June 24, 1958 W. E. RICHARD ET AL 2,840,433

REFRIGERATOR DOORS AND DOOR SHELVES

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Fig-3

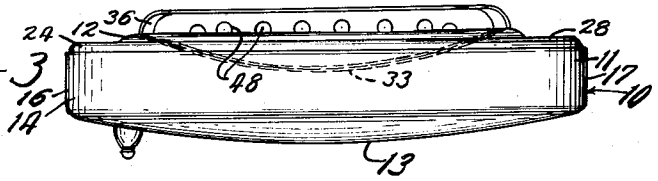



Fig-1

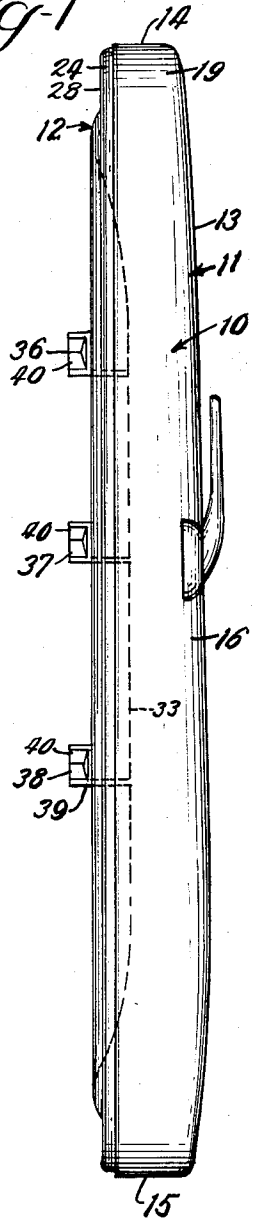
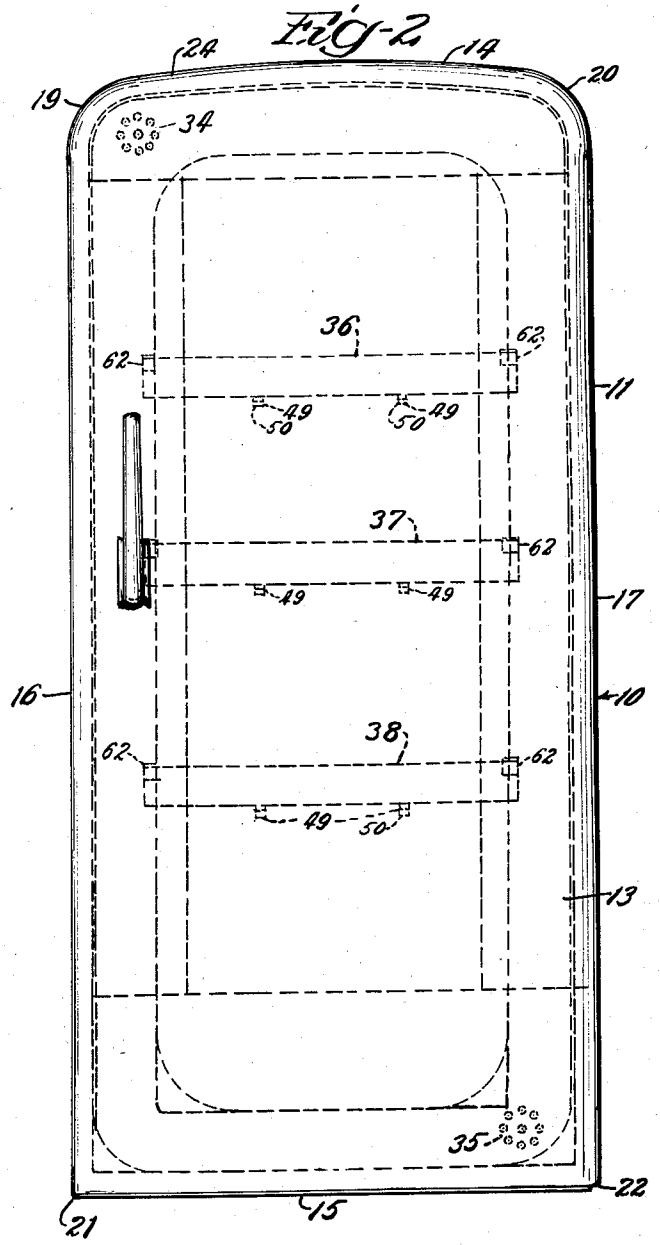



