

Oct. 22, 1968

P. E. KRONENBERGER

3,407,016

REFRIGERATOR DIVIDER SHELF ASSEMBLY

Filed March 17, 1967

2 Sheets-Sheet 1

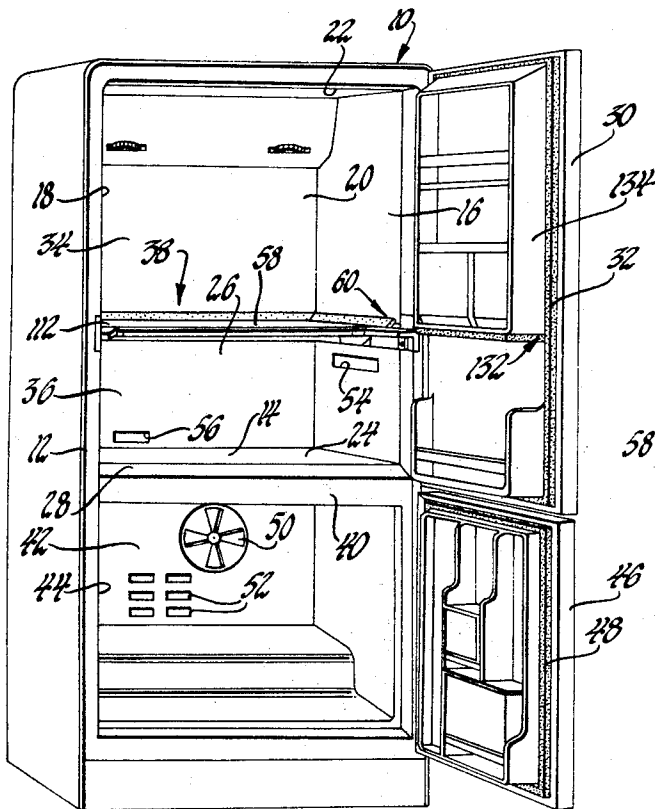


Fig. 1

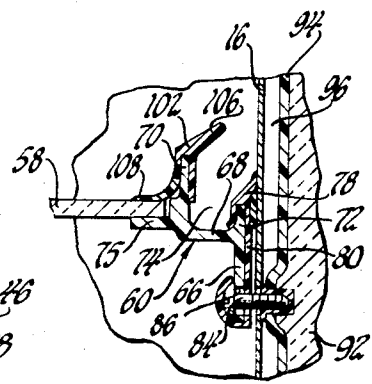


Fig. 3

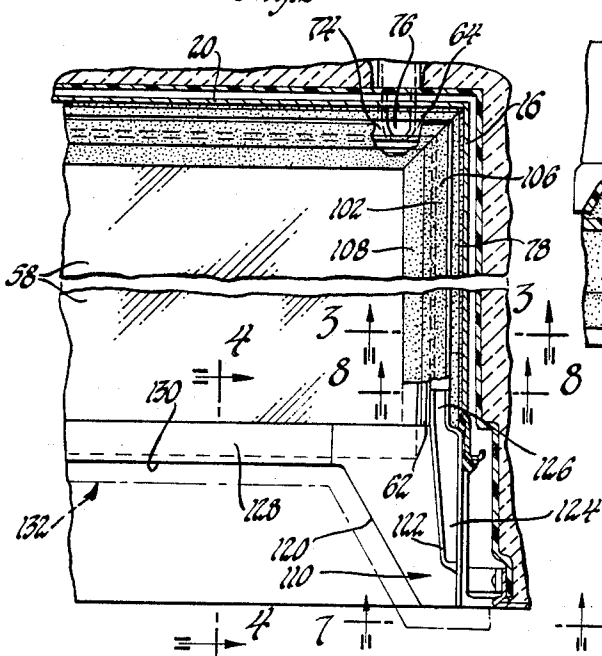


Fig. 2

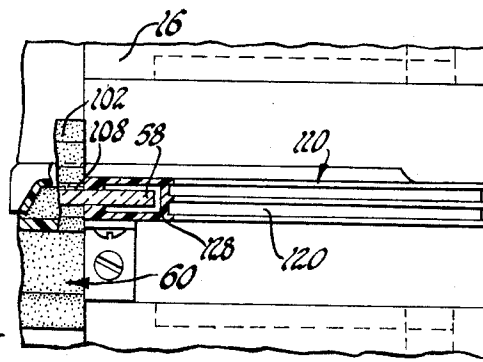


Fig. 4

INVENTOR.
Paul E. Kronenberger
BY
J. C. Luana
ATTORNEY

Oct. 22, 1968

P. E. KRONENBERGER

3,407,016

REFRIGERATOR DIVIDER SHELF ASSEMBLY

Filed March 17, 1967

2 Sheets-Sheet 2

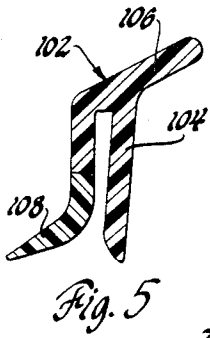


Fig. 5

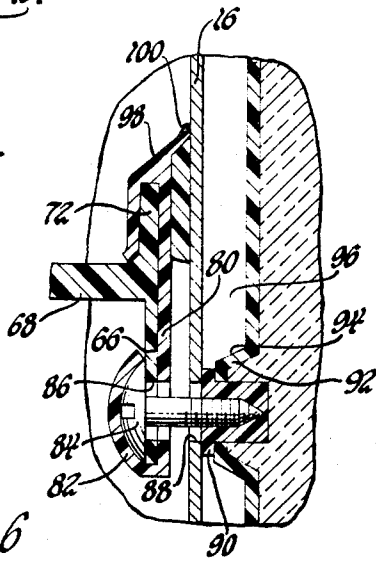


Fig. 6

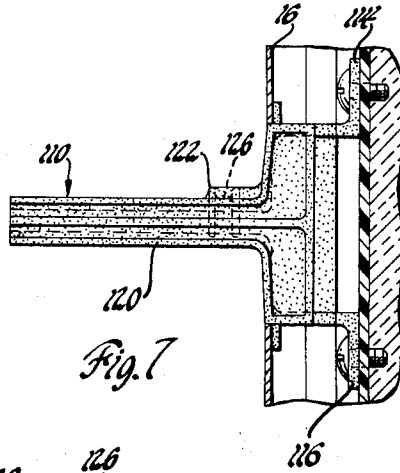


Fig. 7

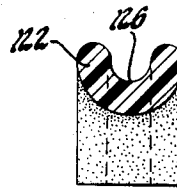


Fig. 8

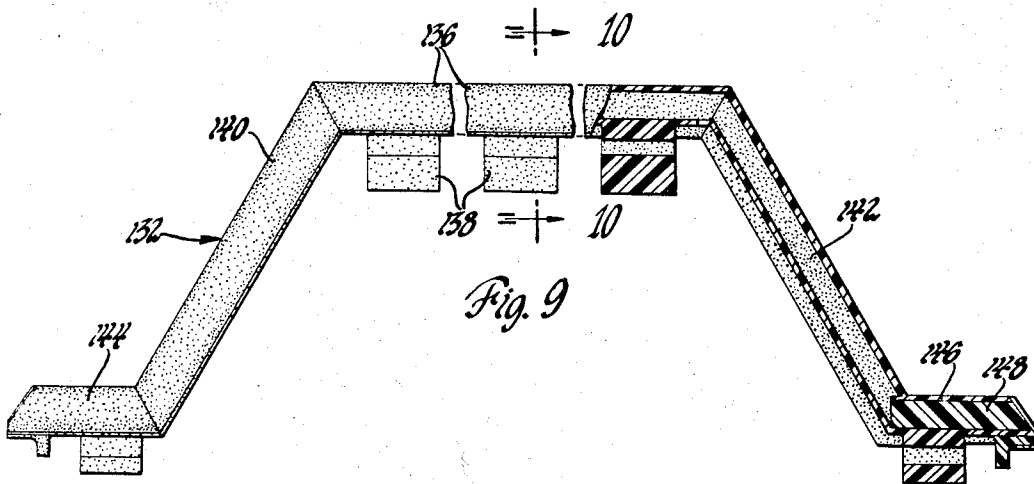


Fig. 9

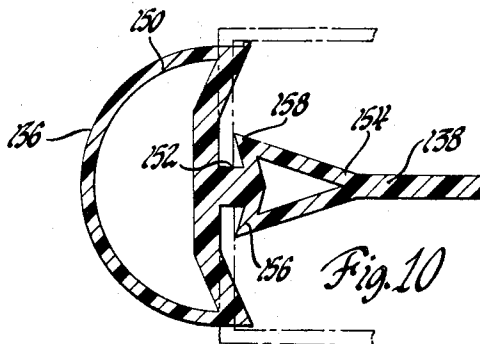


Fig. 10

INVENTOR.
Paul E. Kronenberger
BY
J. C. Evans
ATTORNEY

1

3,407,016

REFRIGERATOR DIVIDER SHELF ASSEMBLY
Paul E. Kronenberger, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Mar. 17, 1967, Ser. No. 623,970

2 Claims. (Cl. 312—296)

ABSTRACT OF THE DISCLOSURE

A refrigerator compartment divider assembly separates a compartment defined by an inner liner into a high humidity compartment and a flowing cold compartment including a divider shelf surrounded by and supportingly received on a support rail. The rail has a drain trough portion and seal supporting edges for a first seal member on the rail for covering the trough and a second seal member on the rail for diverting condensate from the liner walls of the high humidity compartment into the trough.

