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FOAM INSULATED DOOR STRUCTURE INCLUDING ELECTRICAL HINGE

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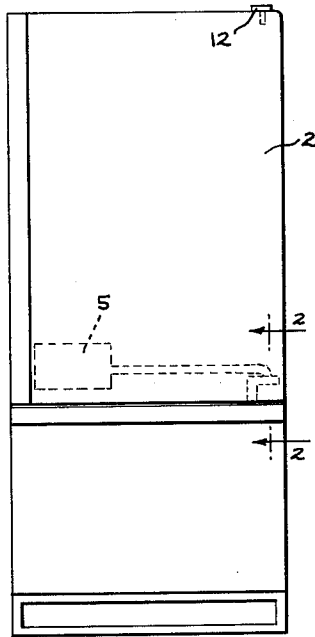


FIG. 1

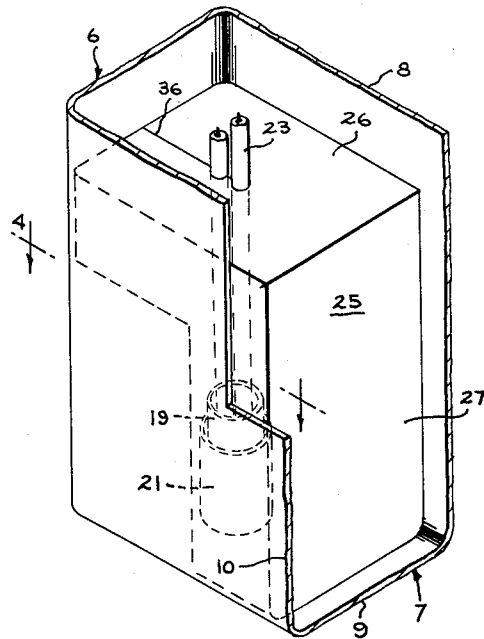


FIG. 3

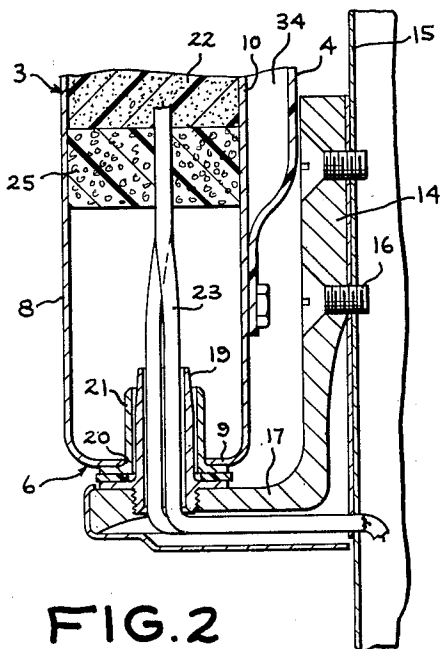


FIG. 2

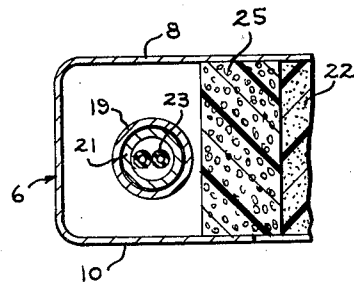


FIG. 4

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FOAM INSULATED DOOR STRUCTURE INCLUDING ELECTRICAL HINGE

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The present invention relates to foam insulated door structures and is particularly concerned with a foam-insulated door including an electrical hinge arrangement for accommodating one or more electric leads or conductors supplying electric energy to an electrical device mounted on the door.

For some years it has been common practice to provide on the inner panel of an insulated refrigerator door, one or more compartments designed to operate at a temperature somewhat above the normal cabinet temperature. In many cases, an electrical heating element associated with such a compartment has provided the desired temperature differential. This requires conductors for the transmission of current from the cabinet to the door. A convenient and inconspicuous point of entry for the conductors into the door has been through the hinge structure used for supporting the door on the face of the cabinet.

