A Freezer Compartment for a Refrigerator is provided. A shell with a face and opening allows for access to the freezer compartment. The freezer compartment further has at least two drawers slidably mounted within the opening and configured to seal against the face of the shell. At least one mullion assembly is configured between the drawers and is further configured to be flush with the face of the shell.
A DUAL DRAWER BOTTOM MOUNT FREEZER AND MULLION

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to refrigerator cabinets, and more particularly to cabinets for refrigerators having two compartments, one above the other, separated by a partition.

[0002] As shown in FIG. 1 a common arrangement for a household refrigerator provides two separate compartments, one above the other. The configuration shown is called a bottom mount freezer configuration. In this arrangement the upper compartment may serve as a fresh food compartment and be maintained at a temperature slightly above the freezing point of water, while the lower compartment is maintained at a temperature below the freezing point of water for best preservation of frozen foods. Each of these compartments has its own door mounted on hinges secured to the cabinet, and has a magnetic sealing gasket around its periphery that must engage with a smooth magnetic surface around each of the associated food compartments opened and closed by the door.

Because of space considerations, such refrigerators have a fresh food compartment with a rectangular cabinet or box having a height that is greater in magnitude than the width of the cabinet. The freezer compartment typically has a volume of less then the volume of the fresh food compartment.

[0003] In this arrangement, the lower freezer section typically has at least one incorporated drawer for access to items stored therein. Often a single drawer is used which may be pulled out from within the freezer compartment. Such drawers include a front facade. Another design contains a plurality of drawers behind a single door. This allows access to any items in the drawers without having to sift through the entire contents to find an item at the drawer bottom. In both of these designs when a particular item in the freezer is needed the entire front of the freezer compartment must be opened to gain access. Each time the compartment is accessed the cold freezer compartment air within “spills” out and is replaced by warmer ambient air, thereby raising the temperature of the air in the freezer compartment. Thus, each time the drawers are accessed, the air in the freezer compartment must be cooled.

[0004] Refrigerators of this type include a relatively thin metal outer shell forming the exterior surfaces of the cabinet and this shell forms a flange around the front cabinet face to provide for engagement with the sealing gaskets carried by the doors. An interior liner is formed from a sheet of thermoplastic using a conventional thermoforming process. The liner has a peripheral flange along the front edge and the liner is mounted within the shell by the flange, which seats into a groove on the shell directly behind the front cabinet face. The space between the liner and the shell is filled with insulating, rigid foam, such as polyurethane foam. The foam is sandwiched between the liner and shell and the result is a generally rigid and strong cabinet. However, the shell and the liner, by themselves, do not have a great deal of rigidity.

[0005] To separate the compartments, a partition, which includes insulating material, is mounted in the liner and generally held in place by a plurality of projecting ribs or by grooves formed within the liner so that the partition can be supported around the three sides in engagement with the cabinet liner. This arrangement requires the use of a mullion assembly which extends between the two sides of the shell in line with the front of the partition. The mullion provides a plurality of functions, including holding the partition in place, providing a tension strap between the opposed sides of the cabinet to prevent the sides from bowing outwardly, providing a finished surface for seating of the magnetic gaskets along the adjacent door edges, and providing a mount for a hinge assembly bracket which provides the lower hinge point for the upper door and the upper hinge point for the lower door.

SUMMARY OF THE INVENTION

[0006] In one embodiment of the present invention, a freezer compartment for a refrigerator is provided. A shell with a face and an opening allows for access to the freezer compartment. The freezer compartment further has at least two drawers slidably mounted within the opening and configured to seal against the face of the shell. At least one mullion assembly is configured between the drawers and is further configured to be flush with the face of the shell.

[0007] In another embodiment, a refrigerator comprising a shell having a face with at least one opening for access to compartments within the shell is provided. One compartment comprises a freezer compartment. The freezer compartment further comprises at least two drawers slidably mounted within the opening. The drawers are configured to seal against the face of the shell. At least one mullion assembly is configured between the drawers and is further configured to be flush with the face of the shell.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a refrigerator having a bottom freezer drawer compartment open and with the fresh food compartment doors closed.

[0009] FIG. 2 is a perspective view of a refrigerator of the present invention having dual bottom freezer drawer compartments open and with the fresh food compartment doors closed.

[0010] FIG. 3 is a front sectioned view of the freezer compartment of the refrigerator of FIG. 2 with the drawer faces removed showing the mullion of the present invention.

[0011] FIG. 4 is top view of the incorporated mullion of the refrigerator of FIG. 3 cross-sectioned along 4-4 showing of one end of the mullion of the present invention.

[0012] FIG. 5 is a detail view of one end of the mullion of FIG. 4.

