Dec. 29, 1953 C. MILLMAN 2,663,916

REFRIGERATOR CABINET

Filed March 9, 1950 2 Sheets-Sheet 1

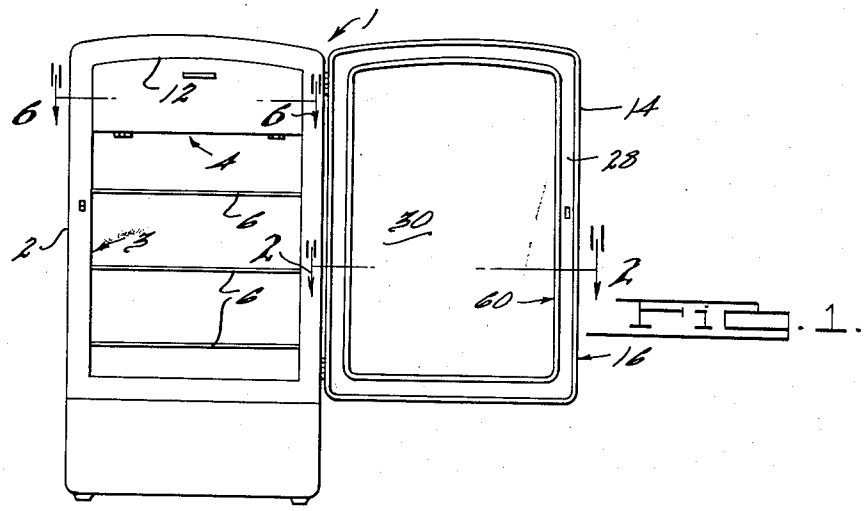


Fig. 1.

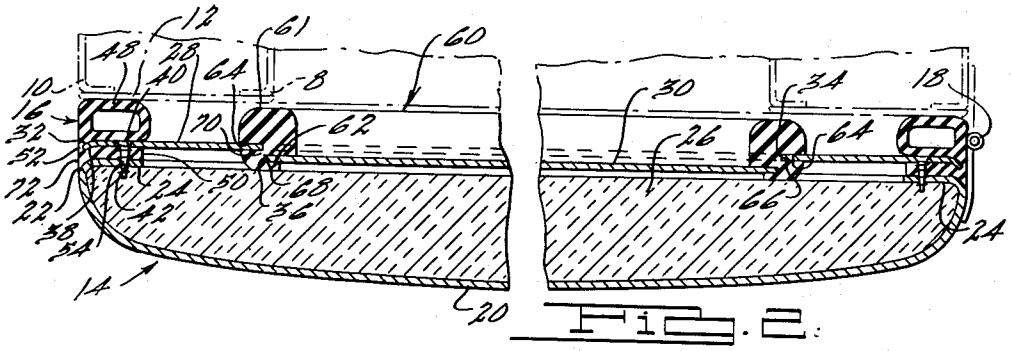


Fig. 2.

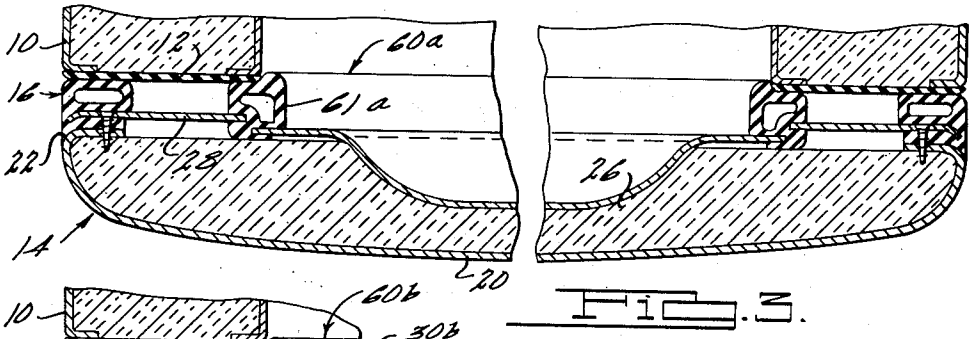


Fig. 3.