With the development of improved plastic foam insulation, such materials are now being used for insulating the walls of a refrigerator cabinet including the door component thereof. A preferred method of foam insulating a refrigerator door comprises introducing a foamable liquid resin mixture such as a foamable polyurethane resin mixture directly into the space between the assembled inner and outer door panels or into the outer metal panel while that panel is confined in a mold having a shape and configuration such that the inner surface of the foam layer will conform substantially to the shape of the inner door panel and permitting the polyurethane foam to form in contact with the outer metal panel. This method of insulating the refrigerator door or the like has as one of its principal advantages the fact that the liquid foam producing resin can be caused to flow into all of the recesses and crevices within the panel structure and completely fill the door structure with rigid foam insulation. However, as the flowable foam producing resin also tends to flow into or through and completely seal any openings provided in the door panel, the leads for any electrically heated compartment on the door must be inserted through the lead receiving openings before the foaming operation. The portions of the leads contacted by the foam become firmly anchored therein. When such leads or conductors pass through the hinge structure, they must be given some freedom of movement to absorb and dissipate the twisting action resulting when the door is opened so that the complete embedding of the conductors within the door and particularly adjacent the electrical hinge area by the rigid foam cannot be tolerated.

Accordingly, it is a primary object of the present invention to provide an improved rigid foam insulated door structure including a low cost means for preventing the foam from entering the electric hinge and for providing a space between the hinge and foam which frees a short length of the conductors or leads adjacent the hinge for absorbing the twisting action resulting from door movement.

Another object of the invention is to provide an improved low cost arrangement for preventing foam from entering the electric hinge area of a refrigerator door during the foaming operation.

Further objects and advantages of the present invention will become apparent as the following description

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proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claim annexed to and forming a part of this specification.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

FIGURE 1 is a front elevational view of a refrigerator cabinet embodying the present invention;

FIGURE 2 is an enlarged sectional view taken along line 2-2 of FIGURE 1;

FIGURE 3 is a sectional perspective view of a portion of the hinge area of the cabinet of FIGURE 1; and

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

Referring now to FIGURE 1 of the drawing, there is shown a household refrigerator cabinet having a door 2 mounted on the front portion of the cabinet for the purpose of closing the access opening to the interior of food storage space within the cabinet. This door comprises, as shown in FIGURE 2, a rectangular outer panel 3 of sheet metal or the like and an inner panel 4 which is preferably composed of a sheet plastic material and is formed to include a compartment such as a butter storage and conditioning compartment 5 shown in dotted lines in FIGURE 1 of the drawing.

The outer metal panel is shaped to have vertical and horizontal channel or U-shaped strengthening sections 6 and 7 on the vertical and horizontal edges of its face portion 8 which intersect at the corners of the panel. Each channel section includes a base portion 9 and an inner face or wall portion 10. The inner panel 4 is secured by screws or other fastening means to the wall portions 9.

The door 2 is supported at the top and bottom by means of pivot hinges 12 and 13. The hinge 13 which also provides means for supplying electrical power to the butter conditioner 5 comprises a bracket 14 secured to the face of the cabinet 15 by means of screws 16, the bracket including a horizontally extending arm 17 for supporting the door 2. The arm 17 of the bracket includes an opening for receiving one end of a hollow pin or pintle 19 which is secured to the bracket by any suitable means as by brazing or soldering. The adjacent base portion 9 of the channel 7 at the bottom edge of the door is provided with an opening 20 for receiving a sleeve 21 which is press fit into the opening 20 and which extends into the space between the face of panel 8 and the inner wall portion 10. This sleeve is adapted to receive the hollow pin 19 and to provide for pivotable movement of the door relative to the pin 19. A pair of leads or conductors 23 for energizing a heater for the butter conditioner extend from the cabinet through the hollow hinge pin 19 and into the space between the inner and outer panels 3 and 4.