Fig-2



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REFRIGERATOR DOORS AND DOOR SHELVES

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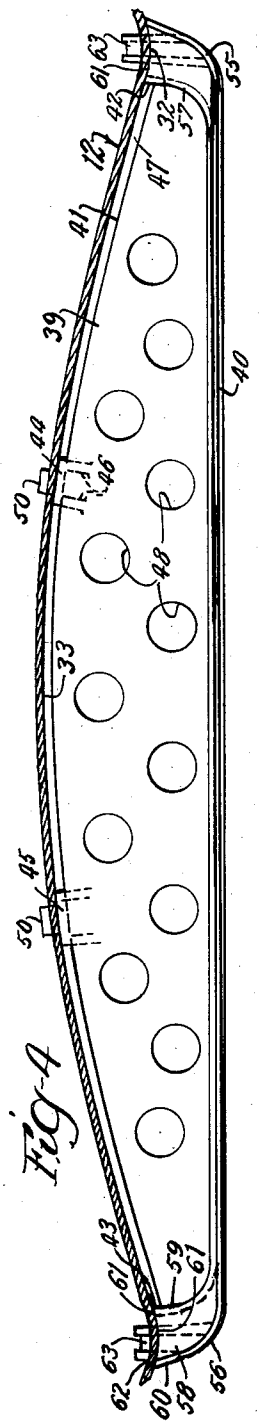