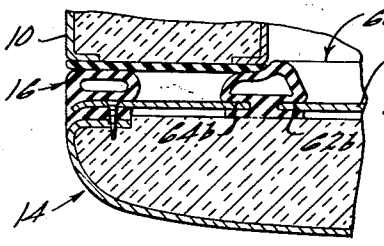


Fig. 4.

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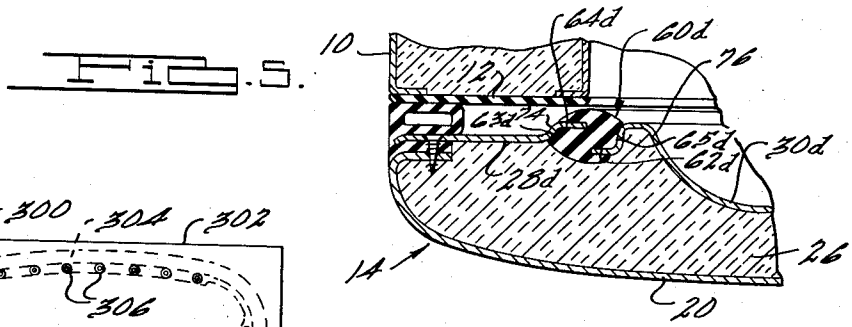


Fig. 5.

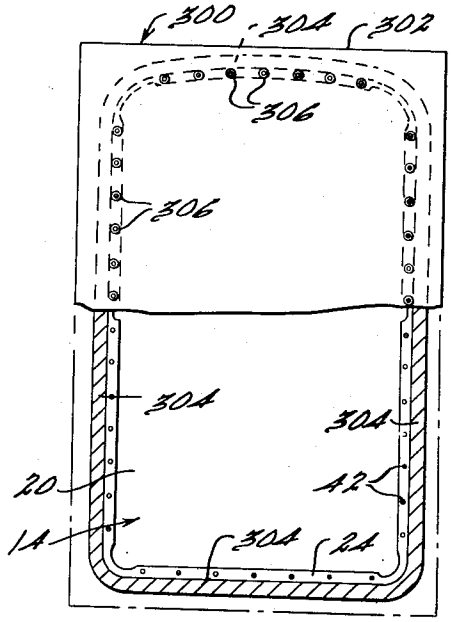


Fig. 8.

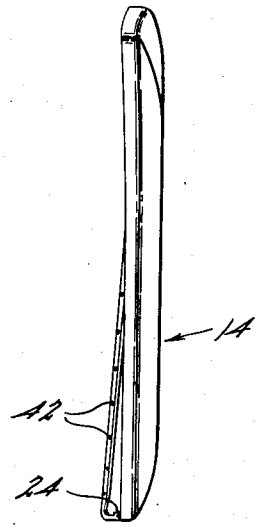


Fig. 7.

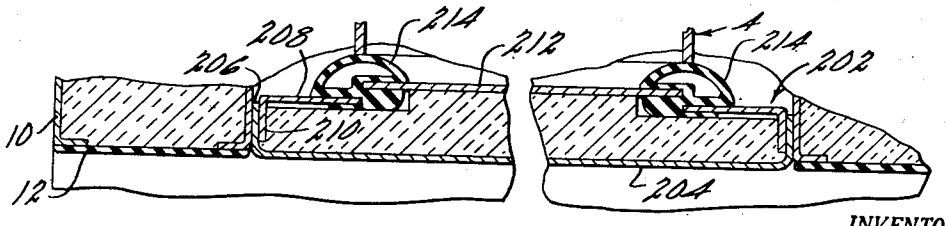


Fig. 6.

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REFRIGERATOR CABINET

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4 Claims. (Cl. 20—35)

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This invention relates generally to refrigerator cabinets and is particularly adapted among other uses in connection with domestic refrigerators.

An object of this invention is to provide a new door construction for a refrigerator.

