April 18, 1944. J. H. ASHBAUGH 2,346,641

REFRIGERATION APPARATUS

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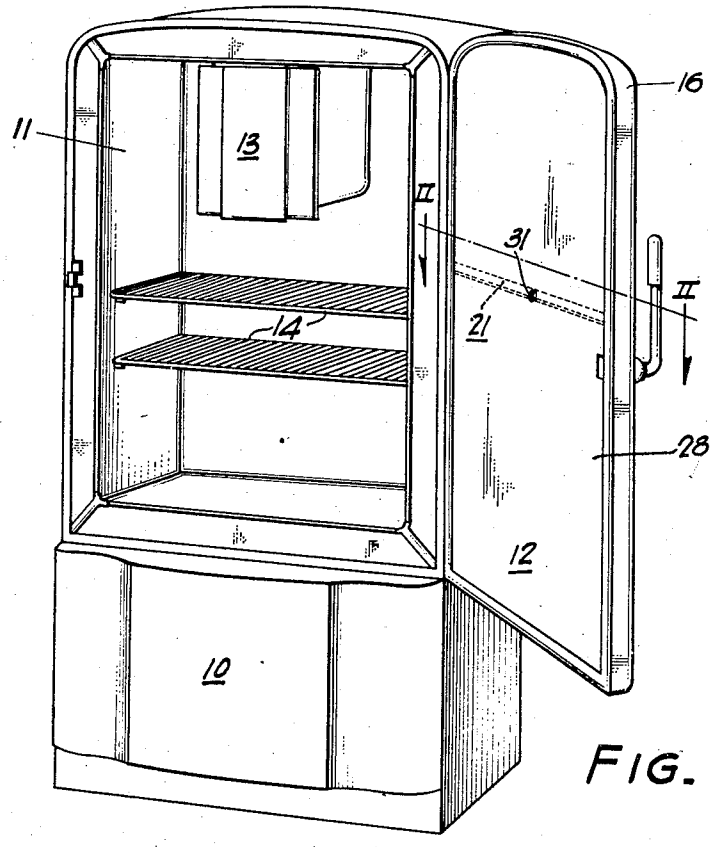


FIG. 1.

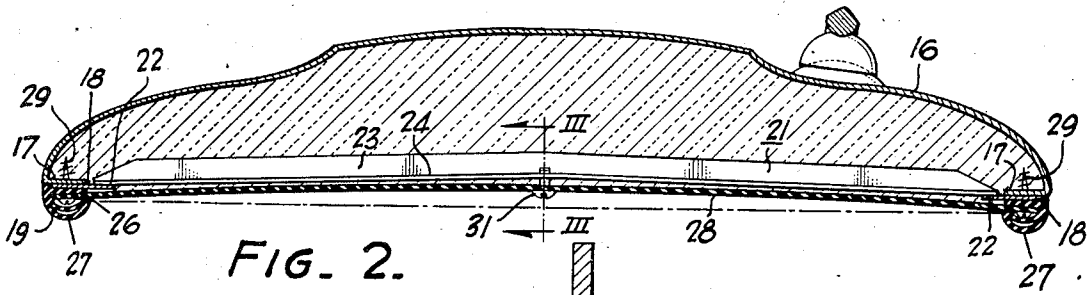


FIG. 2.

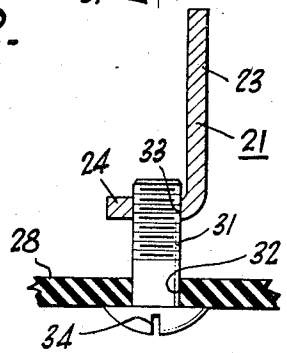


FIG. 3.

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REFRIGERATION APPARATUS

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10 Claims. (Cl. 20—35)

This invention relates to refrigerator cabinet construction, and more especially to a construction which overcomes the warping of panels of heat-insulating material in a refrigerator cabinet.

In the construction of refrigerator cabinets, flat, thin panels of rigid heat-insulating material are frequently used as the inner panels of doors and other parts of the cabinet. Such panels are not completely impervious to moisture. When a refrigerator door embodying such a panel is opened while the refrigerator is in operation and the ambient air is humid, moisture from the atmosphere condenses on the exposed outer surface of the panel, penetrates the surface thereof and causes the surface layers of the panel to expand. If the panel is flat and unsupported, the expansion of the surface layers causes the panel to bulge and it may strike the shelving in the refrigerator cabinet when the door is closed. If the rigid panel of heat-insulating material also forms a vertical retaining wall for loose heat-insulating material, the outward bulging of the panel permits the heat-insulating material to settle so that the upper portions of the door are not properly insulated.