[0013] FIG. 6 is a detail perspective view of the refrigerator and incorporated mullion of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Referring to the Figures and the details disclosed in the Figures, FIG. 1 shows a bottom freezer refrigerator 100 having a freezer compartment 111 in the lower portion of the refrigerator and a food compartment 112 directly above the freezer compartment. The freezer and food compartments are separated by a horizontal partition (not shown) that extends between the refrigerator sidewalls. The refrigerator 100 comprises a metal outer shell 116 extending around at least the top wall and two vertical sidewalls of the refrigerator 100. The peripheral edges of the shell walls are bent or otherwise redirected to extend towards the interior of the refrigerator when the shell is assembled for use. The edges are bent through a 90-degree angle to form a front face 117. The front face is substantially planar or flat and as a result, serves as an effective surface for doors 122, 123 and drawer 121 to seal.
against when they in a closed position. A liner 118 forming the inner surface of the freezer and food compartments 111 and 112 is mounted within the shell 116 and is spaced from the shell by conventional polyurethane foam insulation. The insulation is sandwiched between the liner and shell. The insulation bonds to the shell and liner to form an integral unit. A bottom or freezer door 121 is mounted to close and provide access to the freezer compartment 111, while top or fresh food compartment doors 122 and 123 are mounted directly above the freezer door 121 to close and provide access to the fresh food compartment 112.

[0015] Now referring to FIGS. 2 and 3, a refrigerator 200 with a dual drawer bottom mount freezer is shown. The refrigerator has a freezer compartment 211 in the lower portion of the refrigerator and a food compartment 212 directly above and separated from the food compartment by a partition 229. The partition extends substantially horizontally when the refrigerator is in use. The partition extends between the refrigerator sidewalls. The refrigerator 200 comprises a metal outer shell 216 extending around at least the top wall and two sidewalls of the refrigerator 200, and the periphery of the front edges of the sidewalls and top of the shell walls are extended and bent inwardly through a 90-degree angle to form a substantially planar face 217. Face 217 provides an effective sealing surface for drawers 220, 221 and doors 222, 223. The doors magnetically seal against the surface when the doors are closed. However, the doors do not need to be sealed magnetically and when a non-magnetic seal or non-magnetic means is used to hold the doors 222, 223 and drawers 220, 221 in a closed position, the outer shell 216 may be made out of any substantially rigid, nonmagnetic material. A liner 218 forming the inner surface of the freezer and food compartiments 211 and 212 is mounted within the shell 216 and spaced from the shell by the conventional polyurethane foam insulation. The insulation is sandwiched between the shell and liner. The insulation bonds to the shell and liner to form an integral unit. Fresh food compartment doors 222 and 223 are mounted to close or provide access to the fresh food compartment 212.

[0016] Typically a bottom freezer drawer refrigerator has one drawer to close or provide access to the freezer compartment. The double drawers 220, 221 of the present invention gives a consumer the option to compartmentalize or sort out food in the freezer compartment and provides the option to open either one of the drawers as needed. This allows for better visibility of and accessibility to the freezer contents and also limits inefficiencies associated with the displacement of cool air with warmer ambient air when the freezer drawer is opened. The present invention provides a number of improvements over the prior art refrigerators with a single freezer drawer. A consumer may keep frequently used food items in the top drawer such as ice cream, snacks, and small items that may get buried under other items in the freezer. Other less frequently used or larger packages of food items in the bottom drawer. Additionally, the present invention requires less drawer opening force, allowing for the use of less expensive, lighter weight slides supporting drawer movement. This design also allows less heat leakage as compared to known bottom mount refrigerators since a reduced area is open at any one time.

[0017] Bottom or freezer drawers 220 and 221 are mounted to close off the freezer compartment 211. A pair of like slides 230 facilitate the movement of drawer 220 along a substantially straight path, away from freezer compartment 211. Moving the drawer provides access to a tray or basket 240. Slides 230 may be configured such that the portion or end of the slide adjacent face 217 is at a vertical position relative to sidewalls that is different than the relative sidewall position of the opposite slide end. In the configuration shown in FIG. 3, drawer 220 is in a closed position.

[0018] As with slides 230 which facilitate the movement of drawer 220, a pair of slides 231 facilitate the movement of drawer 221 along a substantially straight path, parallel to the path of travel of drawer 220. Moving the drawer 221 away from faces 217 provides access to a tray or basket 241. Slides 231 may be configured such that the portion or end of the slide adjacent face 217 is at a vertical position relative to sidewalls that is different than the relative sidewall position of the opposite slide end. In the configuration shown in FIG. 3, drawer 221 is in a closed position.

[0019] A mullion 300 is included to provide a surface between drawers 220 and 221 to seal against when the drawers are closed. Referring to FIG. 4, the mullion 300 is configured between the side edges of the face 217 of shelf 216, which is necessary to have each end extend behind the face to receive fasteners, as described hereinafter. Mullion 300 has a front mullion face 302. The front mullion face 302 is made of metal to facilitate sealing of the drawers against the front mullion face 302 where a magnetic seal is used. However, front mullion face 302 may comprise any material when a non-magnetic means is used to maintain a seal between the drawers and mullion.