Another object is to provide such a door construction in which the inner panel thereof is carried in a new and novel manner.

Another object is to provide such a door construction in which the inner panel may be of metallic material.

Another object is to provide a refrigerator cabinet in which the door cooperates with the remainder of the cabinet in a new manner.

Another object is to provide such a door which may be used for closing the access opening of a refrigerator evaporator.

Another object is to provide such a door in which the outer periphery of the door may vary widely from the shape and size of the evaporator opening.

Another object is to provide a flushtype door for a refrigerator which is free from the usual cumbersome internal bracing.

Another object is to provide a new method for assembling refrigerator doors.

Other objects will be apparent from the specification, the appended claims and the drawings in which drawings,

Figure 1 is a front view of a domestic refrigerator cabinet with the door in open position;

Fig. 2 is a view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing a modified form of door construction;

Figs. 4 and 5 are partial views similar to Figs. 2 and 3 and showing further modified forms of door construction;

Fig. 6 is a view taken substantially along the line 6—6 of Fig. 1 showing a form of the invention when applied to evaporator doors;

Fig. 7 is a view of the inner side of an outer door panel; and,

Fig. 8 is a view showing one step in the manufacture of the refrigerator door.

Referring to the drawings by characters of reference, the numeral 1 indicates generally a refrigerator cabinet having an outer shell 2, an inner liner 3 provided with an evaporator 4, and suitable shelves 6 for the storage of comestibles. The liner 3 is located within the shell 2 in spaced relation thereto and has a front opening 8 registering with a front opening 10 in the shell 2. The space between the liner 8 and shell 2 is

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closed by means of a peripherally extending frame member 12 fabricated from material having a relatively poor conduction of heat. The front openings of the shell 2 and liner 3 are closed by means of a door 14 having an outer sealing gasket 16 which cooperates with the outer shell 10 or frame 12 to prevent flow of fluid inwardly into or outwardly from the interior of the liner 3 when the door is closed. The door is preferably hinged to the outer shell by hinges 18.

The door 14 has a hollow outer shell 20 which has a peripheral edge 22 which is of substantially identical contour and size as the outer periphery of the shell 2. The hollow outer shell 20 has an inturned flange 24 extending inwardly from the peripheral edge 22. Suitable insulating material 26 is contained within the hollow interior of the shell 20. The open face of the shell 20 is closed by means of a peripherally extending frame 28 and an inner door panel 30. The outer peripheral edge 32 of the frame 28 is of substantially the same contour and size as, and extends completely around, the periphery 22 and has a central opening forming an inner peripheral edge 34. The inner panel 30 has an outer peripheral edge 36 which preferably is of the same size and contour as the inner peripheral edge 34 and may consist of the blank which is stamped out during fabrication of the frame 28 whereby the panel 30 and frame may be fabricated from a single metallic sheet in a punch press operation without waste of material. The outer peripheral edge of the frame 28 is downturned as at 38. In the same punching operation a series of holes 40 are provided and located just inwardly of the downturned portion 38. This series of holes 40 extends completely around the outer peripheral portion of the frame 28 and the holes 40 are aligned with similar holes 42 provided in the inturned flange 24.

The gasket 16 extends around the outer periphery of the frame 28 and has a doughnutlike or cavity defining portion 48 and a tongue portion 50 joined together at the outer edge of the gasket as at 52. The frame member extends between the doughtnutlike portion 48 and the tongue 50 and the doughnutlike portion 48 overlies the aperture 40. Screws 54 which may be sheet metal screws extend through the apertures 40 and 42 and tightly secure the frame 28 and lip 50 to the flange 24.