Fig-4

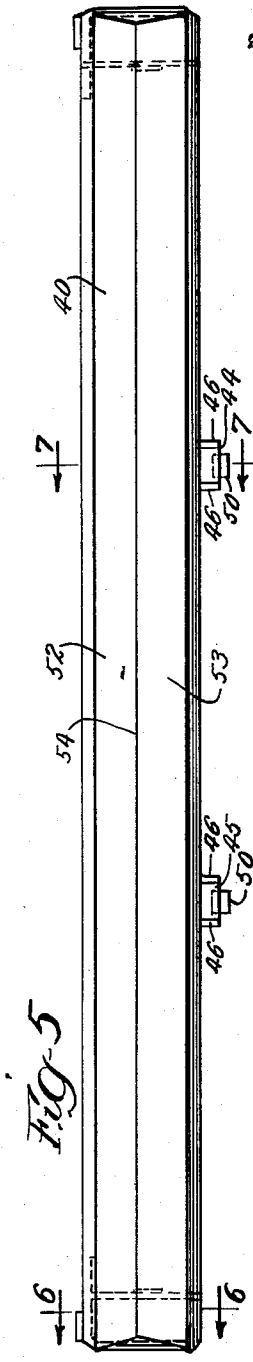


Fig-5

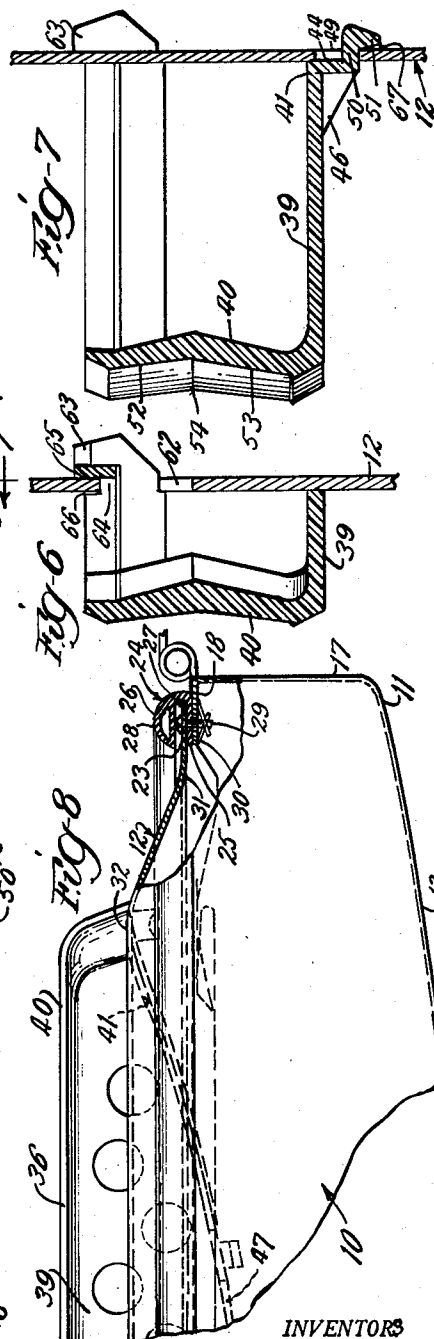


Fig-7



Fig-6



Fig-8

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# REFRIGERATOR DOORS AND DOOR SHELVES

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1 Claim. (Cl. 312—214)

The present invention relates to refrigerator doors and door shelves, and is particularly concerned with an improved construction of refrigerator doors and door shelves.

One of the objects of the invention is the provision of an improved refrigerator door and door shelf construction, in which the door shelves are wholly detachable without the use of any tools, so that considerable labor is saved in the construction and assembly of the door with the shelves and so that the shelves may be removed by the housewife for washing and cleaning of the shelves; and washing the inner door panel without encountering the door shelves as obstructions.

Another object of the invention is the provision of an improved door and shelf assembly in which the shelves serve the additional purpose of bracing and increasing the rigidity of the inner panel of the door.

Another object of the invention is the provision of an improved door shelf construction and mode of attachment which allows for ventilation by passage of air between the shelf and the inner door panel, and through the bottom of the shelves themselves to promote a circulation of air about the commodities carried by the shelves.

Another object of the invention is the provision of an improved shelf which may be provided with a suitable wire bail for extending upwardly above the door shelf and preventing bottles or other long articles from tipping off the shelf.

Another object of the invention is the provision of an improved door shelf construction and form of attachment to the door panel, which is engaged more tightly with the door panel by the weight of the articles acting on the shelf when it is loaded.

Another object of the invention is the provision of an improved door shelf adapted to serve as egg trays, being provided with apertures within which eggs may be seated to prevent them from rolling around the shelf.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the two sheets of drawings accompanying this specification,

Fig. 1 is a side elevational view of an insulated refrigerator door embodying the invention;

Fig. 2 is an outside elevational view of the door;

Fig. 3 is a top plan view of the door;

Fig. 4 is a top plan view of one of the door shelves shown in connection with fragments of the inner panel;

Fig. 5 is a front elevational view of one of the door shelf units;

Fig. 6 is a fragmentary sectional view taken on the plane of the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary sectional view taken on the plane of the line 7—7 of Fig. 5, looking in the direction of the arrows; and

Fig. 8 is a fragmentary top plan view of the door showing the mode of assembly of the inner and outer door panels and door seal.

Referring to Figs. 1 to 3, the insulated refrigerator door is indicated in its entirety by the numeral 10, and it preferably includes an outer metal shell 11, an inner insulated panel 12, having an intermediate filling of suitable fibrous insulation.

The outer shell 11 may comprise a stamped sheet metal member provided with a front wall 13 and with a rearwardly extending top wall 14, a bottom wall 15 and two side walls 16 and 17.

The walls 14—17, which surround the face panel 13, are provided with an inwardly extending flange 18 on the back side of the outer shell to be used in attaching the outer shell to the inner panel 12.

The outer shell 11 is preferably made of steel and has rounded corners 19, 20 at the top, and relatively square corners 21, 22 which are slightly rounded at the bottom.

The inner panel 12 of the door is provided with a border flange 23 all around its edge, which serves as an attachment flange and is located in the same plane so that it may be attached to the inwardly extending attaching flange 18 on the outer shell.

The attaching flange 23 of the inner panel terminates short of the outer edge of the door so that it may be mounted in a door seal 24, which comprises a resilient rubber member having a rubber attaching flange 25, spaced from its main body 26 by a groove 27 which receives the edges of the inner panel.

The main body of the door seal 24 is hollow and oval in shape so that its curved face 28 may engage a flat face flange on the refrigerator cabinet to effect an air tight seal between the door and the cabinet.

