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2,106,840

REFRIGERATING APPARATUS

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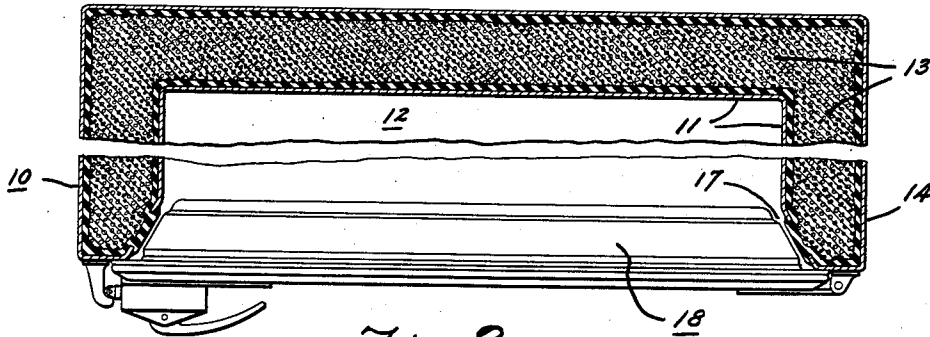


Fig. 2

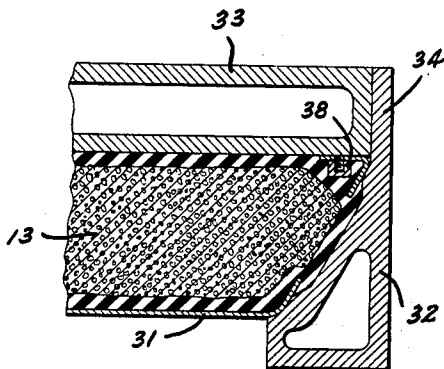


Fig. 5

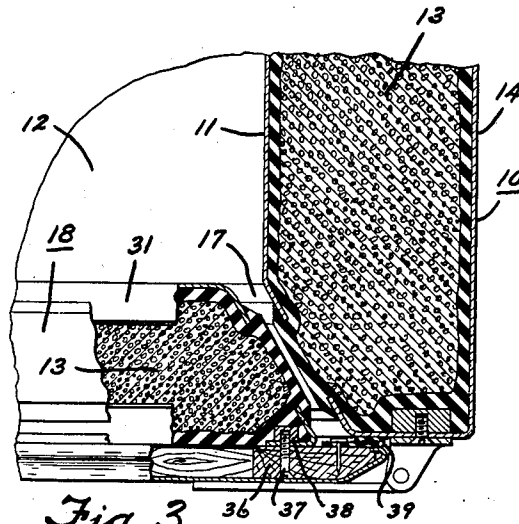


Fig. 3

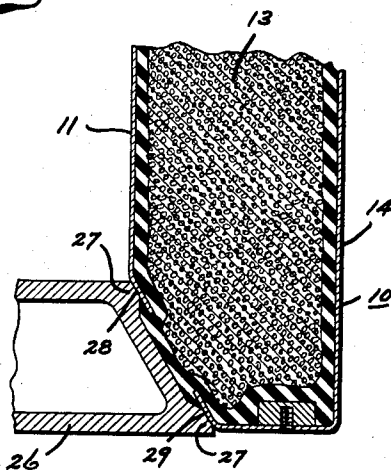


Fig. 4

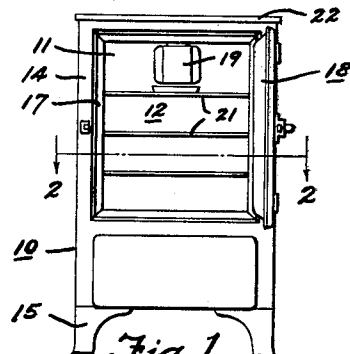


Fig. 1

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REFRIGERATING APPARATUS

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5 Claims. (Cl. 220-9)

This invention relates to refrigerating apparatus and more particularly to the construction of cabinets for such apparatus.

5 An object of the invention is to provide an improved refrigerator cabinet construction.

Another object of the invention is to provide a refrigerator cabinet that will be light in weight and constructed of efficient insulating material which will not absorb moisture.

