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REFRIGERATOR CABINET CONSTRUCTION
HAVING HEAT EXCHANGE INNER WALLS
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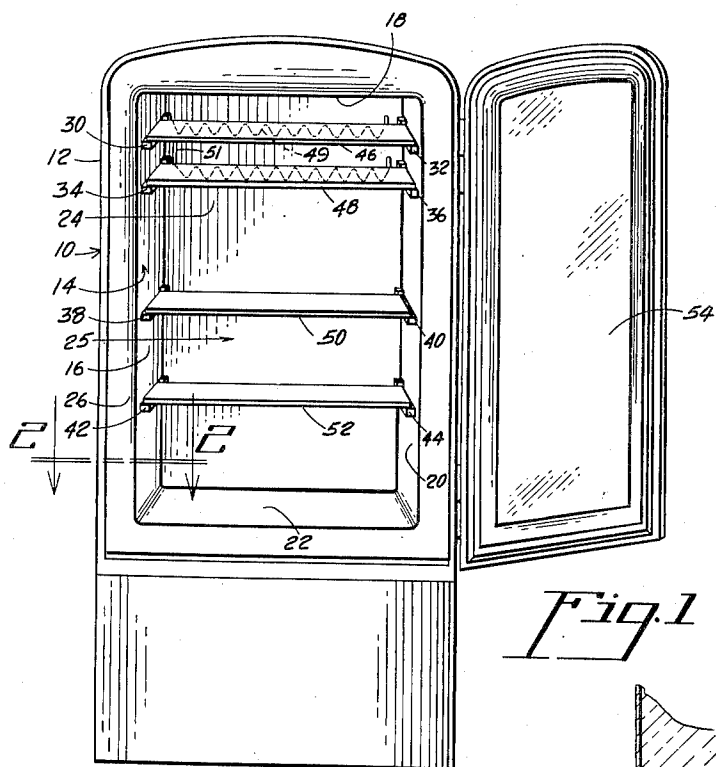


Fig. 1

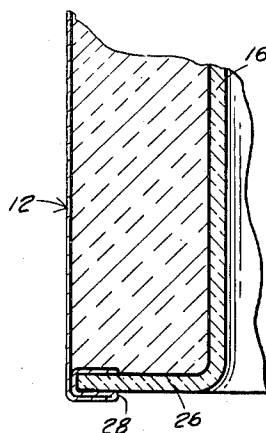


Fig. 2

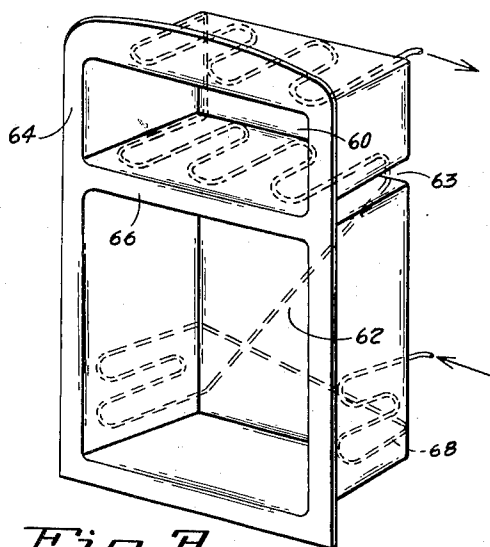


Fig. 3

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REFRIGERATOR CABINET CONSTRUCTION
HAVING HEAT EXCHANGE INNER WALLSRalph L. Benson, Cincinnati, Ohio, assignor to
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2 Claims. (Cl. 62-99)

1

This invention relates to refrigerator cabinets and more particularly to a novel liner for such cabinets of the household type, which liners may be more economically produced and assembled in the cabinet and in which separate fastening means for securing the breaker strip to the liner as commonly practiced in the art are eliminated.

In the manufacture of household refrigerators it has been the common practice to form the refrigerator cabinet of spaced inner and outer metallic shells physically connected by either a plurality of, or a single breaker strip to prevent heat flow from the outer to the inner shell of the cabinet. Such liners are commonly made of porcelain coated sheet steel, and with metallic liners of this type substantial scrap loss has been experienced due to chipping of the porcelain and warping of the liners due to the high temperatures necessary to bond the porcelain to the liner. Additional costs have been necessarily incurred due to the special equipment necessary to handle the porcelain ware, the use of special fastening means to secure the breaker strips to the inner liner of the cabinet, and special handling in assembling the individual breaker strips in the cabinet.

It is accordingly an object of my invention to provide a refrigerator cabinet having a non-metallic inner liner which may be produced, and assembled in the cabinet in a more economical and facile manner than liners of conventional construction.

A further object of my invention is to provide a refrigerator cabinet having a non-metallic liner of heat insulating material.