It is accordingly an object of the invention to provide a refrigerator construction which prevents the bulging of flat rigid panels of heat-insulating material used in the refrigerator cabinet walls.

A further object of the invention is to forcibly retain a rigid and normally flat panel of a refrigerator cabinet in a dished or pre-set position in which expansion of the layers on the concave side of the panel prevents bulging of the panel in a direction which may interfere with the contents of the interior of the refrigerator.

A further object of the invention is to provide a refrigerator cabinet comprising rigid low-cost sheets of substantially flat heat-insulating material.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in acordance with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a view in perspective of a refrigerator cabinet embodying a door constructed in accordance with the invention;

Fig. 2 is a section of the door on the line II—II of Fig. 1; and

Fig. 3 is a section on the line III—III of Fig. 2.

Referring to the drawing for a detailed description of the invention, the reference numeral 10 represents a refrigerator cabinet embodying a food-storage chamber 11 and a door 12 for the food-storage chamber. An evaporator 13 is located in the upper portion of the food-storage chamber 11 and several shelves 14 for supporting the articles to be refrigerated are located beneath the evaporator 13.

The door 12 comprises a dished or curvilinear outer panel 16 of sheet metal, the edges 17 of which are turned inwardly. A continuous frame 18 is secured to the inwardly-turned edges to provide a flat seating surface for the sealing gaskets 19. A brace 21 extends horizontally across the opening in the frame 18 and is spot-welded to the frame 18 at points 22 at both ends of the brace 21. The brace 21 is of an L-section, comprising a long leg 23 and a short leg 24 and is bent slightly at its center towards the interior of the door 12.

The sealing gasket 19 comprises an attachment flange 26 and a tubular portion 27. An inner panel 28 of thin, rigid heat-insulating material lies with its edges adjacent to the frame 18 and is secured thereto by screws 29. The panel may be formed, for example, of a material impregnated with a resinous condensate product or may be a painted cellulose panel. The attachment flange 26 of the gasket 19 lies between the frame 18 and the edges of the inner panel 28, and is clamped therebetween. The inner panel 28 is flat in its normal position. It is not completely impervious to moisture and has a tendency to warp, bulge, or buckle when one side is wetted and the other side retained in a dry condition.

The panel 28, when proper provisions are not taken to prevent such action, would bulge outwardly when the refrigerator is in operation and the door 12 is opened. During the operation of the refrigerator, the inner panel 28 of the door 12 is cooled, and when the door 12 is opened and the dew point temperature of the ambient air is above the temperature of the inner panel 28, moisture from the air will condense on the exposed surface of the inner panel 28. When this moisture penetrates the outer layers of the panel 28, the panel 28 bulges outwardly and may strike the shelving 14 in the refrigerator cabinet when the door 12 is again closed.

The outward bulging of the panel 28, according to this invention, is prevented by forcibly dishing or pre-setting the panel 28 inwardly. The inward dishing of the panel 28 may be effected in numerous ways and in this embodiment of the invention is effected by a screw 31 inserted through an opening 32 formed approx-

imately in the center of the panel 28, which screw 31 engages a threaded hole 33 in the leg 24 of the brace 21. The inward deflection of the central portion of the panel 28 is adjusted by turning the screw 31 by means of the screw driver slot 34.

It is obvious that the portion of the panel 28 near the screw 31 cannot bulge outwardly. In actual practice it has been found that not only the portion of the panel 28 near the screw 31 is held rigidly but also all other portions of the panel 28, even though remote from any point of support, retain their original position when the refrigerator door 12 is opened. When the inner panel 28 is pre-set into a dished configuration, the expanding forces of the moistened outer layer of the panel 28 tend to bulge the panel further inwardly toward the outer door pan 16, rather than outwardly toward the shelves. The relative motion of the dished panel 28 when moistened will also be smaller than the relative motion of a flat panel under the same conditions.

It will be apparent from the above that this invention provides a simple means for preventing the bulging of panels of rigid panels of flat heat-insulating material in refrigerators. It also provides a door for a refrigerator cabinet in which low-cost panels of heat insulation are satisfactorily utilized.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. The method of fabricating a door for a refrigerator cabinet, said method comprising securing a panel of stiff heat insulating material at its edges to a rigid door frame, said panel having a flat portion facing the refrigerated chamber of the cabinet when the door is in use, and distorting the flat portion of said panel into a dished configuration by forcibly drawing a small part of said portion, spaced from the edges thereof, in a direction inwardly of said door and retaining said part in said position, the flat portion of said panel, between said part and the edges of said portion, being free to move inwardly or outwardly with respect to the door.