10 Another object of the invention is to provide a refrigerator cabinet with rigid metallic interior and exterior wall surfaces which are maintained in spaced apart relation by a relatively thick insulating structure formed of cellular rubber material having an impervious crust or outer surface vulcanized to the metallic interior and exterior walls of the cabinet.

A further object of the invention is to utilize the crust or impervious outer surface of the insulating structure as a means for covering and concealing the spaced apart edges of the inner and outer metallic wall surfaces of the cabinet as a means for providing a finished impervious insulating breaker strip between the edges of the metal walls about the cabinet access opening.

20 In carrying out the foregoing objects, it is a still further object of the invention to bond the insulating material to the inner and outer metallic wall surfaces of the cabinet to cause the outer metallic wall to form the sole support for the inner wall and the insulating material.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred form of the present invention is clearly shown.

In the drawing:

40 Fig. 1 is a front elevational view of a refrigerator cabinet constructed according to the present invention;

Fig. 2 is a horizontal sectional view through the refrigerator cabinet taken on the line 2-2 of Fig. 1;

45 Fig. 3 is an enlarged fragmentary horizontal sectional view through a corner of the cabinet at the access opening thereof and showing a door closing the opening;

50 Fig. 4 is a sectional view showing a portion of a mold abutting the bounding surface of the door opening of the cabinet during the process of heating the structure to cause formation of a crust on the insulating material about the cabinet access opening; and

55 Fig. 5 is a sectional view showing portions of

molds positioned along certain wall surfaces of a door for the refrigerator cabinet.

Referring to the drawing, for the purpose of illustrating my invention, I have shown in Fig. 1 thereof a refrigerator cabinet, generally represented by the reference character 10, constructed in accordance with the teaching of the present invention. Cabinet 10 includes a metal lining member 11 forming a plurality of horizontal and vertical walls of a food storage chamber 12 within the cabinet. Lining member 11 is surrounded by an insulating material 13 which will be more fully described hereinafter. A metal shell 14 is disposed over and surrounds the insulating material 13 and chamber 12. Shell 14 extends beyond the insulating material 13 and chamber or compartment 12 at the bottom of cabinet 10 to form walls of a compartment adapted to house or enclose a refrigerating machine to be associated with the cabinet. This extension of shell 14 is also adapted to have legs 15 secured thereto and in this manner, it is obvious that the shell 14 serves as the sole supporting member or structure for the compartment 12 and insulation 13. Cabinet 10 is provided with an opening 17 which affords access to compartment 12 and which opening is adapted to be closed by a door generally represented by the reference character 18 and constructed in a manner to be hereinafter described. A cooling element 19 of any suitable construction is adapted to be mounted within compartment 12 for cooling and causing circulation of air therein. The food chamber 12 is divided into a plurality of superimposed compartments by shelves 21 secured therein in any suitable and well known manner. It will be noted that the shell 14 is of a one-piece tubular form and extends continuously across the front side of the cabinet, having the access opening 17 provided therein, and continuously across adjacent sides and the back of the cabinet. A flat sheet metal plate 22 has a downwardly turned flange welded or otherwise secured to the tubular shell 14 to close the open upper end thereof. Another flat sheet metal plate (not shown) but similar to plate 22 is located within the shell 14 below the insulating material 13 at the bottom of the compartment 12 and has its peripheral edges welded or otherwise secured to the inner surfaces of shell 14. The two flat sheet metal plates are preferably secured to shell 14 in such a manner as to hermetically seal the insulation within the shell.