Another object of my invention is to provide a refrigerator cabinet having an inner liner moulded of heat insulating material having a trim frame formed integrally therewith and extending from the inner liner to the outer shell entirely around the periphery of the inner liner at the front of the cabinet, so that special handling of the breaker strips in assembly and special fasteners for securing the breaker strip to the inner liner are eliminated.

A still further object of my invention is to provide a refrigerator cabinet having a moulded non-metallic inner liner in which refrigerant conducting conduits are disposed within the walls of the liner for cooling the cabinet.

Still another object of my invention is to provide a refrigerator cabinet having a moulded non-metallic inner liner having means formed integrally therewith for supporting an evaporator directly in contact with said liner and without any heat insulation between the evaporator and

2

liner so that the evaporator plates and walls of the liner form a freezing chamber.

These and other objects of this invention will be apparent from the following description and claims taken in conjunction with the accompanying drawings in which:

Fig. 1 is a front elevation of a refrigerator cabinet constructed in accordance with the principles of this invention;

Fig. 2 is a sectional view taken along the line II-II of Fig. 1;

Fig. 3 is a perspective view of an alternative embodiment of this invention.

Referring to Fig. 1, there is shown a refrigerator cabinet 10 including an outer shell 12 and an inner liner 14. Liner 14 is a non-metallic liner formed of heat insulating material and is preferably moulded as hereafter explained. The liner includes walls 16, 18, 20, 22 and 24 defining a food storage compartment 25 and includes a trim frame 26 formed integrally with the liner. Trim frame 26 extends entirely about the periphery of the opening providing access to compartment 25 and extends laterally a distance sufficient to bridge the space between liner 14 and shell 12 at the front of the cabinet.

Liner 14 is provided with a series of rails 30-32, 34-36, 38-40 and 42-44 moulded into the side walls thereof to provide supports for a pair of evaporator plates 46 and 48 and for shelves 50 and 52. A door 54 is provided to close off the opening through which access to the interior of the cabinet may be had. By forming a liner of a non-metallic heat insulating material it is possible to utilize plate-type evaporators supported directly upon the liner and without additional heat insulation between the evaporator and liner. In addition, the conventional side and back plates may be entirely omitted from the evaporator and the vertical side and rear walls of the liner may be utilized in place thereof to complete the box-like enclosure between the two evaporator plates to form the freezing compartment between the plates 46 and 48. The evaporator plates are preferably substantially equal in width and depth to the width and depth of the inner liner and may each have a sinuous passage 49 therein for conducting refrigerant therethrough and may be connected in series by tubing 51 so that incoming refrigerant will pass first through the bottom and then through the top evaporator plate. The refrigerant conduits will, of course, be connected to a conventional compression-expansion type of refrigerating system. In conventional practice with metallic liners it is necessary that the evaporator be spaced from the liner and thermally in-

3

ulated therefrom at its points of attachment to the liner. Also, the evaporator is commonly formed with side and rear walls spaced from the liner to complete the box-like enclosure forming the freezing compartment. By using a liner formed in accordance with my invention these extra evaporator walls and insulation may be entirely eliminated, thus providing a structure which may be more economically manufactured than is possible with conventional liners. The invention illustrated in Figure 1 is described and claimed in divisional application Serial No. 242,339 filed by Ralph L. Benson on August 17, 1951 and entitled "Refrigerator Cabinet Construction."

As shown in Fig. 2, outer shell 12 is provided with a channel 28 extending entirely about the periphery of the forward extremity of the shell and facing toward the interior of the cabinet. In assembled relationship, trim frame 26 is positioned with the outer edge thereof disposed in channel 28 at the front of the cabinet. Thus, trim frame 26 serves to bridge the space between the inner and outer shells of the cabinet entirely about the front of the cabinet. By forming liner 14 of a non-metallic heat insulating material and moulding trim frame 26 integrally therewith, all special handling of separate breaker strips and all separate fastening means for securing the breaker strip to the inner liner are eliminated, and all loss due to warping of the liner and chipping of porcelain is prevented.

In Fig. 3 there is shown an alternative form of liner having a pair of spaced compartments 60 and 62 formed therein together with a trim frame 64 all formed integrally as a single unit. Compartment 60 constitutes a freezing chamber while compartment 62 is a food storage compartment for articles to be maintained at above-freezing temperatures. The compartments are preferably spaced from each other and joined by trim frame 64 as indicated at 66. Trim frame 64 extends about the periphery of each compartment a distance sufficient to bridge the gap between the inner and outer shells in assembled relationship. In assembled relationship, suitable insulation may be inserted between the inner liner and outer shell and also in the space 63 between compartments 60 and 62 behind the trim frame 64.