2. The method of fabricating a door for a refrigerator cabinet, said method comprising securing a substantially flat panel of stiff heat-insulating material at its edges to a rigid door frame forming a part of the outer member of said door, said panel facing the refrigerated chamber of the cabinet when the door is in use, and distorting said panel into a dished configuration by forcibly drawing a small portion of said panel spaced from said edges in a direction inwardly of said door and retaining said portion in said position, the portions of said panel between said first-named portion and the edges of said panel being free to move inwardly or outwardly with respect to the door.

3. The method of fabricating a door for a refrigerator cabinet, said method comprising securing a substantially flat panel of stiff heat-insulating material at its edges to a rigid door frame forming a part of the outer member of said door, said panel facing the refrigerated chamber of the cabinet when the door is in use, and distorting said panel into a dished configuration by forcibly drawing the central portion of said panel inwardly of said door and retaining it in said position, the portions of said panel between said central portion and the edges of said panel being free to move inwardly or outwardly with respect to the door.

4. In a refrigerator cabinet, the combination of a thin, normally flat panel of relatively stiff heat-insulating material so positioned in the refrigerator cabinet that it is subjected to moisture on only one side thereof, and a rigid member secured to said panel to distort the same into a dished configuration with the side subjected to moisture forming the concave side of the panel to prevent bulging of the panel in the opposite direction, said rigid member being out of contact with the major portion of said panel.

5. In a refrigerator cabinet, the combination of a rigid member, a thin, normally flat panel of relatively stiff heat-insulating material so positioned in the refrigerator cabinet that it is subjected to moisture on only one side thereof, means for securing the periphery of said panel to said rigid member, and means for distorting said panel into a dished configuration with the side subjected to moisture forming the concave side of the panel to prevent bulging in the opposite direction, said distorting means including the means for securing the periphery of the panel and also including additional structure acting upon the panel within its periphery, said structure being out of contact with the major portion of the panel.

6. In a door for a refrigerator having a refrigerated storage chamber, the combination of an outer door pan, an inner panel of a normally flat rigid heat-insulating material so positioned that it is subjected to moisture on the side thereof facing said refrigerated chamber when the door is in use, means for securing the periphery of said inner panel to the edges of said outer door pan, and means for forcibly distorting said panel into a dished configuration with the side subjected to moisture forming the concave side of said panel to prevent bulging thereof towards said refrigerated chamber, said distorting means including the means for securing the periphery of the panel and also including additional structure acting upon the panel within its periphery, said structure being out of contact with the major portion of the panel.

7. In a door for a refrigerator having a refrigerated storage chamber the combination of an outer door panel, a normally flat inner panel of rigid heat-insulating material so positioned that it is subjected to moisture on the side thereof facing said refrigerated chamber, means for securing the periphery of said inner panel to the edges of said outer door pan, and means for forcibly distorting said panel into a dished configuration with the side subjected to moisture forming the concave side, said distorting means comprising a rigid member disposed between the outer door pan and the inner panel and means for fastening only the center of said inner panel to said rigid member.

8. In a door for a refrigerator, the combination of a dished metallic outer panel, inwardly-turned flanges on said panel, a brace secured at its ends to said flanges and extending across said panel at approximately its mid-section, an inner panel of normally flat sheet material secured at its edges to said flanges, said material tending to bulge outwardly away from said outer panel when said door is in service on a refrigerator, heat-insulating material between said inner and

outer panels, and means for securing said panel at approximately its center to said brace to forcibly dish said panel inwardly, thereby tending to destroy the tendency of said material to bulge outwardly at unsecured portions thereof.

9. In a door for a refrigerator, the combination of a dished metallic outer panel, inwardly-turned flanges on said panel, a brace secured at its ends to said flanges and extending across said panel at approximately its mid-section, an inner panel of normally flat sheet material secured at its edges to said flanges, said material tending to bulge outwardly away from said outer panel when said door is in service on a refrigerator, heat-insulating material between said inner and outer panels, a sealing gasket at the edges of the inner panel, and means for securing said panel at approximately its center to said brace to forcibly dish said panel inwardly, thereby tending to destroy the tendency of said material to bulge outwardly at unsecured portions thereof.

10. The method of fabricating a door for a refrigerated chamber, said door comprising a door frame and an initially flat panel of stiff heat-insulating material secured at its edges to said door frame, said panel facing the refrigerated chamber, and when in use and not otherwise supported, tending to warp in a dished configuration with the convex side toward said chamber, said method comprising forcing the central portion of said panel from its original flat position so that said panel presents a dished configuration with the concave side toward said chamber, said forcing being effected by a member of the door secured to said frame and to only a small area of said panel remote from said frame.

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