ALL PLASTIC REFRIGERATOR DOOR WITH INTEGRAL BUMP STOP HANDLE

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ABSTRACT

In preferred form, an all plastic refrigerator door including an outer panel and an inside panel having the sides thereof interconnected with one another to form side corners on the door. Rigid foamed-in-place insulation material fills a space between the outside and inner panels and reinforces a front planar extent of the door and the corners thereof against deflection. An integrally formed flange on the front panel extends outwardly and forwardly thereof to define a resiliently yieldable flaplike bumper for absorbing shock.

1 Claims, 4 Drawing Figures
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This invention relates to insulated doors for refrigerators and more particularly to all plastic refrigerator constructions having spaced panels filled with rigid foamed-in-place thermal insulation.

In refrigerator construction it is becoming commonplace to have an all plastic door including an outside panel and an inside panel spaced with respect to one another to form a volume filled with foamed-in-place thermal insulation.

The panels are, for example, made from a strong plastic material such as ABS (acrylonitrile-butadiene-styrene), expanded polypropylene, polyvinyl chloride and the like are formed into intricate shapes by vacuum molding or the like. Typically, for example, the inside panel may have shelves and the like formed therein by the molding process.

In representative all plastic door constructions the plastic panels have a relatively thin section and in the case of certain constructions have relatively sharp corners formed therein that experience stress concentration.

Furthermore, the thin sheet plastic that forms the front or outside panel is reinforced by the rigid foamed-in-place insulation against flexure.

As a result, when the sharp corners of the door are impacted against an object during movement of the door between open and closed positions, cracks may result in the outer panel.

A further aspect of all plastic doors is that an internally located reinforcing structure may be provided in association therewith for the connection of door handles and the like.

An object of the present invention is to include a multipurpose integrally formed member on the outer door panel on an all plastic refrigerator that serves the combined function of an energy absorbing bumper and door operating handle.

A further object of the present invention is to provide an all plastic refrigerator door of the type adapted to have one side pivotally connected to the refrigerator cabinet for movement between open and closed positions and wherein the door includes inner and outer panels of thin plastic material that are spaced apart to form a space for foamed-in-place thermal insulation that reinforces the thin section plastic panels and wherein the outer panel includes a resiliently deflectable outwardly directed flange thereon which is located with respect to the front corner edge of the pivoted door to protect it against impact loadings and wherein the flange is configured to form a door operating handle throughout the full height of the insulated door section.

Still another object of the present invention is to provide an improved side section on an all plastic refrigerator door having foamed-in-place thermal insulation for reinforcing spaced-apart plastic panels; the side section including a bent corner integrally formed with the front of a door which reinforces an integrally formed handle flange that extends forwardly of the front panel at one side thereof through the full height of the door and wherein the handle flange itself is relatively yieldable and located forwardly of the door corner to serve as an energy absorbing bumper at the side of the door.

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

In the drawings:

FIG. 1 is a view in perspective of a two-compartment refrigerator with all plastic doors constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary view in horizontal section taken along the line 2--2 of FIG. 1;

FIG. 3 is a view in perspective of a two compartment refrigerator with doors showing a second embodiment of the invention; and

FIG. 4 is an enlarged fragmentary view in horizontal section taken along the line 4--4 of FIG. 3.

Referring now to the drawings, in FIG. 1 a refrigerator 10 is illustrated including a cabinet 12 having a front opening to a top food storage compartment closed by a door 14 which has one of its sides pivotally connected by hinge pins 16, 18 to suitably brackets 17, 19 fastened to the cabinet 12.

By virtue of this support, the door 14 is pivotable about the axis defined by the pins 16, 18 from the closed position shown in FIG. 1 to an open position wherein the side 20 thereof sweeps through an arcuate path forwardly and toward one side of the cabinet 12.

Additionally, the refrigerator cabinet includes a bottom compartment having an access opening closed by a lower door 22 which is hinged at its side by hinges 15 and brackets 19, 25 for pivot movement about a vertical axis on the cabinet 12 outwardly and forwardly so that a side 28 thereon moves through a like arcuate path.

In accordance with certain principles of the present invention each of the doors 14, 16 as is shown in FIG. 2 includes an outside panel 30 and an inside panel 32 each formed of a high-strength plastic material such as ABS (acrylonitrile-butadiene-styrene) or expanded polypropylene plastic.

Each of the panels 30, 32 have a relatively thin section. In the case of the inner panel 32 vacuum molding is used to form convolutions 34 of bottom compartments or shelves 36 on which articles are stored to be located within the food compartment 38 of the refrigerator when the door is closed.

As shown in FIG. 2 the inner panel 32 further includes a forward, side step 40 wherein it terminates in a side edge 42. A magnetic door seal 43 is secured to edge 42 by screws 45 and clamps 47 around the perimeter of panel 32.

The front panel 30 is injection molded to include an integral, channel-shaped side 44 that has an inside leg 46, a side surface 48 and a front leg 50 which is integrally joined to one side of the front face 52 of the panel 30 along the full height thereof. The seal screws 45 fasten edge 42 to leg 46 to join panels 30, 32. A like channel-shaped side 54 is formed on the hinged side of the door.

The front face 52 has a planar extent which is greater than that of the access opening to the refrigerator compartment 38, and it along with side channels 44, 54 cover the sidewalks 55 of the refrigerator when the doors 14, 22 are closed and serve to locate seal 43 in sealing engagement with the cabinet walls 55.

The thin sectioned outer and inner panels 30, 32 are spaced from one another through a predetermined distance to form a volume which is filled by foamed-in-place thermal insulating material 57 such as a polyurethane foam insulating material.

This material is characterized by being rigid and serves to prevent any substantial flexure of the wide, thin panels 30, 32.

