

April 3, 1956

K. K. KESLING

2,740,266

REFRIGERATING APPARATUS HAVING SHELVES ON DOOR

Filed March 19, 1953

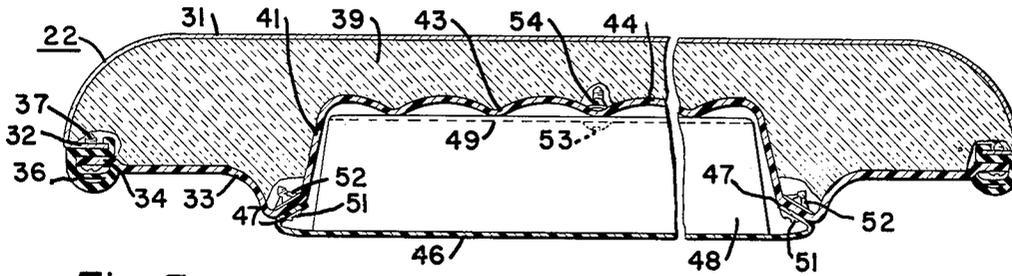


Fig. 3

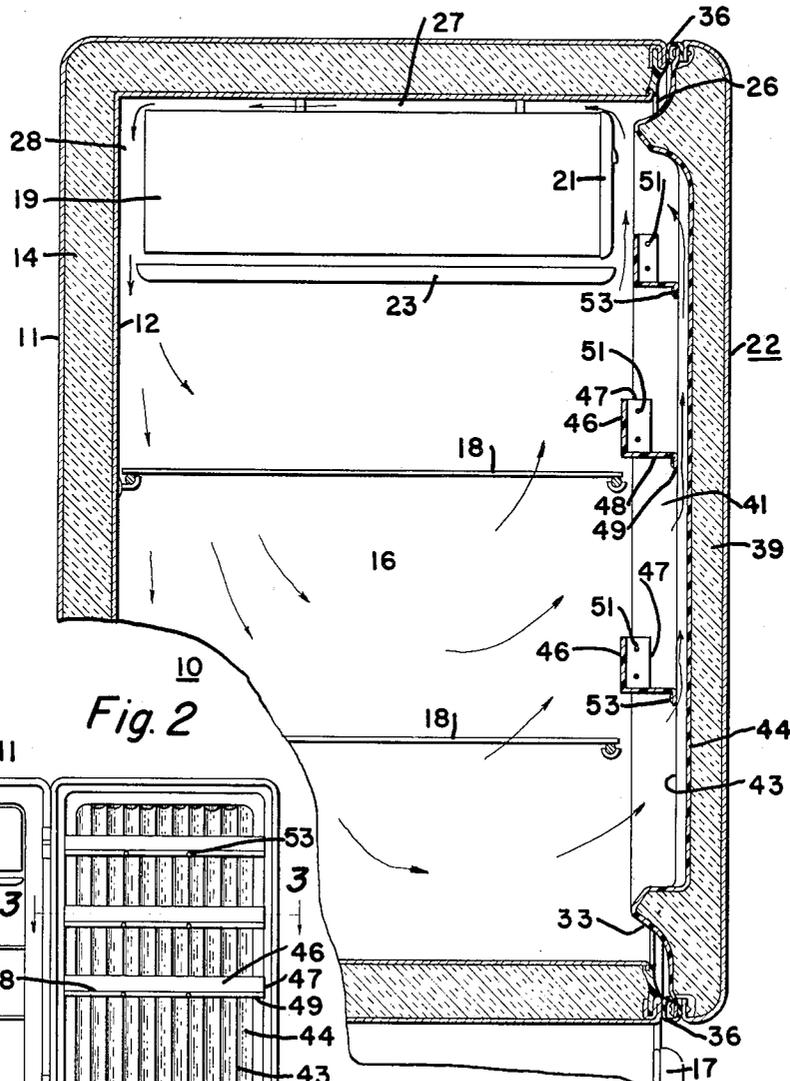


Fig. 2

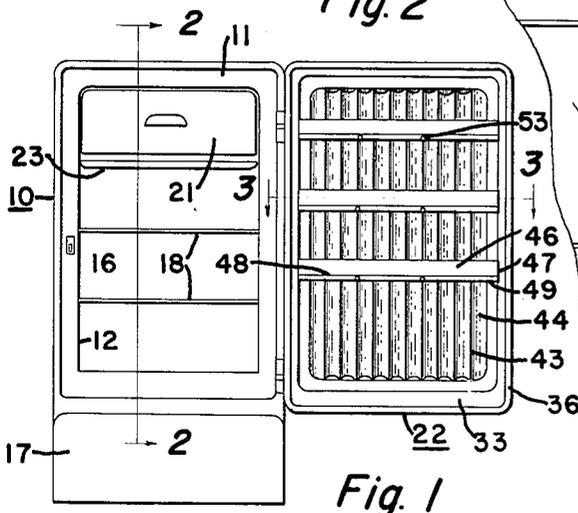


Fig. 1

INVENTOR.  
Keith K. Kesling

BY

R. R. Candor.  
Attorney

1

2,740,266

**REFRIGERATING APPARATUS HAVING SHELVES ON DOOR**

Keith K. Kesling, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application March 19, 1953, Serial No. 343,322