The door seal 24, inner panel 12 and flange 18 of the outer shell are secured together by means of headed threaded members 29, which engage resilient nuts 30 on the inside of the shell flange 18.

Thus the heads of the threaded members 29 are located beneath the door seal body 26, and the shell is attached to the inner panel at regularly spaced points all around the exterior of the inner panel, forming a closed container for the insulation.

The inner panel 12 is preferably molded out of a paper base fiber which is laminated and impregnated with a phenolic condensation compound and coated on the inside with a hard synthetic enamel.

Adjacent the plane attaching flange 23 the inner panel 12 curves outward at 31 and inward at 32, being formed with a bulge or curved portion which is rectangular in elevation and extends around the inner panel adjacent its outer edge.

From the rib 32 on one side the inner panel is dished inwardly, reaching a maximum inward displacement at center 33 of the door. This gives the inner panel an inward curvature which tends to stiffen it and surround the inward curvature with an outwardly bulging rectangular frame near the attaching flange.

The inner panel 12 may be made all of one piece or it may be made of two separate sections, tongue and grooved together midway between the top and bottom of the door.

The door seal 24 may be made of a single molded resilient rubber member or it may be made up of one or more lengths of the door seal material mitered at the corners and suitably joined together by means of rubber cement.

The door is preferably provided at the top of its inner panel with a multiplicity of air ventilation openings 34

and with a similar number of openings 35 at the bottom of the door at the bottom corner.

These openings permit air to circulate through the insulation, and the freezing action of the evaporator in the refrigerator serves to freeze out the moisture in the air and keep the insulation dry and effective.

The dished portion of the inner panel 12 provides space for a multiplicity of shelves 36—38, three of which are shown, but in any number of which may be employed.

The shelves are preferably molded out of initially plastic material or molding powder, and one of the shelf units is shown in Figs. 4 and 5.

Each shelf unit is provided with a plane bottom wall 39, which is integrally joined to an ornamental front wall 40, the latter extending upward at right angles.

The bottom wall 39 may be curved at 41, along its rear edge to correspond to the curvature of the dished portion 33 of the inner panel 12; but the curved edge 41 is spaced from the inner panel 12 by a plurality of outwardly extending lugs 42, 43 at each end, and 44, 45 intermediate the ends.

The lugs 44, 45 are carried by the bottom wall 39, and they have a reinforcing connection with the bottom wall in the form of tapered ribs 46.

Thus the bottom wall 39 is spaced from the inner panel, leaving a crack 47 for passage of air and facilitating the circulation of air to cool the products carried by the shelves.

Additional air circulation through the bottom wall 39 is permitted by a multiplicity of staggered circular apertures 48, located in the bottom wall 39, and also serving to seat eggs when a shelf is used as an egg rack.

The inner panel 12 is provided with a pair of rectangular apertures 49, Fig. 7, for passing a downwardly hooked extension 50, which is carried by each lug 44 and 45. Each lug 44, 45 has a downward extension 51 below the hooked extension 50 for engaging behind the inner panel 12.

The length of the aperture above the hooked extension 50 is sufficient to pass the entire hooked extension 50 when the bottom wall 39 is flexed or bent upward; and this makes the bottom wall quickly detachable by bending its hooks upward.

The front wall 40 of each shelf unit may be straight and it is provided with a pair of inward bevels 52, 53, joined at a center line 54 for ornamental purposes.

At each end the front wall 40 curves inward toward the inner door panel 12, and has a rounded corner at 55 and 56, and a thickened end wall 57 and 58. This thickened end wall may actually be hollow and is formed with two thin walls 59 and 60, the edges 61 of which are curved to fit against the outward bulge 32 of the inner panel 12.

The inner panel 12 is provided with a pair of rectangular apertures 62, located to receive outwardly extending lugs 63, carried by each end wall 58.

The lugs 63 are shown in section in Fig. 7, and actually comprise an inwardly extending portion 64 and an upwardly extending hook 65. The apertures 62, Fig. 6, are long enough in a vertical direction to pass the entire lug 63, with its upward hook 65 when the entire shelf unit is moved downward.