A gasket 60 is provided with a pair of oppositely opening pockets 62 and 64 and extends around the inner periphery of the frame member 28 with the frame member 28 extending into the out-

wardly opening pocket 64 and seating against the bottom wall 66 thereof. The outer peripheral edge portion of the inner panel 30 extends into the pocket 62 and seats against the bottom wall 68 thereof. Preferably the pockets 62 and 64 are laterally offset with respect to each other so that there remains a section of the gasket 60 intermediate the two pockets to form a cross wall 70. It will be observed that the gasket 60 forms the sole means of supporting the inner panel 30 to the frame 28 and serves to provide a break in the heat path between frame 28 and panel 30. It will further be observed that the engagement of the frame 28 with the bottom 66 of the pocket 64 acts to hold the gasket tightly against the outer periphery of the inner member 30 and conversely the engagement of the bottom wall 68 of the pocket 62 with the inner panel 30 acts to hold the gasket to the frame 28. Preferably, the gasket 60 has an extending portion 61 which extends outwardly of the door and almost to the adjacent surface of the frame 12 whereby flow of fluid to and from the interior of the liner 3 past the gasket portion 61 to the space intermediate the gaskets 16 and 60 and the frames 12 and 28 is restricted. This restriction permits sufficient communication of this space with the interior of the liner to prevent external sweating of the cabinet and yet does not permit a frost film to form therein.

In the manufacture of the outer door panel 20 it is very difficult and expensive to form a nice, distinct, smooth peripheral edge 22 between the flange 24 and the remainder of the outer door panel 20. For this reason, the connecting portion 52 of the gasket 16 is provided with a slight downwardly extending tang 72. The downturned portion 38 of the frame 28 acts to force this tang 72 downwardly against this peripheral edge whereby the gasket 46 acts to present a finished appearance and the compressed tongue also serves to form a good seal to prevent the ingress and egress of any moisture between the flange 24 and tongue 50.

In order to form outer door panels of the character described in presses from a single piece of sheet material with the inturned flange 24, it is necessary to reduce the width of these flanges at the corner portions of the door in order to prevent undue wrinkling of the material or else to cut V-shape segments out of the portion of the flange at this corner. Other portions of the flange may be required to be cut away for the inclusion of various door accessories such as hardware. This weakens the outer door panel 20 so that it tends to bend and warp and cannot be made to hold its desired shape. For this reason, prior art doors of this class have required internal bracing structures which are costly to manufacture and assemble and add much weight to the door structure. It has generally been found desirable to use metal for such inner door supports and this tends to increase the heat leakage through the door. I have found that if I form the holes 42 in the flange 24 in a predetermined orientated position with respect to each other and also form the holes 40 in the frame 28 in the same predetermined orientated position, that outer door panels 20 which are warped out of shape can be assembled to the frame 28 by means of drift pins or similar tools and by proper application of manually exerted force. As the holes 40 and 42 are brought into alignment for receiving the screws 54 to secure the frame 28 and tongue 50 to the flange 24, the panel 30 will

spring back into shape and the frame 28 will act to hold the outer panel 20 in this shape. The frame 28 is stamped from a single planar sheet of material and can be made of any desired width or thickness so that it will act to form a reinforcing flange for the door.

As shown in Fig. 5 this frame may have an offset portion which adds further rigidity thereto and to the door structure. This method of fabricating the door is relatively inexpensive and requires no expensive welding operations or other welded reinforced corner portions. In the form shown in Fig. 2, the inner door panel 30 is planar, while in the form shown in Fig. 3 the inner door has been recessed inwardly to form pockets for the reception of suitable shelves for the storage of comestibles in the door. In the form shown in Fig. 3 the inner gasket 60*a* is provided with a doughnutlike portion 61*a* and which portion seals against the frame 12 to prevent flow of fluid between the liner and the space intermediate the gaskets 60*a* and 46 and the frames 12 and 28. This seal of the gasket 60*a* is desirable in some instances, especially in low temperature work such as frozen food storage cabinets where a double gasket seal on the door is desirable. The form shown in Fig. 4 is similar to that shown in Fig. 3 except that a different form of gasket 60*b* is provided in which the pockets 62*b* and 64*b* are in alignment and the inner panel 30*b* has an outer periphery which is of similar contour to, but slightly smaller in periphery than, the inner contour and periphery of the frame member 28. In some instances, this form of inner panel 30*b* and gasket 60*b* may be desirable.