1 Claim. (Cl. 62—89)

This invention relates to refrigerator cabinets and particularly to a door shelf arrangement for such cabinets.

I am aware of the fact that others have provided food receiving storage shelves or ledges on refrigerator cabinet doors. Some of these shelves have been of the type including a solid or imperforate food supporting base portion so as to prevent small articles of food or the like placed thereon from falling through the shelf. Door shelves of this type have presented problems which are difficult to overcome, and are solved only by increasing the manufacturing cost thereof. One of these problems is that of spacing the imperforate base portion of a shelf from a smooth inner face of the refrigerator cabinet door so as to permit cold air, cooled by a cooling unit or evaporator of a refrigerating system associated with the refrigerator and caused to circulate within the food storage chamber of the refrigerator, to pass around the back of the shelf along the inner face of the door in order to carry away warm air as it forms at this point. Others have provided lugs or bosses projecting from the rear edge of the base portion of such shelves for engaging the inner door pan or panel to thereby space this portion of a shelf from the inner face of the door and permit air to circulate around the back of the shelf. Such lugs or bosses in addition to increasing the cost of dies employed to form molded plastic shelf doors also frequently become broken off the shelf in shipment thereof and in handling of the shelf during assembly to a door. For this reason it has been necessary for the manufacturer of such shelves to provide special shipping cartons to protect the projecting lugs or bosses thereon from breakage while being shipped to manufacturers of refrigerators and this also increase the cost of providing such shelves.

An object of my invention is to provide an improved refrigerator cabinet of the type having shelves mounted upon the inner face of the door thereon.

Another object of my invention is to provide a novel molded plastic door shelf arrangement for a refrigerator cabinet wherein the necessity of forming spacing studs or bosses on the door shelves, for permitting air to flow between the inner face of the door and the rear edge of an imperforate or solid article supporting base portion of a door shelf, is eliminated to thereby reduce the cost of such shelves.

A further object of my invention is to provide a molded plastic inner refrigerator cabinet door pan or panel with a serrated face portion at least in the vicinity of shelves mounted on the door which in addition to increasing the structural strength of the panel, reducing bowing or warpage of the panel and enhancing the appearance of the inner side of the door, also provides means for preventing articles supported on the door shelves from blocking the circulation of air around the rear portion of a shelf and the articles thereon.

A still further and more specific object of my invention is to mount a shelf in a recess of a refrigerator

2

cabinet door provided with a corrugated inner pan or panel which corrugation forms alternate raised ridges and furrows and to position the rear edge of an imperforate food supporting base portion of the shelf adjacent the inner face of the door so that the rear edge of the shelf base position abuts the ridges and is thereby spaced from the furrows to form a plurality of air passages between the shelf and the inner face of the door for the flow of cold air in the cabinet around the back of the shelf to carry away warm air as it forms adjacent the inner face 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 form of the invention is clearly shown.

In the drawing:

Figure 1 is a front view of a refrigerator cabinet having my invention embodied therein and showing the food storage chamber door thereof in open position;

Figure 2 is an enlarged fragmentary vertical sectional view of the refrigerator disclosed in Figure 1 and is taken on the line 2—2 thereof showing the food chamber door in closed position; and

Figure 3 is an enlarged broken sectional view of the refrigerator cabinet door and a shelf thereon taken on the line 3—3 of Figure 1.