Having described the general construction of the cabinet, I will now proceed to describe the

steps in the making of same and particularly the method of providing the layer of insulating material 13. The flat metal plate (not shown) but which extends parallel with the bottom wall of liner 11 and in spaced relation thereto, to provide a space for the insulation 13 along the bottom wall of liner 11, is welded or otherwise secured in shell 14 at a predetermined point intermediate the open ends of the shell. The liner member 11 is then placed within shell 14 and is held in spaced relation to the walls of the shell by a suitable fixture 26 of substantially rectangular form (see Fig. 4). It will be noted (see Fig. 4) that the fixture 26 has outwardly extending portions 27 which engage an outwardly bent flanged portion 28 provided on liner 11 and an inwardly bent flanged portion 29 provided in the front wall of shell 14 about the access opening 17. It is through engaging portions of fixture 26 with the liner 11 and shell 14 which holds the liner in spaced relation to shell 14. The edge surface of the rectangular hollow fixture 26 intermediate the raised portions 27 thereon is in the form of a groove having tapered side walls emerging into the raised portions 27. This groove is for a purpose to be hereinafter more fully described. After the lower sheet metal plate has been welded or otherwise secured to shell 14, a predetermined amount of a dough or paste is placed between the liner 11 and shell 14. The top sheet metal plate 22 is then welded or otherwise secured or sealed to walls of the shell 14 to close the space intermediate the liner 11 and shell 14 about the compartment 12. The paste or dough may be of any suitable substance for carrying out the objects of the invention and may, for example, consist of rubber having a nitrogen gas mixed or commingled therewith or the dough may comprise a mixture of rubber and dry ammonia and/or sodium carbonate. It is to be understood that the amount of dough or paste mixture placed between liner 11 and shell 14 must be predetermined through experimentation and that the chamber containing same must be vented during the application of heat to the dough to form the cellular insulation 13 so as to prevent bulging or deformation of the walls of liner 11 and shell 14. These walls must also be reinforced against deformation, as for example, by being placed in suitable forms.

Having assembled or placed the elements above described together in the manner explained, the dough mixture is ready to be heated to cause expansion thereof between the walls of liner 11 and shell 14. Heat may be applied to the dough mixture in any suitable or well known manner such, for example, as by placing the entire structure including the fixture 26 and other suitable reinforcing forms in an oven or by directing steam through the fixture 26 and other molds or fixtures placed into abutting relation with walls of the liner 11 and shell 14. Heating of the structure causes the mass of dough or paste mixture to expand in the chamber between liner 11 and shell 14. As before stated, any suitable or desirable means for venting and permitting air trapped in the insulating chamber to escape may be employed. Expansion of the dough mixture is similar to the expansion of dough in the ordinary process of making bread wherein the ammonium or sodium carbonate upon being heated forms carbon dioxide and expands the mass into a cellular structure. The rubber constituent of the dough mixture, upon contacting the heated walls of liner 11 and shell 14, becomes

bonded thereto and also forms a hard impervious crust adjacent these walls. Heat being less intense toward the center of the chamber to be filled with the insulation 13, causes the dough mixture to form a substantially cellular structure intermediate the hard bounding crust. The mixture which flows into the groove intermediate the raised portions 27 of fixture or mold 26 forms a hard impervious crust adjacent the groove which embeds and becomes bonded to the edges of the flanged portions 28 and 29 of liner 11 and shell 14 respectively. The crust adjacent the groove in fixture or mold 26 also forms an insulating breaker strip for the cabinet which extends between the edges of the flanges 28 and 29. The structure is permitted to cool and the fixture or mold 26 and other molds employed in heating the structure may then be readily removed therefrom. By virtue of the fact that the tapered wall along the inner raised portion 27 of fixture or mold 26 is parallel with walls of liner 11, the mold 26 may be moved horizontally away from the cabinet structure. Any suitable or desirable inserts employed to secure door hinges or other hardware to cabinet 10 may, of course, be welded or otherwise secured to the inner surface of shell 14 prior to the assembling and heating operations. The entire structure may, during the heating operation thereof, be rotated in various directions to insure uniform flow and expansion of the dough mixture to all portions of the chamber to be occupied by the expanded insulation.