This invention relates to refrigerator cabinet constructions and more particularly to plural compartment refrigerators including a high humidity compartment with condensate collecting liner walls therein.

In order to improve domestic refrigerators of the plural compartment frost proof type including a forced draft air flow for directly convectively cooling articles placed therein, one or more of the compartments may be sealed against direct food dehydrating air flow therethrough and cooled by radiation to inner liner walls defining a high humidity compartment surrounded by air cooling ducts or the like. One working embodiment of a system of this type is set forth in copending United States application Ser. No. 606,999 to Bright and O'Connell filed Jan. 3, 1967. In such arrangements, the inside liner walls that reduce the temperature within the high humidity section without a forced a draft air flow or the like therethrough are, because of their reduced temperature, under certain ambient conditions, capable of condensing a substantial amount of moisture from the high humidity section. The condensate following a period of operation will collect in amounts requiring the provision of a drain system for condensate removal. The prior art recognizes the necessity for sealing a high humidity compartment in a refrigerator from other compartments therein and it also requires the general desirability of collected condensate from a high humidity compartment in a domestic refrigerator. The present invention is directed to an improved refrigerator divider shelf assembly for both sealing a humidified section of a refrigerator compartment and draining condensate collected on the inner liner walls defining the humidified section.

An object of the present invention therefore is to provide a refrigeration construction having an inner liner with spaced apart side walls and a rear wall defining a refrigerator compartment and wherein the refrigerator compartment is separated into two distinct cooling regions by a divider shelf assembly including a support rail mounted on the side and rear walls of the liner and including a trough portion throughout the longitudinal extent of the rail with spaced apart upstanding edges thereon forming an upwardly facing inlet to the trough and further including a peripheral shelf segment thereon which supportingly receives side and rear edges of a solid divider plate for separating the refrigerator compartment into its first and second cooling regions and wherein the shelf assembly includes a pair of continuous spaced apart sealing means extending throughout the longitudinal extent of said support rail and being secured to the upstanding edges of the rail trough and including portions thereon located in seal-

2

ing engagement with the peripheral edge of the divider plate and the side and rear walls of the inner liner to positively seal against fluid flow between the separated regions of the compartment.

