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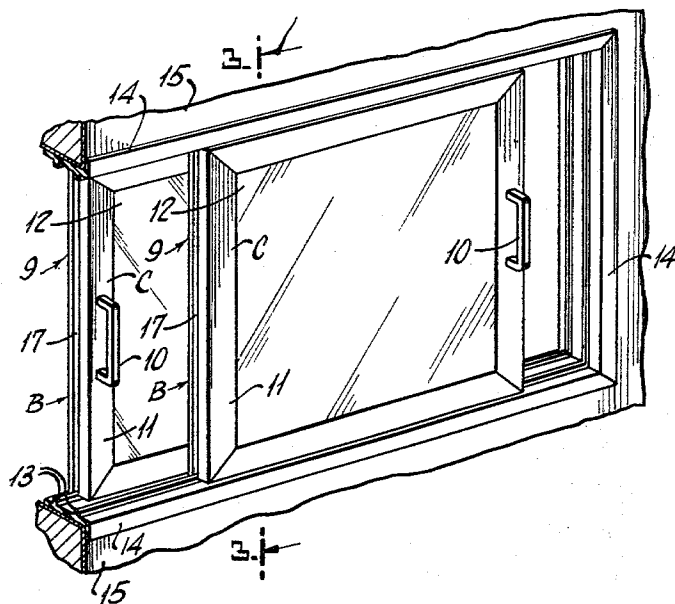
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REFRIGERATOR DOOR CONSTRUCTION

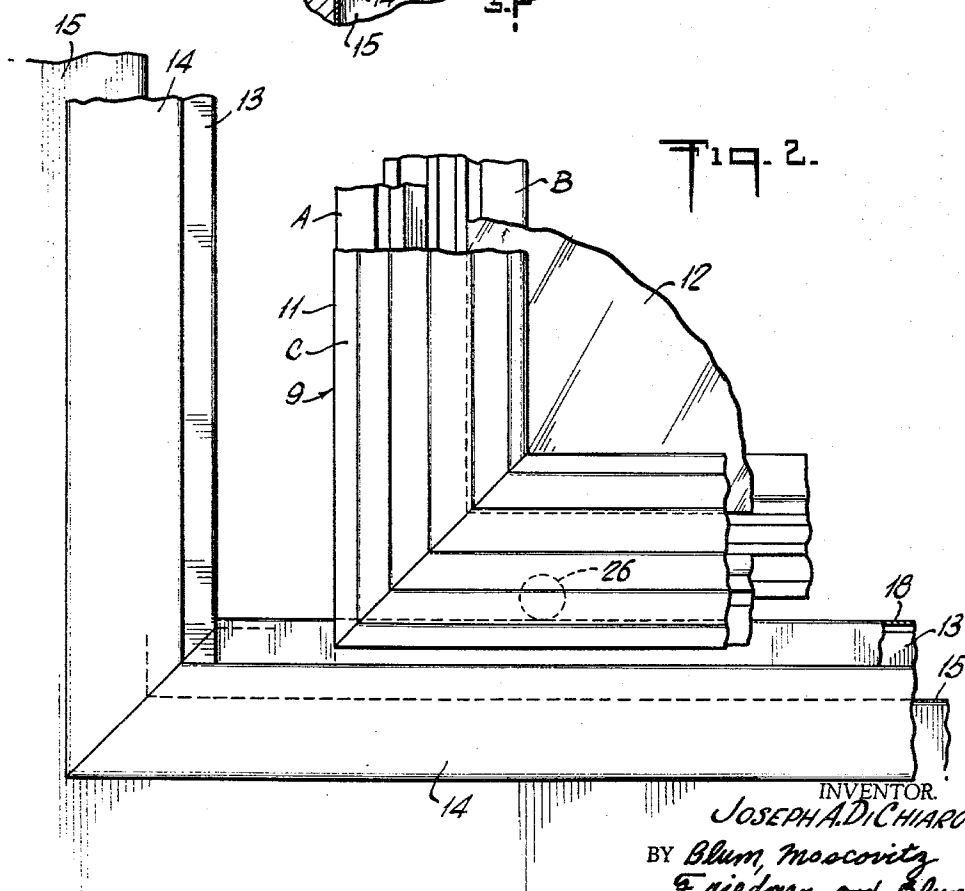
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3 Sheets-Sheet 1

Fig. 1.