The door 18 of cabinet 10 may be formed in substantially the same manner as the insulated walls of the cabinet. For example, a metal pan 31, which will serve as the inner wall surface of door 18, may be placed in a substantially rectangular hollow fixture or mold 32 (see Fig. 5) and a predetermined amount of the dough mixture is then placed upon the pan 31. A fixture or mold 33 may then be fitted into the upwardly directed walls 34 of mold 32 to form a substantially closed chamber in which the dough mixture upon the pan 31 may be heated and caused to expand. After the door insulation has been formed and permitted to cool, the fixtures or molds 32 and 33 are removed therefrom and other elements of the door construction are assembled or secured to the door insulation. For example, a wooden frame 36 may be attached to the door insulation by screws 37 secured to a metal insert 38 bonded to the door insulation during formation thereof. A gasket 39 secured to frame 36 engages the front surface of shell 14 to seal the door opening 17 when the door opening is closed. It will be noted that the mold or fixture 32 has a groove formed therein which provides, when the dough mixture is expanded in the door, a raised or paneled edge surface on the door insulation which serves as an impervious exposed peripheral outer portion of the door 18 to match or conform with the periphery of the cabinet door opening 17. The metal walls of cabinet 10 and the exposed hard crust of insulation 13 at the door opening 17 thereof may be uniformly coated with any desirable paint or other coating.

The expanded rubber mixture which forms the insulation 13 is of better insulating properties than that generally used in refrigerator cabinets and is also much lighter in weight and does not absorb moisture. The formation of the layer of hard crust in the insulating material about the

outer surfaces thereof which encloses the integral cellular structure in forming an impervious insulating breaker strip about the walls of the door opening 17 eliminates the necessity of attaching other finished strips of wood or other material to these walls and thus eliminates the unsightly appearance of attaching means therefor. Thus, rusting and deterioration of attaching means ordinarily employed for securing breaker strips to refrigerator cabinets about the door openings thereof are eliminated by my improved cabinet construction. It will also be apparent that the chamber containing the expanded rubber insulation is substantially sealed from ingress of moisture and that the shell 14 extends continuously around the four vertical sides of the cabinet and forms the sole support for the insulation 13 and food compartment 12.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. An insulated wall structure comprising, spaced apart sheet metal members having an expanded rubber insulation therebetween, each of said sheet metal members having an aperture therein registering with one another to provide an opening in said structure, and said insulation having a hard impervious crust bonded to said members and extending from the edge of the aperture in one of said members to the edge of the aperture in the other of said members to form the walls of said opening and to seal the space between the metal members.

2. An insulated wall structure comprising, spaced apart sheet metal members having an expanded rubber insulation therebetween, each of said sheet metal members having an aperture therein registering with one another to provide an opening in said structure, and said insulation having a hard impervious crust bonded to said members and extending from the edge of the aperture in one of said members to the edge of the aperture in the other of said members to form the walls of said opening and to seal the space between the metal members, and a door

having a seal engaging one of said metal members for closing said opening.

3. An insulated wall structure comprising, spaced apart sheet metal members having an expanded rubber insulation therebetween, each of said sheet metal members having an aperture therein registering with one another to provide an opening in said structure, and said insulation having a hard impervious crust embedding the edges of the spaced apart sheet metal members about the opening in the wall structure, said impervious crust being bonded to the edges of said members and extending therebetween to form walls of said opening in the structure and to seal the space between the metal members.

4. A refrigerator cabinet comprising a box-like structure including an inner metal liner forming walls of a compartment to be cooled within said cabinet and having an access opening, a sheet metal member spaced from said liner walls and having an opening registering with the opening in said liner, insulating material between the walls of said liner and said sheet metal member for maintaining same in spaced apart relation, said sheet metal member forming a support for said liner and said insulating material and forming as well outer finish walls of said cabinet, said insulating material including an expanded rubber insulation having a hard impervious crust bonded to said liner and to said outer sheet metal member, and said impervious insulating crust extending between the edge of the opening in said liner and the edge of the opening in said outer sheet metal member and forming the walls of said opening.

5. A wall structure comprising, sheet metal members spaced apart and forming a chamber therebetween, insulating material within said chamber, an edge of one of said members being spaced from an edge of the other of said members to break the metal-to-metal contact therebetween and to define an opening for said chamber, and said insulating material comprising expanded rubber having a hard crust bonded to said edges of said sheet metal members and extending therebetween to form a wall for said opening for sealing the space between said members.

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