Thus each end of the shelf unit is provided near its upper edge with lugs 63 for engagement with the inner panel 12.

Lug 63 is provided with a groove 66 for receiving the edge of the panel 12, which is the upper boundary of the aperture 62.

The normal position of the lugs 63 and the lugs 44, 45 is such that the hooks 50 tend to turn downward inside the apertures 49, and the lugs 63 tend to turn upward inside the apertures 62; but the shelf unit may be disengaged from the door panel as follows;

To take a shelf unit off the bottom 39 is bent upward near its middle portion, thus moving both hooks 50 upward until the hook 51 clears the aperture 49 in each case.

Then the bottom of the shelf is pivoted away from the door panel, moving the lower hooks 50 out of the apertures 49.

When this has been accomplished the bottom of the shelf is free and the entire shelf may be moved downward, the lugs 63 at each end moving downward until the panel edge at the holes 62 moves out of the groove 66.

Then the lugs 63 may be withdrawn from the apertures 62, thus freeing the shelf unit at each end and at the top.

It is a great advantage to be able to remove the shelf unit because then the inner door panel may be wiped clean of its entire area without leaving a streak of dirt where the shelf bottom is and where the shelf is attached.

The shelf also may be cleaned separately with soap and water and replaced as follows:

First the top of the shelf is tilted forward toward the door panel 12, and both lugs 63 are inserted in the apertures 62 and moved upward until the groove 66 receives the panel at the edge of the apertures 62, as shown in Fig. 6.

The bottom 39 is curved inward toward the door panel 12, the beveled surface 67 engaging the bottom of apertures 49. Hooked extensions 50 will not pass into apertures 49 until the bottom 39 is actually bent upward at each hook 50.

After the hooked extensions 50 have entered the apertures 49 the bottom 39 is permitted to bend downward again into a straight condition, causing the depending hooks 51 to engage the inside of the inner panel 12.

Thus each shelf unit is quickly attachable and quickly detachable, saving the expense of threaded bolts and other fasteners, and saving the labor of securing these parts together with threaded members.

Each shelf with its engaging lugs 44, 45, and 57, 58 tends to stiffen the inner panel 12 and to reinforce it against bending; and it thus becomes unnecessary to use any other braces than the shelves for bracing the door and the inner panel against warping or bending.

It will thus be observed that we have invented an improved door construction which may be manufactured very low in cost and which requires a minimum amount of labor in its assembly and has a minimum number of parts.

The present shelves may be removed at will by the user, thus facilitating the cleaning of the shelves and inner panel; and they may be replaced with a minimum amount of labor.

While we have illustrated a preferred embodiment of our invention, many modifications may be made without departing from the spirit of the invention, and we do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of all changes within the scope of the appended claim.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States, is:

A refrigerator cabinet door panel which is outwardly bowed from the cabinet and inwardly recessed for shelves, and which comprises an integral insulating panel of sheet material adapted to cover the inside of a refrigerator door, said panel removably supporting a plurality of shelf units extending into the recess of said panel and projecting oppositely toward the cabinet, each shelf unit having an apertured bottom wall, a side wall and two end walls, the bottom wall and end walls conforming to the curvature of the panel, said shelf units carrying a plurality of rigid supporting lugs having bodies projecting through lug apertures in the panel while the unit engages the front of the panel, each lug having a hook-shaped end engaging the back of the panel adjacent each lug aperture, the lug apertures being of such length and clearance vertically that the hook-shaped ends may pass through the lug apertures, there being a pair of lugs, one at each end wall of the shelf near the top

thereof, with an upwardly extending hook, and there being another pair of lugs carried by the bottom wall of the shelf intermediate the shelf ends, each having a downwardly extending hook, the said lug apertures being located in alignment with the bodies of said lugs with the vertical clearance of each lug aperture extending oppositely to the hook end of its lug, the said shelf unit being resilient and bendable centrally to permit one pair of lugs to be inserted and hooked in their apertures upwardly, and thereafter bending the shelf until the other pair of lugs have their hooks passed through their apertures, the latter lugs springing down with the straightening of the shelf, until the two pairs of hooks are oppositely secured in the panel.



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