Referring to the drawing I show a household refrigerator cabinet, generally represented by the reference character 10 including the usual outer shells or panels 11, an inner metal liner 12 an insulating material 14 therebetween (see Figure 2). Liner 12 forms the top, bottom, back and side walls of a food storage chamber 16 within cabinet 10. A machine compartment, closed by the closure member 17, is provided in cabinet 10 below the chamber 16 and this compartment houses a refrigerant translating device of a closed refrigerating system associated with the cabinet. Chamber 16 has the usual perforated or reticulated food supporting shelves 18 mounted therein. The closed refrigerating system also includes a cooling unit or evaporator 19 located within the upper portion of chamber 16 to cool and cause circulation of air in the food storage chamber. Evaporator 19 may be of any suitable type and is preferably of the sheet metal variety formed by superimposing an embossed metal sheet upon another metal sheet and brazing or bonding the two sheets together to provide refrigerant expansion or evaporating passages therebetween as is now conventional and well known to those skilled in the art. Evaporator 19 is preferably shaped to provide walls of a freezing or frozen food storage compartment in chamber 16 and is provided with a door 21 closing the open front thereof. The food storage chamber 16 has an access opening provided in the front of cabinet 10 and a recessed insulated door structure, generally represented by the reference character 22 and to be more fully described hereafter, normally closes the food storage chamber access opening. Evaporator 19 may be mounted or supported in chamber 16 in any suitable or conventional manner and a drip tray 23 may be located below the same for catching defrost water and conveying this water to a drain. It will be noted that door 21 of evaporator 19 is spaced from the recessed inner face of chamber door 22 to provide a first flue 26 therebetween. The top of evaporator 19 is spaced from the top wall of chamber 16 to provide a second or horizontal flue 27 therebetween. The back of evaporator 19 is spaced from the chamber back wall to provide a third vertical flue 28 at the rear of the evaporator. Evaporator 19 and tray 23 extend substantially entirely across chamber 16 intermediate its side walls and the spacing thereof from other of the chamber walls provides the flues 26, 27 and 28 for the circulation of

air upwardly around the evaporator door 21, rearwardly of cabinet 10 through flue 27 and downward at the back of chamber 16 through the rear or third flue. Thus air cooled by evaporator 19 and caused to circulate through-  
out the food storage chamber 16 flows entirely around the evaporator from front to rear of the refrigerator cabinet since the drip tray prevents air flowing downwardly in chamber 16 at the sides of the evaporator. This air circulation within a refrigerated chamber of a refrigerator cabinet has been previously developed by those skilled in the art so as to permit the mounting of food supporting shelves on the inner face of the food chamber door in order to cool foods placed on the shelves to substantially the same temperature as food products located on the larger or main shelves within the chamber.

In accordance with my invention the refrigerated food storage chamber door construction 22 comprises an outer rectangular substantially rigid metal pan member 31 flanged inwardly about the periphery thereof as at 22 (see Figure 3). An inner door panel 33 has its peripheral edge portions 34 located in overlapping relation with and secured to the peripheral flange 32 of outer door pan 31. This inner door panel 33 is preferably formed of molded plastic material such for example as powdered styrene which is heated and forced into a suitable mold. Other materials such as polyvinyl-acetate or polyvinyl-chloride may be employed to form this door panel if desired. A rubber or the like gasket 36 is provided with a resilient or flexible sealing bead, adapted to engage the front wall of cabinet 10 to close the food chamber 16, and integral leg portions interposed between the peripheral edges of pan member 31 and panel 33. The gasket 36 extends entirely around door 22 and a plurality of spaced apart screws or the like 37 pass through openings in panel 33 and the legs of gasket 36 and are secured to outer pan member 31 of door 22 to rigidly clamp panel 33 and gasket 36 thereto. Any suitable or desirable insulating material 39 is disposed between outer and inner panel or pan members 31 and 33 of door structure 22. The inner door panel 33 is dished or projected rearwardly of the peripheral edge portions thereof as at 41 to provide a recess in the inner face of door 22. That portion of the molded plastic door panel 33 intermediate the inwardly projected wall portions 41 thereof is serrated or corrugated in a vertical direction at least in the vicinity of shelves adapted to be mounted upon the inner face of door 22. In the present disclosure the corrugations extend continuously from the lower to the upper portion of door 22. These serrations or corrugations provide, within the recessed inner face portion of door 22, alternate raised ridges 43 and furrows 44. The ridges 43 and furrows 44 of the corrugated part of door panel 33 in addition to reinforcing and/or increasing the structural strength of this panel and preventing warpage thereof also serves another purpose to be hereinafter more fully described.

I mount a plurality of shelves on the inner side of door structure 22 so as to augment the food supporting area within the refrigerated storage chamber of cabinet 10. The shelves are horizontally disposed on door 22 in vertical spaced relation so as to extend transversely to the direction of extension of the ridges and furrows of the serrations or corrugations in the recessed portion of door panel 33 and they may be larger or smaller relative to one another as their location on the door permits. These shelves may be formed of metal or they may be molded from the same material as specified for the molded plastic door panel 33. Each shelf comprises an upright front rail 46, having inturned flanges 47 at the ends thereof, a substantially horizontal solid or imperforate food supporting base 48 and a downwardly directed flange 49 at the rear of base 48. End flanges 47 of each shelf are provided with a suitable hole or holes for receiving a mounting stud 51 which passes through a hole or holes