In this embodiment, refrigerant tubing 68 is moulded and embedded directly within the walls of the various compartments, thereby providing expansion chambers for refrigerant in order to cool the refrigerator. By moulding the tubing so that it is closely adjacent the inner surface of the walls of the compartments, efficient heat transfer is accomplished and maximum usable storage space in the individual compartments is provided. Freezing is accomplished in chamber 60 by apportioning the tubing in greater amount in relation to the cubic volume of the chamber than is the case in chamber 62. By limiting the length of tubing effective to absorb heat in compartment 62, the temperature of that compartment may be maintained at any predetermined temperature, for example, 40° F. while refrigerant in the tubing cooling compartment 62 passes up to compartment 60, where, due to the increased length of tubing, freezing is accomplished.

The inner liner of either embodiment of this invention may be formed of various materials and by different methods. In the preferred method the liner may be formed of a fiberglass reinforced polyester plastic. In forming the liner, glass wool or fiberglass is blown upon a screen

4

form having a shape corresponding generally to that of the desired liner. A small amount of polyester resin such as Selectron or BCM, for example, is sprayed in with the fiberglass so that after a short curing bake a glass wool preform results which resembles a heavy felt material and is capable of withstanding considerable handling without tearing. The curing bake for the preform may be carried out at a temperature in the vicinity of 200° F. and requires from three to five minutes time for completion at atmospheric pressure. The preform is then placed in a mold having the final shape to be imparted to the preform (desired shape of the liner) and polyester resin is poured in upon the preform. The mold is then closed and heat and pressure are applied to completely cure the preform. This may be achieved by heating the preform to approximately 250° F., applying a pressure of approximately 100#/sq. in., and maintaining the preform at this temperature and pressure for from three to four minutes.

While a particular method has been described for forming the liner, it will readily be understood that other methods may be employed. For example, a phenolic thermosetting plastic could be used in place of the polyester thermosetting plastic. With the latter plastic, however, less pressure and time is required to cure the preform than is the case with the former. It will also be understood that the liner might be formed of polystyrene hot-pressed to the shape desired or could be formed of other materials such as laminated resin-impregnated paper moulded in a suitable high pressure mold.

By forming the liner of a non-metallic heat insulating material as described it is possible to eliminate the conventional back and side plates of the evaporator and position the flat plates constituting the evaporator directly upon suitable supports formed in the liner. The rails for supporting the evaporator plates and shelves are moulded in the liner and thus eliminate the need for separate fasteners and supports as heretofore practiced in the art. In addition, the refrigerant tubing for cooling the refrigerator may be molded directly into the liner material.

In practice, it has heretofore been the custom to position refrigerant tubing adjacent the outer wall of the inner liner and between the inner and outer shells of the refrigerator. This has been objectionable due to the collection of moisture about the tubing. This moisture reduces the efficiency of the insulation between the inner and outer shells and promotes rusting of the cabinet. By molding the tubing in the inner liner and closely adjacent to the surfaces facing the interior of the compartments formed by the inner liner, the problem of moisture collection in the insulation and rusting of the cabinet is greatly minimized.

By this invention there is provided a novel liner for a refrigerator which is economical of manufacture, eliminates many of the separate fasteners heretofore required, eliminates losses due to enamel chipping and warping, and minimizes the collection of moisture in the insulation between the inner and outer shells of the cabinet.

While I have shown and described two embodiments of my invention, it will be apparent to those skilled in the art that numerous changes and variations may be made without departing from the underlying principles of the invention. I therefore desire, by the following claims, to include within the scope of the invention, all such

5

modifications and variations by which substantially the results thereof may be obtained by substantially the same or equivalent means.

What is claimed is:

1. In a refrigerator, an outer shell, an inwardly facing U-shaped channel on said outer shell at the front edge thereof and extending entirely around the same, a moulded plastic inner liner including walls forming a pair of compartments spaced from each other, a trim frame integral with said compartment at the front thereof, said trim frame including an outwardly projecting flange extending entirely around the front edge of both of said compartments, the outer portion of said flange extending into said U-shaped channel, said trim frame including a second portion extending between said compartments and the inner edges of said outwardly extending flange at the front of said inner liner, and refrigerant conducting tubing totally embedded within the walls of each of said compartments for cooling said compartments, respectively, said tubing being disposed closely adjacent the surfaces facing the interior of the compartments formed by the liner.

2. In a refrigerator cabinet having an outer shell, a combined liner, trim strip and evaporator comprising a moulded non-metallic integral member of synthetic resin forming at least one compartment, said member having out-turned flanges serving as a support and trim strip for supporting and insulating said liner from said shell, and refrigerant conducting tubes totally

6

embedded within the walls of said member and located closely adjacent the surfaces facing the interior thereof and relatively remote from the exterior surfaces of said liner, whereby said assembly serves as the inner liner for supporting and enclosing the contents of said cabinet, the breaker strip for reducing heat leak into the cabinet adjacent the liner supports, and an evaporator for withdrawing heat from the interior of said cabinet, and whereby said assembly also tends to insulate the contents of said cabinet and prevent heat leak through the walls thereof.

RALPH L. BENSON.

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