The space between the outer panel 3 and the inner panel 4 is substantially filled with a resinous foam insulation such as polyurethane foam 22 prepared by expanding the liquid polyurethane foam reactants in contact with at least the outer panel 3. Since the liquid foam reactants tend to flow and expand into and through any openings in the panel during the foaming thereof, there is provided in accordance with the present invention an improved low cost sealing means for preventing the liquid resin or foam from leaking out through the hinge pin 19 during the foaming operation and also to provide between the hinge bracket 17 and the point where the conductors 23 become embedded in the foam insulation 22 a free length of conductors sufficient to absorb the twisting action thereon during the opening and closing of the door. This sealing means comprises a generally L-shaped member 25 of a resilient or compressible foam material adapted to have one leg 26 wedged

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or compressed into the vertical channel 6 above the hinge pintle 19 into contact with the channel bottom wall 9 and the other leg 27 similarly disposed in the horizontal channel 7 adjacent the pintle 19. Soft polyurethane foams or a foamed rubber are suitable materials for member 25. Most or all of the side edges of member 25 are contained within the channel sections so that contact thereof with the panel face portion 8 and the channel rear walls 10, isolates the hinge pin and the surrounding area from the remaining foamed space within the door.

In order to provide means for passage of the conductors 23 through the sealing member 25, the horizontal leg 26 above the hinge pintle 19 is provided with a slit 36. In one method employed for the manufacture of the door as illustrated in the drawing, the conductors 23 passing through the pintle 19 are inserted into the slit 36 at the time that the member 25 is forced into the channel sections 6 and 7. Both ends of the conductors 23 are then temporarily secured to the outer side edge or surface of the panel 3 by tape or the like and the foam-forming ingredients are introduced into the panel 3 while the panel is contained in mold having one surface conforming generally to the shape of the inner panel 4. The liquid foam producing mixture fills all of the volume defined by the panel 3 and the mold walls excepting the volume sealed by the member 25. While the foam also tends to flow into any openings in the slit 36 adjacent leads 23, these openings are not large so that the foam solidifies and fills them before any significant amount has passed completely through the slit. As a result, the member 25 protects the portions or lengths of the conductors between the pintle 19 and the facing surfaces of the member 25 so that they do not become embedded in the foam. After foaming of panel 3, the ends of the leads are arranged in the space 34 between the foam 22 and the inner panel 4 and are connected to the compartment heater at the time the inner panel is secured in place on the outer panel.

While there has been shown and described a particular embodiment of the present invention it is to be under-

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stood that the invention is not limited thereto and it is intended by the appended claim to cover all modifications within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

A door structure comprising spaced inner and outer panels, one of said panels including a face portion and channel sections on the side thereof facing the other of said panels and extending along at least two adjacent vertical and horizontal edges of said face portion and intersecting at a corner of said door, each of said channel sections including a wall spaced from said face portion and a base portion connecting said wall and said face portion, a hollow hinge pintle projecting into said door through one of said base portions adjacent said corner, an electric lead adapted to be connected to means mounted on said door, said lead extending from the interior portion of said door through said pintle, an L-shaped member composed of resilient foam material having the respective ends thereof wedged in said respective channel sections at said corner in spaced relation with said pintle and overlying and sealing the area of said corner around said pintle, said member having a slit in one leg thereof, said lead passing through said slit, and a mass of resin foam insulation formed in situ within the space between said inner and outer panels, said member preventing said foam insulation from contacting and embedding the length of said lead within the corner area sealed by said member whereby said length is free to absorb the twisting action thereof resulting from opening and closing movement of said door on said hinge pintle.

References Cited in the file of this patent

UNITED STATES PATENTS

2,737,781	Gelfand	Mar. 13, 1956
2,764,785	Sulcek	Oct. 2, 1956
3,089,202	Pulaski	May 14, 1963

FOREIGN PATENTS

1,061,618	France	Dec. 2, 1953
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