provided in an angularly disposed portion of door panel 33 intermediate its peripheral edge 34 and its inwardly projecting wall portion 41. The inner end of stud or studs 51 receive a suitable locking clip or fastener 52 which engages and bears against the inner side of door panel 33 (see Figure 3) to rigidly clamp the shelves, at their ends, to the inner face of door 22. Base portion 47 of each of the shelves extends into the recess of door 22 and has the rear edge thereof abutting against the raised ridges 43 and spaced from the furrows 44 of the serrations or corrugations in door panel 33. The shelves may also be secured, by suitable studs 53 and locking clips 54, similar to the studs 51 and fasteners 52, to door panel 33 at one or more points intermediate their secured ends. Stud 53 are projected through suitable openings provided in rear flange 49 of door panel 33 and the clips or fasteners 54 placed thereover to engage and clamp against the inner surface of the raised ridges 43 of the corrugated door panel.

It is to be noted that in the arrangement disclosed the space between the inner edge of base portion 48 or flange 49 of each shelf and the bottom of furrows 44 of the serrations or corrugations provided in the recessed part of panel 33 provide a plurality of horizontally spaced apart passages along and intermediate the shelf and portions of the inner face of door 22. Air cooled and caused to circulate downwardly, by the refrigerating effect produced by evaporator 19, in the rear or third flue 28 into the back portion of food storage chamber 16 flows forwardly within this chamber into the recessed part of door 22 and upwardly along its inner face. This upward circulating cool air flows through the passages, formed by the alternate ridges and furrows 43 and 44 respectively of the corrugated inner door panel 33 (see Figure 2), around the back of each door shelf to carry away warm air as it tends to form adjacent the inner face of door 22 and particularly behind the shelves. The air flowing upwardly at the forward part of chamber 16, both over the front of the shelves and around the back thereof, then enters the first or front flue 26 and is directed into the second or horizontal flue 27 above evaporator 19. The passages around the back and along the length of the shelves cannot become blocked or closed because the raised ridges 43 of the serrated or corrugated recessed portion of inner door panel 33 spaces flat sided articles of food or small flat sided packaged food products stored on the shelves from the bottom of the furrows 44. Thus circulation of cooling air is insured around the back of the shelves and more important around the back of such flat sided food products thereon as well as over round sided small bottles and jars or the like.

From the foregoing it should be apparent to those skilled in the art that my improvement not only eliminates the necessity of forming lugs or bosses on the rear edge of refrigerator cabinet door shelves to space the same from an inner face of the door for permitting the circulation of air therearound but also provides other features and advantages. The structural strength of a molded plastic inner door panel or pan member is materially strengthened by corrugating or serrating the same to prevent it from bulging and/or warping under temperature changes to which it is subjected. The corrugating of the recessed door shelf receiving portion of a refrigerator cabinet door in addition to cooperating with the rear edge part of a shelf to provide a plurality of air passages around the back thereof furthermore prevents flat sided food products stored on the supporting base portion of a shelf from blocking the flow of air through the passages.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claim which follow.

What is claimed is as follows:

In combination, a refrigerator cabinet having a food storage chamber therein provided with an access opening,

5

6

a door pivotally mounted on said cabinet for swinging movement relative thereto and normally closing said chamber access opening, means for cooling the interior of said chamber and causing circulation of air therein, said door including an outer pan-like panel and a one-piece molded plastic panel forming the inner face thereof exposed to the interior of said chamber, said one-piece inner panel being attached to said outer pan-like panel only at its peripheral edges, a portion of said one-piece inner panel inwardly of its peripheral edges being formed to provide a recess in the inner face of said door, a shelf secured to said door and extending across said recess in the inner face thereof, said shelf having an imperforate article supporting base, said inner one-piece molded plastic door panel being corrugated at least along the recess thereof in a direction transverse to the extension of said shelf, said corrugations serving to increase the structural strength of said one piece molded plastic inner door

5 panel and preventing bowing thereof inwardly of its points of attachment to said outer door pan-like panel, and the rear edge of said shelf base abutting ridges of said corrugations and being spaced from furrows thereof to define a plurality of separate spaced apart passages between said shelf base and said inner door face for the flow of air circulating in said chamber around the back of said shelf to carry away warm air as it forms adjacent the inner face of said door at said recessed portion thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,256,162	Patee -----	Feb. 12, 1918
2,292,365	De More -----	Aug. 11, 1942
2,412,904	Money -----	Dec. 17, 1946
2,484,310	Philipp -----	Oct. 11, 1949
2,562,057	Norberg -----	July 24, 1951