The form shown in Fig. 5 has been referred to hereinabove as being provided with an offset 74. A similar offset 76 is provided adjacent the outer periphery of the inner door panel 30*d* and a gasket 60*d* is provided with pockets 62*d* and 64*d* for receiving the adjacent portions of the frame 28*d* and panel 30*d*. In this form not only do the bottom walls of the pockets 62*d* and 64*d* act to mutually engage the inner panel 30*d* and frame 28*d* for securing the same together but also the peripheral edge portions 63*d* and 65*d* of the gasket 60*d* cooperate with the outstruck portions of the ribs 74 and 76 to further aid in the securing of the two members together.

In Fig. 6 there is shown the form of door construction which is particularly adapted for use with evaporators. As shown therein, an evaporator 4 may have an open front defined by the peripheral edge of the side walls of the evaporator of a first size and shape while the door 202 may have an outer periphery of a second size and shape. The door 202 is similar to the door 14 and comprises an outer hollow panel 204 having a periphery 206 of the desired cross section and size. In this form however there is no inturned flange corresponding to the flange 24 of the panel 20. A frame 208 is provided similar to the frame 28 except that in this instance it has an outturned flange 210 adjacent its outer peripheral edge and which telescopes within adjacent edge portions of the hollow outer panel 204 and may be secured to the panel 204 by any suitable means such as welding. The door 202 is provided with an inner panel 212 which is secured to the frame 208 by means of a gasket 214 which may be similar to any of the gaskets 60, 60*a*, 60*b*. The frame 208 has an inner periphery which corresponds with the periphery defined by the walls of the evaporator 4 so that the gasket 214 not only serves to support and carry the inner panel

212 but also engages the evaporator 4 to form a seal therewith by which fluid is prevented from passing into and out of the evaporator 4. It may be seen that with this construction, the outer periphery of the door 202 may be any desired contour which will harmonize with the lines of the refrigerator to present a pleasing appearance while the inner peripheral opening of the frame 208 may agree with that presented between the walls of the evaporator 4 so that the door will not only have a pleasing appearance but will also be provided with means for sealing the evaporator to prevent an undue accumulation of frost therein. The frame 208 acts to reinforce and hold the door in shape.

A typical sprung or warped panel is shown in Fig. 7 illustrating the nonconforming condition which such panels may assume and also showing how the flange 24 must be cut away. In Fig. 8 the same panel is shown inserted in a jig 300 which comprises a base plate 302 having a surface against which the flange 24 abuts. The plate 302 is provided with an outwardly extending peripheral wall 304 which is of the same internal contour at its intersection with the plate 302 as the desired finished periphery of the edge 22. The panels 20 are preferably manufactured in a punch press and as such are initially of the desired shape but when removed from the press spring or warp. As these warped panels are inserted into the jig 300 they will spring back to shape and be held in this shape by the plate 302 and wall 304.

The plate 302 is provided with a series of apertures in which are positioned a series of drill guides 306. These apertures hold the guides in proper orientated position so that the flange 24 may be drilled to provide its series of holes 42 which with the door panel 20 in proper shape will align with the holes 40 in the frame 28. After the holes 42 have been drilled, the panel 20 may be removed from the jig 300 and stored for future use. Upon removal, the panel will probably again spring or work out of shape but this will do no harm since when a frame 28 is assembled thereto and the holes 40 and 42 brought into alignment it will assume its desired shape. Of course, if desired, a jig similar to that shown in Fig. 8 but with the plate 302 on the opposite side of the wall 304 whereby the frame 28 and gasket 16 may be superimposed on the flange 24 and the screws 54 inserted. After assembly of the gasket and frame the panel 20 will retain its desired shape.