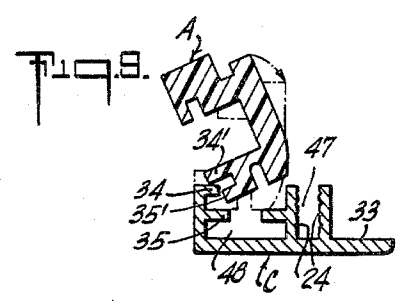
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3 Sheets-Sheet 2



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REFRIGERATOR DOOR CONSTRUCTION

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5 Claims. (Cl. 189-46)

The present invention relates generally to an improved door construction, and more particularly, to a refrigerator door suitable for use in commercial refrigeration units such as those employed in grocery stores for keeping milk and other dairy products under refrigeration while offering visible inspection to the consumer. More particularly, the present invention deals with an improved door construction which offers substantial advantages in reducing refrigeration losses, wear and tear on various component parts, as well as offering advantages in terms of being readily constructed.

Since commercial refrigeration units of the type noted are constantly being opened and closed as the sales of produce are made, there is a considerably more significant heat transfer problem than that normally incurred in domestic units. A wide variety of structures have been suggested for the cabinets and door frames of such commercial refrigeration units. For example, it has been suggested to employ an all aluminum frame surrounding the central glass portion of the door. However, the resultant contact of the metal against the glass causes an inordinate amount of condensation and impairs the efficiency of the refrigeration unit. Heretofore it has been suggested to employ an outer frame of stainless steel and an inner frame of wood. However, within a relatively short period of time, the wood begins to swell due to absorption of condensing water. This swelling affects the dimensional tolerance of the entire door construction, and particularly affects the easy movement of the door on its corresponding slides. The use of all plastic materials in the frame offers disadvantages in that upon being exposed to the atmosphere it tends to lose its aesthetic beauty with the passage of time, does not wear as well as the metal and is in general fairly expensive to fabricate.

In accordance with the present invention, a refrigerator door construction is provided which overcomes many of the above disadvantages. More particularly, the present invention contemplates the use of a refrigerator door frame characterized by a metallic outer frame section, such as aluminum or stainless steel, and at least two plastic non-thermal conductive inner frame sections. The plastic is preferably polystyrene or poly-vinyl-chloride, although other plastics may be used. The various frame sections are interlocked by virtue of grooves extending longitudinally in said sections. One of the plastic inner frame sections has an interconnecting portion to mate with the interconnecting portion of the aluminum frame section, and additional sections for receiving an interconnecting portion from the other plastic frame section. The second plastic inner frame section has an extruded channel aligned with an extruded channel of the outer metallic frame member. The channel in the metallic outer frame member has ridges formed along its edge so as to define a screw thread. This channel receives a screw thread bolt, preferably a self-tapping screw thread which passes additionally through the plastic section of the frame (and the aligned plastic channel), the bolt serving to hold the various frame sections rigidly together.

The outer metal frame section has an additional channel adapted to receive an angle iron so that one metal frame section may be joined to another metal frame section. The angle iron may be spot welded to the channel, but preferably contains apertures so that portions of the chan-

nel edge may be forced into the apertures to provide a rigid joint between the frame sections.

Further, the bottom portion of the lower plastic non-thermal conductive frame section has a groove along its edge adapted to be slidably mounted upon a plastic rib extending longitudinally along the door cabinet of said refrigerator. The plastic rib has a smooth surfaced metallic snap-on cover fitted along its length so that the longitudinal groove of the plastic door frame section slides along the metallic cover thus insuring a sturdy track while limiting heat flow. The refrigerator door construction of the present invention has a variety of other novel features which will be made more clearly apparent by reference to the following description and accompanying drawings.

With respect to the drawings:

FIGURE 1 is a front perspective view of a refrigerator door construction embodying the present invention;

FIGURE 2 is a fragmentary front view of the lower left-hand portion of the door frame showing the transverse dowel riding on the door track;

FIGURE 3 is an enlarged fragmentary view taken along line 3-3 of FIGURE 1 showing the front and rear doors in cross section;

FIGURE 4 is a cross-sectional view taken along line 4-4 of FIGURE 3;

FIGURE 5 is a further enlarged, fragmentary cross-sectional view showing the details of the construction of the door frame section and door track;

FIGURE 6 is a fragmentary perspective view showing the elements at a corner of the rim portion of the door in mutually separated alignment for their progressive assembly;

FIGURE 7 is a fragmentary cross-sectional view taken along line 7-7 of FIGURE 6;

FIGURE 8 is a cross-sectional view taken along line 8-8 of FIGURE 7; and

FIGURE 9 is a cross-sectional view showing the assembly of the first inner frame member to the outer frame member.

Referring to the drawings, FIGURE 1 shows a refrigerator freezer cabinet employing the construction of the present invention. Cabinet 15 has base portion 14 which is provided with guide ribs 13 along which refrigerator door 9 moves, as will be further described with reference particularly to FIGURE 5.

