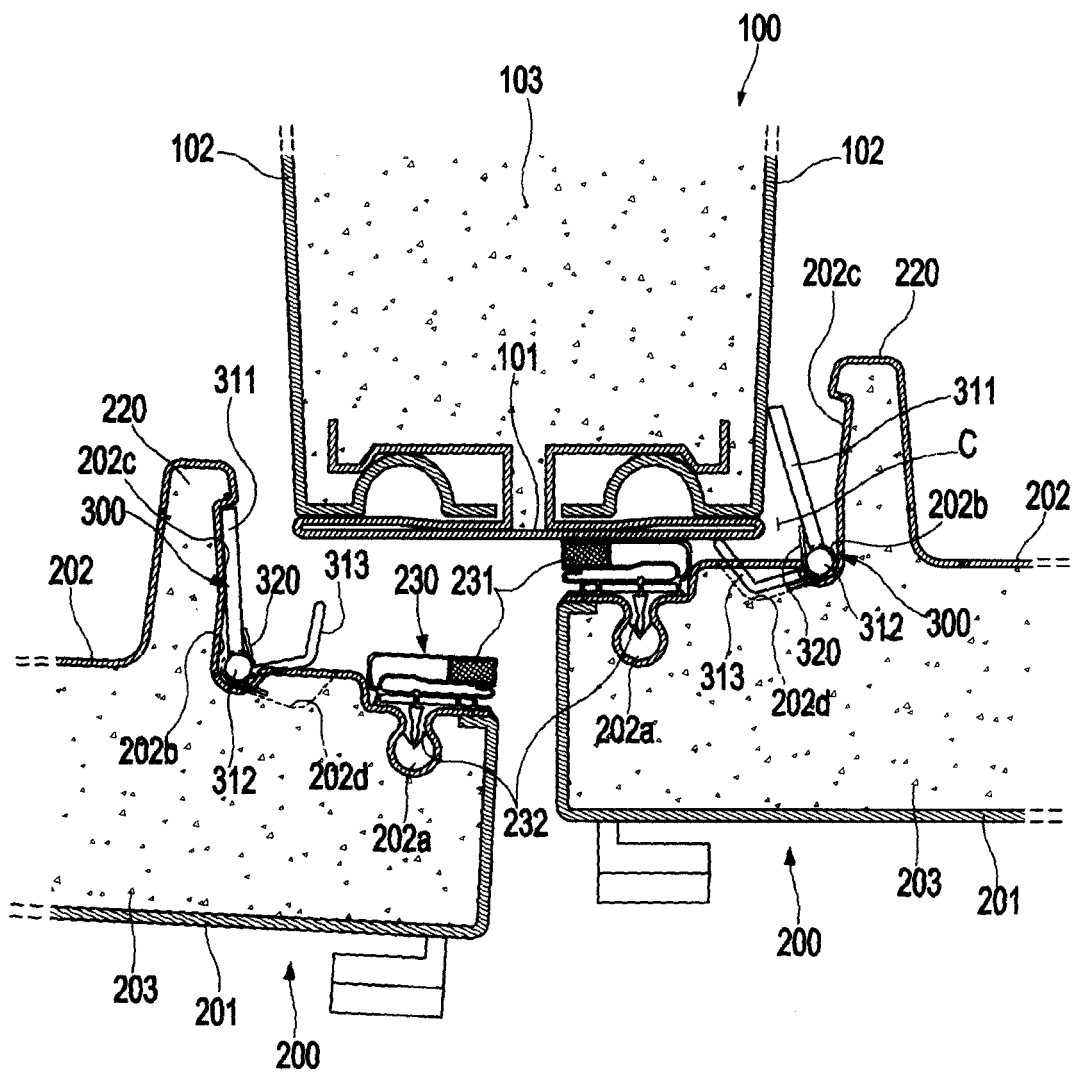


FIG 4.

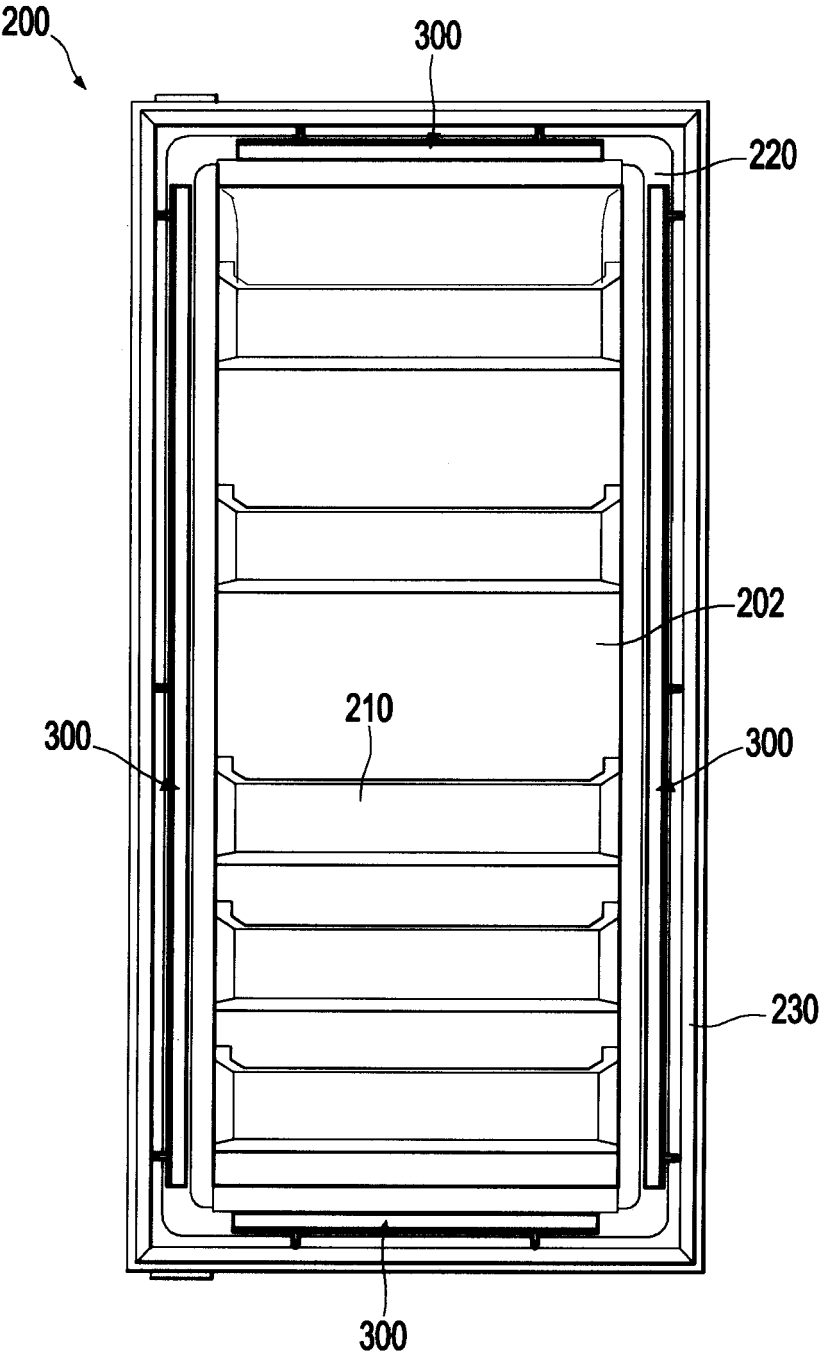


FIG 5.