[0020] As the front mullion face 302 is fitted behind the face 217 of the shelf 216, the mullion must be flexible so that the mullion member can be flexed to draw the opposite ends of the mullion together in order to allow the mullion to be inserted in place after the mullion body 340 has been placed in the liner. Accordingly, the front mullion face 302, which is preferably made from relatively heavy gauge galvanized steel, has left and right ends 304 and 305 which are mirror images of each other and join a flat and flexible center section 306 which defines the zone in which the flexing takes place during assembly. As shown in the detailed view of FIG. 5, the front mullion face 302 has an offset at 307 to allow the end portion 304 to fit behind the face 217 of the shelf 216 while leaving the central portion between the two offsets close to the plane of the front face 217. Note that a similar offset (not shown) is provided at end 305 to allow the mullion body to be located in the shell. To prevent flexing of the front mullion face 203 during use a mullion assembly 320 is provided. Front mullion face 302 is attached to mullion assembly 320 by any means. However, as the front mullion face 302 is inserted behind face 217 removable means of securing front mullion face 302 to mullion assembly 320 is preferred allowing for removal and replacement if necessary.

[0021] Mullion assembly 320 comprises a mullion face cover 330 and a mullion body 340. Mullion body 340 has attachment means 325 for securing the mullion assembly to the shell 218 within freezer compartment 211. As shown in FIG. 6, attachment means may be holes for facilitating attachment by screws, but could be brackets clips or other known means. FIG. 4 shows mullion body as substantially trough or U-shaped, having an open front and enclosed top, bottom, left and right sides and back. In this present configuration when mullion face cover 330 is placed over the open front of mullion body an enclosed volume 380 is created within mullion body. The enclosed volume is defined by the mullion sides and cover. Mullion face cover is made integral with mullion
body 340 forming the permanently enclosed volume. Foam is injected into the mullion assembly 320 to fill the enclosed volume providing insulation to reduce heat transfer from the freezer compartment 211 to the mullion face cover 302.

It can be appreciated that any means of forming an enclosed volume may be used. Including, but not limited to, forming a shell around a foam core, vacuum forming, injection molding or blow molding. It may also be appreciated that an enclosed volume is not necessary where the solid mullion body 320 provides support for front mullion face 302 and provides an insulating means between the freezer compartment 211 and the front mullion face 302. One such example is structural foam having low heat transfer properties. It can further be appreciated that the enclosed volume need not be filled with an insulating material where a vacuum is created in the enclosed volume.

Heating means 315 may be placed between face mullion 302 and mullion front cover 320 to restrict the creating of frost at or near the freezer drawers 220 and 221. The heating means being appropriately connected to a supply of power within the refrigerator in a known manner. The connection may be directly to a permanent supply of power such that the heating means is always operating or may be connected to a timer or control board for the refrigerator to be activated at regular intervals or when needed to prevent frost buildup. A further ethafoam layer or other insulating material (not shown) may be placed between the heating means 315 and the front mullion cover 330 to provide additional insulation.

The mullion of the present invention, described above, permits the use of the dual drawers provided in a bottom mount refrigerator without compromising the interior volume of the freezer compartment.

While the invention has been described in terms of various specific embodiments, those skilled in the art will recognize that the invention can be practiced with modifications within the spirit and scope of the claims.

1. A freezer compartment for a refrigerator comprising a shell having a face with a opening for access to the freezer compartment and further comprising:

   at least two drawers slidably mounted within the opening and configured to seal against the face of the shell; and
   at least one mullion assembly configured between the drawers and further configured flush with the face of the shell.

2. The freezer compartment of claim 1, wherein the mullion assembly comprises a front mullion cover and a mullion body forming an enclosed volume.

3. The freezer compartment of claim 2 wherein an insulating material is located in the enclosed volume.

4. The freezer compartment of claim 1, wherein the mullion assembly further comprises a face mullion configured in front of the front mullion cover and the mullion body.

5. The freezer compartment of claim 4, further comprising a heater configured between the face mullion and the front mullion cover.

6. A refrigerator comprising a shell having a face with at least one opening for access to compartments within the shell one compartment comprising a freezer compartment, the freezer compartment further comprising:

   at least two drawers slidably mounted within the opening and configured to seal against the face of the shell; and
   at least one mullion assembly configured between the drawers and further configured flush with the face of the shell.

7. The freezer compartment of claim 6, wherein the mullion assembly comprises a front mullion cover and a mullion body forming an enclosed volume.

8. The freezer compartment of claim 7, wherein an insulating material is located in the enclosed volume.

9. The freezer compartment of claim 7, wherein the mullion assembly further comprises a face mullion configured in front of the front mullion cover and the mullion body.

10. The freezer compartment of claim 9, further comprising a heater configured between the face mullion and the front mullion cover.

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