Refrigerator door 9 contains an outer metallic frame, e.g., an aluminum frame 11, enclosing a transparent glass or plastic pane 12 which will normally take the form of a multi-ply glass sheet. Inner plastic non-conductive frame section B contains a groove 17 which is normally an extension of channel 38 by means of which the frame moves along guide ribs 13. Similarly, the cabinet 15 normally will have guide ribs 13 extending along the side ends of the base plate 14, groove 17 thus fitting about guide ribs 13 when the door is fully slid open.

FIGURE 2 illustrates a fragmentary front view of the lower left hand portion of the door frame and illustrates that it is basically composed of an outer metallic frame section C and plastic non-thermal conductive inner sections A and B. The various sections are provided with indented grooved surfaces which interconnect with one another as is made more clearly apparent by reference to the other drawings. Both the outer metallic frame C and plastic section B contain support surfaces which hold glass pane 12 in place. The entire door moves along rib 13 which is capped with metal track 18. A low friction, preferably plastic, dowel 26 is provided between the edges of the plastic section defining channel 38. The door section will actually be supported by one or more such dowels which ride over the guide track 13.

The structure of the various segments making up the refrigerator door frame is made more clearly apparent by reference to FIGURES 3 through 9.

With reference to FIGURE 3, shown therein is a cross section of the front and rear doors, denoted as 43 and 46 in the drawings. The door structures are substantially the same and thus a description of one door frame essentially identifies the nature of the other frame. Turning to the left hand frame section, as noted previously, it is composed of an aluminum outer section C and inner plastic non-thermal conductive sections A and B. Channel 38 is longitudinally grooved in section A. The channel contains dowel elements 26 and the relative size and shape of the channel is such that it is adapted to ride on cabinet ribs 13 which are made of a plastic non-thermal conductive material. Metal track 18 caps rib 13 so as to provide a smooth surface which does not readily wear. However, the general construction wherein both section A and rib 13 and base 14 are made of a plastic, non-thermal conductive material tends to minimize heat losses. As more clearly shown in FIGURE 5, the transparent sheet may take the form of two glass panes 12 and 19 separated by air space 22. A holder 20 which may be made of aluminum presses outwardly against the glass panes holding them in place while simultaneously defining a relatively dead air space 20' which further cuts down on heat loss. A pasty sticky insulation material 21, such as mastic or rubber, is provided along the lower surfaces of the glass pane to minimize heat loss, as well as to insure a tight fit between supporting arm 22 of plastic section B and pane 19, and similarly supporting arm 33 of the aluminum section and pane 12.

The various sections of the frame member are provided with longitudinally directed grooves and ridges which are adapted to fit within and about the grooves and ridges of the other frame sections. Thus, aluminum section C contains edges 35 and 34 which are adapted to receive in the groove defined thereby edge 35' of plastic frame section A. Similarly plastic section B contains edge 36 and section 37 which defines a groove adapted to contain therein rib 37' of section A. Edge 36' of section A further complements rib 36 of section B thus insuring a tight interconnecting fit.

As particularly shown in FIGURES 5 and 8, aluminum section C contains channel 47 whose edges have ridges 24 disposed therein so as to define a screw thread structure as viewed transversely across channel 47. The edges are preferably oppositely aligned to each other and serve to define a screw path for receiving the threaded portion 25 of bolt 23. Bolt 23 passes through plastic non-thermal conductive section B and particularly through the channel defined therein which is opposite and complementary to channel 47. The bolt is thus anchored in the essentially threaded portion of channel 47 and serves to firmly hold the various frame sections in place relative to one another. Where a self-tapping screw is employed, the ridge 24 may be omitted.

FIGURE 6 shows the various sections making up the overall frame and more particularly delineates the structure of each section, particularly with respect to the channel and edges which interconnect the corresponding portions of the other frame sections.

With particular reference to FIGURES 7 and 8, shown therein is a unique structure which permits the outer aluminum frame sections to readily be bonded to one another. The aluminum outer frame section C contains a channel 48 disposed along its length. Channel 48 is adapted to receive angle iron 30. Thus, two different sections of the aluminum frame portion may be joined together by telescopically moving them about angle iron 30 so as to place the angle iron within channel 48. Angle iron 30 preferably contains a series of apertures 31 disposed along its length. Edges 32 of the portion of aluminum section C overlying channel 48 need simply be driven downwardly or otherwise upset so as to cause a portion of the metal

surface to pass downwardly into aperture 31. Thus the edges of the channel which are driven downwardly into the apertures serve to firmly anchor the metal frame section to angle iron joint 30 and thus firmly anchor one metal frame section to another. While the angle iron joint may be connected to the aluminum sections by means of spot welding, the above described novel connecting means will offer substantial advantages thereover in terms of ease of construction and feasibility.