What is claimed and is desired to be secured by United States Letters Patent is as follows:

1. A door for a storage cabinet comprising, a generally dish-shaped outer panel having an inturned peripheral flange, a one piece sheet material framing panel having an outer peripheral edge portion arranged in juxtaposition with said flange, said framing panel having an aperture therethrough providing an inner peripheral edge, a one piece inner panel having an outer peripheral edge of substantially the same size and contour as said framing panel inner peripheral edge, the adjacent edge portions of said inner panel and said framing panel extending in opposite directions, the ends of said inner panel and said framing panel being in substantially parallel planes normal to the plane of said inner and said framing panels, said inner panel being positioned relative to said framing panel so that said inner panel peripheral edge is transversely offset from the plane of said framing panel inner peripheral edge, means rigidly securing said framing panel to said flange whereby the stiffness of said framing panel acts to reinforce said outer panel against deflection, and resilient member having a low rate of heat conduction, said resilient member having oppositely extending slots offset transversely with respect to each other, one of said slots opening toward and receiving said framing panel inner peripheral edge and the other of said slots opening toward and receiving said inner panel peripheral edge, said last named member acting as the sole support for said inner panel.

2. A door for a storage cabinet comprising a generally dish-shaped outer panel having an inturned peripheral flange, a framing panel and an inner panel formed from a single piece of sheet material, said framing panel having an outer peripheral edge portion arranged in juxtaposition with said flange, the adjacent edge portions of said inner panel and said framing panel extending in opposite directions, the ends of said inner panel and said framing panel being in substantially parallel planes normal to the plane of said adjacent edge portions of said inner panel and said framing panel, said inner panel being positioned relative to said framing panel so that said inner panel peripheral edge is transversely offset from the plane of said framing panel inner peripheral edge, means rigidly securing said framing panel to said flange whereby the stiffness of said framing panel acts to reinforce said outer panel against deformation, and a resilient member having a low rate of heat conduction, said resilient member having oppositely extending slots offset transversely with respect to each other, one of said slots opening toward and receiving said framing panel inner peripheral edge and the other of said slots opening toward and receiving said inner panel peripheral edge, said resilient member acting as the sole support for said inner panel.

3. A door for a storage cabinet comprising, a generally dish-shaped outer sheet material panel having a peripheral inturned flange, a one piece sheet material framing panel having an outer peripheral edge portion overlying said flange, said edge having an outwardly turned portion, a resilient gasket overlying said flange and having an outwardly projecting tang extending around said outer panel, said basket also having an inwardly extending slot receiving said outwardly turned portion, fastening means extending through said framing panel and a portion of said gasket and clamping said framing panel to said outer panel and positioning said outwardly turned portion to deform said gasket to fit the contour of the portion of said outer panel which it overlies, said framing panel having an aperture therethrough providing an inner peripheral edge, a one piece inner panel having an outer peripheral edge of substantially the same size and contour as said framing panel inner peripheral edge, the adjacent edge portions of said inner panel and said framing panel extending in opposite directions, the ends of said inner panel and said framing panel being in substantially parallel planes normal to the plane of said inner panel and said framing panel, said inner panel being positioned relative to said framing panel so that said inner panel peripheral edge is offset from the plane of said framing panel inner peripheral edge, means rigidly securing said framing panel to said flange whereby the stiffness of said framing panel acts to reinforce said outer panel against deflection, and a resilient member having

a low rate of heat conduction, said resilient member having oppositely extending slots spaced transversely with respect to each other, one of said slots opening toward and receiving said framing panel inner peripheral edge and the other of said slots opening toward and receiving said inner panel peripheral edge, said last named member acting as the sole support for said inner panel.

4. A door for a storage cabinet, comprising a generally dish-shaped outer door panel having a front wall and end walls and side walls, said end and side walls being provided with inturned flanges, an inner panel structure having an outer peripheral edge overlying said flange adjacent said side and end walls, said edge having an outwardly turned portion, a resilient gasket member having an outwardly projecting tang extending around said structure outer periphery and having an inwardly opening slot receiving said structure peripheral edge, securing means extending between said flange and said structure

and clamping said structure to said flange for mutual support and for causing said outwardly turned portion of said peripheral edge to deform said gasket tang into tight engagement with the adjacent portions of said outer panel.

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