Rounded corners 56, 58 on the channel 44 serve as transition radii for joining the legs 46, 50 to the side surface 48. Since the outer panel 30 is rigidly reinforced by foamed material 57 these points of stress concentration can be damaged when impacted sharply against an object during pivotal movement of the door.

In accordance with certain principles of the present invention, the channel-shaped side 44 defines a structural cross section which serves to reinforce the root portion 60 of the combination energy absorbing bumper and handle member 62 which is connected to the door 14 along the side 20 throughout the height thereof as is best seen in FIG. 1.

The handle member 62 includes a flange 64 integrally formed at its root 60 to the front face 52 of panel 30 and the leg 50 of the side portion 44 of outer panel 30. The flange 64 is perpendicularly connected to an elongated flaslplike bent end 66 which is located in spaced parallelism with the leg 50 of the front panel 30 throughout the height of the all plastic door.

Together, they form an open space 68 or pocket for defining a handgrip to serve as an operating handle any place along the height of side 20.

In accordance with certain principles of the invention the handle member 62 is resiliently yieldable upon impact with a stationary object to assume a shape shown exaggerated in dotted lines on FIG. 2 and thereby serves as a resilient energy absorbing bumper located forwardly of the corner 58 and which functions to absorb kinetic energy when it impacts against a stationary object.
Thus, when the door 14 swings about the side hinge pins 16, 18 forwardly and outwardly of the refrigerator door, it is protected by the handle 62.

In the embodiment of FIGS. 3 and 4 a refrigerator 70 is illustrated that includes a cabinet 72 having a top compartment closed by an upper door 74 and a bottom compartment closed by a lower door 76.

In this embodiment the upper door is connected by pivot pins 78, 80 to brackets 79, 81 on one side of cabinet 72 to be pivotally movable about a vertical axis between open and closed positions.

Likewise the lower door 76 is connected by the pin 80 and a lower pivot pin 82 to midbrackets 81 and lower bracket 83 same side of the door for a like movement between open and closed positions.

In this embodiment of the invention, each of the doors includes an integral handle and bumper configuration at each side thereof. More particularly, the upper door 74 can be seen to include an inner plastic panel 84 and an outer plastic panel 85. A like panel is present at the inside and outside of door 76.

The inner panel 84 in this case includes a side flange 86 which is directed generally perpendicularly to a stepped portion 88 on the panel 84 in the vicinity of the access opening 90 to a food compartment 92 of the refrigerator.

The outer panel 85 includes a front 94 having a planar extent in excess of that of the access opening 90 to the compartment 92. At each edge the front 94 is integrally formed with an outwardly sloping face 96 which in turn is integrally joined with a side bumper 98 which is reinforced by a rearwardly directed flange 100 that overlies flange 86 and extends throughout the full height of the front 94 immediately to one side of the sloping face 96.

Between the leg 100 and the flange 86 is connected a side portion 102 of a seal element 103 that has a base 104 in seated relationship with the step transition 88 on the inner panel 84 where it is held in place by suitable fastening means such as an adhesive material to define a reinforced laminated side.

The base 104 is joined to a yieldable bellows portion 106 of the seal that in turn is integrally formed with an annular cross-sectioned gasket 108 in which is located a resilient strip of magnetic material 110.

When the door is in the closed position illustrated in FIG. 4 the magnet 110 is attracted by a surface 112 formed on a metal liner 114 of ferromagnetic material for the compartment 92.

The liner 114 is reversely bent on itself to form a front flange 116 around the access opening 90 joined with the outer cabinet wall 118.

Between the inner panel 114 and the outer cabinet wall 118 is a space filled with rigid foamed-in-place insulation 120.

A like open space formed between the inner panel 84 and the outer panel 85 is filled with rigid foamed-in-place thermal insulation 122 such as blown polyurethane foam which serves to adhere the bent over end 124 of the seal element in place on the inside of side flange 86.

As was the case in the first embodiment, the bumper 98 serves as a continuous handle along the height of the cabinet door 70 and an energy absorbing bumper since it is relatively resiliently yieldable with respect to the front 94 into a position as shown in dotted lines in FIG. 4 upon impact with a stationary object during door swinging movement.

This resiliency serves to insulate the corner region 125 between the sloping face 96 and flange 100 against shock.

Furthermore, the corner region 125 is reinforced by the side flange 86 and a seal side 102 therein.

While the embodiments of the present invention, as herein disclosed, constitute a preferred form, it is to be understood that other forms might be adopted.

1. A refrigerator door adapted to be pivotally mounted on a refrigerator cabinet for closing an access opening therein comprising: an inner panel having side edges thereon, an integrally molded one-piece outer panel including channel-shaped sides, each of said channel-shaped sides including an inside leg and a front leg joined by a side surface, means for connecting each of said inside legs to the side edges of said inner panel, said outer panel including a front face integrally connected to each of said front legs at a point located forwardly of each of said inside legs, said inner and outer panels having a space formed therebetween, rigid foamed-in-place insulation material filling said space and the inside of each of said channel-shaped sides, an inner corner formed by one of said inside legs and said side surfaces reinforced by said insulation material, a front corner formed by one of said front legs and said side surfaces reinforced by said insulation material, a combination energy absorber and handle member formed integrally with said outer panel, said member including a flange having a root portion joined at the juncture between said one of said front legs and said front face of said outer panel, said flange extending outwardly and perpendicularly with respect to said front face, a bent end on said member connected to an end of said flange at a point located in front of the front face, said bent end extending from said flange in parallel spaced relationship to said one of said front legs to locate the free end of said bent end at a point terminating in front of the front corner of said channel-shaped side, said flange and said bent end being resiliently yieldable when said member hits an object to cause said flange and bent end to deflect from the root portion toward the front corner to protect it against impact.

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