With reference to FIGURE 4, shown therein is a cross-sectional view illustrating the use of an elastomeric insulation member so as to reduce heat losses between the two moving refrigerator doors as they move relative to one another. Basically an elastomeric material, e.g., neoprene or natural rubber, strip 40 containing ribs 41 for embracing the walls of plastic non-conductive section A is positioned downwardly through the frame section. An elastomeric arm 43 projecting along the length of element 40 is in contact with the glass plate of the other door of the refrigeration cabinet assembly and serves to insure minimum free communication between the interior refrigerator sections of the unit and the exterior environment.

With reference to FIGURE 9, the drawing illustrates that due to the deformable nature of the plastic sections as well as their interconnecting grooves and ribs, a relatively tight fit may be effected by insertion of one section into complementary fit with the members of the other section. Thus, as shown in FIGURE 9, plastic section A is fitted into and about aluminum section B, ribs 34 and 35 of the latter being adapted to complement and embrace ribs 34' and 35' of the plastic sections.

Various modifications may be made to the present invention. For example, the plastic sections may be made of different plastic materials.

Having described the present invention, that which is sought to be protected is set forth in the following claims:

1. A refrigerator door construction adapted to move within a freezer cabinet comprising a transparent sheet, said transparent sheet being held in place by a frame comprising at least three sections,
 - a first metallic section adapted to be the outer surface of said frame and exposed to the non-refrigerated atmosphere,
 - a second non-heat conductive plastic section generally inwardly spaced from said metallic outer surface and being slideably connected to said first section by embraceably fitting longitudinal grooves in said first and second sections,
 - a third non-heat conductive plastic section adapted to be the inner surface of said frame, said third section being slideably connected to said second section by embraceably fitting longitudinal grooves in said second and third sections,
- said transparent sheet being interposed between said first and third frame sections, supporting planar surfaces in said first metallic and third plastic sections embracing the surfaces of said transparent sheet,
- said second non-heat conductive plastic section having a longitudinal groove along its bottom surface adapted to receive a door cabinet track, said refrigerator door being mounted on said door cabinet track by means of said groove and being adapted to sliding movement along said track.
2. The refrigerator door construction of claim 1 wherein said transparent sheet comprises a multi-ply glass pane, and wherein a pasty cement coating surface is employed between said pane and the supporting surfaces of said first and third sections.
3. The refrigerator door construction of claim 1 wherein said door cabinet track comprises a non-heat conductive plastic rib extending longitudinally along said door cabinet, said plastic rib having a smooth surfaced metallic snap-on cover along its length, a plastic dowel fitted

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in the longitudinal groove along the bottom surface of said second non-heat conductive plastic section, so that said longitudinal groove of said second plastic door frame section slides along said metallic cover by means of said plastic dowel contacting said cover, thus insuring a sturdy track while limiting heat flow.

4. A refrigerator door construction adapted to move within a freezer cabinet comprising a transparent sheet, said transparent sheet being held in place by a frame comprising at least three sections,

a first metallic section adapted to be the outer surface of said frame and exposed to the non-refrigerated atmosphere,

a second non-heat conductive plastic section generally inwardly spaced from said metallic outer surface and being slideably connected to said first section by embraceably fitting longitudinal grooves in said first and second sections,

a third non-heat conductive plastic section adapted to be the inner surface of said frame, said third section being slideably connected to said second section by embraceably fitting longitudinal grooves in said second and third sections,

said transparent sheet being interposed between said first and third frame sections, supporting planar surfaces in said first metallic and third plastic sections embracing the surfaces of said transparent sheet,

said transparent sheet comprising a multi-ply glass pane having a pasty cement coated surface in the area between said pane and the supporting surfaces of said first and second sections,

said second non-heat conductive plastic section having a longitudinal groove along its bottom surface adapt-

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ed to receive a door cabinet track, a plastic dowel fitted in the longitudinal groove along the bottom surface of said second non-heat conductive plastic section,

said refrigerator door being mounted on said door cabinet track by means of said groove and plastic dowel and being adapted to sliding movement along said track by virtue of sliding contact between said plastic dowel and said track,

said door cabinet track comprising a non-heat conductive plastic rib extending longitudinally along said door cabinet,

said plastic rib having a smooth surfaced metallic snap-on cover along its length so that said longitudinal groove of said second plastic door frame section slides along said metallic cover, thus insuring a sturdy track while limiting heat flow.

5. The door frame construction of claim 4 wherein said metallic section is formed from aluminum and said plastic non-thermal conductive sections are formed from high impact polystyrene.

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