A further object of the present invention is to provide an improved plural compartment refrigerator construction including an inner liner having spaced apart side walls, a rear wall joining the side walls and a top and a bottom defining a refrigerated compartment, means including air flow ducts extending across the outer surface of a part of the inner liner and means for directing a forced draft air flow through the compartment and wherein a divider shelf assembly is located between the air cooled outer wall portions of said liner and the forced draft flow through the refrigerator compartment for separating the compartment into a high humidity region and a flowing cold region, said divider shelf assembly including a supporting rail on the inner liner, a divider plate supported on the rail and seal means on the rail for sealing air flow across the divider plate between the high humidity and the flowing cold regions, and a sealing surface supported on the front edge of said divider plate and extending between said side walls of said liner adapted to sealingly engage a movable sealing member on a door closure member for preventing air flow between the separated regions across the front edge of the divider plate.

Yet another object of the present invention is to form plural, separate spaces within a refrigerator compartment formed in part by an inner liner having vertically directed walls thereon defining an access opening into the compartment by the provision of a divider shelf assembly including a support rail extending continuously across and in spaced relationship with the vertically directed walls of the liner, said rail including a trough portion thereon and a support shelf portion thereon, a divider plate received by said shelf portion and a first seal member supported on said trough portion on said rail continuously along the longitudinal extent thereof for sealing the peripheral edge of said divider plate to the rail and a second seal member supported on the support rail continuously along the longitudinal extent thereof to seal between the support rail and the vertical walls of the inner liner, and means forming a sealed edge along the front portion of said divider plate including a door closure member for said access opening and a seal thereon movable into a sealing relationship with the forward edge of the divider plate.

To summarize, the present invention is found in a domestic refrigerator of the type including a high humidity compartment enclosed by liner walls that are cooled by a surrounding air envelope. Another compartment in the refrigerator is separated by a divider shelf assembly which, in accordance with the invention, includes an imperforate shelf seated on a liner wall mounted rail. The rail includes a trough for collecting condensate from the air cooled liner walls. A seal on the rail seals the peripheral edge of the shelf and includes means for partially covering the trough to prevent food particles and the like from entering the trough.

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:

FIGURE 1 is a view in perspective of a plural compartment domestic refrigerator including the present invention;

FIGURE 2 is an enlarged fragmentary top elevational view showing corner segments of the divider shelf assembly of the present invention;

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along the line 3—3 of FIGURE 2;

FIGURE 4 is an enlarged fragmentary vertical sectional view taken along the line 4—4 of FIGURE 2;

FIGURE 5 is an enlarged sectional view of a protector and seal strip in the shelf assembly;

FIGURE 6 is an enlarged vertical sectional view of a divider seal in the combination;

FIGURE 7 is an enlarged front elevational view of a trim bracket in the combination;

FIGURE 8 is an enlarged vertical sectional view taken along the line 8—8 of FIGURE 2;

FIGURE 9 is an elevational view partially in section showing a movable door seal member of the present invention; and

FIGURE 10 is an enlarged vertical sectional view taken along the line 10—10 of FIGURE 9.

Referring now to the drawings in FIGURE 1, a refrigerator 10 is illustrated including an outer insulated cabinet 12 surrounding an upper inner liner 14 having spaced apart side walls 16, 18, a rear wall 20 joining the side walls, a top 22 and a bottom 24. The liner is of a welded steel construction with each of the walls and top thereof being integrally joined one with the other and in the working embodiment of the invention, the liner is coated with an acid resisting porcelain enamel. The bottom 24 of the working embodiment is anodized aluminum for improving the appearance of the interior of a first refrigerated compartment 26 defined by liner 14. In the illustrated arrangement, the refrigerator 10 further includes a molding strip 28 joining the outer cabinet 12 to the inner liner 14 and defining a front access opening into the refrigerated compartment 26 that is closed by a vertically hinged door closure 30 having a peripheral sealing gasket 32 thereon that, when the door is closed, will sealingly engage the molding strip 28. The compartment 26 is separated into an upper space 34 and a lower space 36 by the divider shelf assembly 38 of the present invention.

In the illustrated embodiment of the invention, the refrigerator 10 further includes an insulated wall 40 for separating and thermally insulating the compartment 26 from a freezer compartment 42 defined by an inner liner 44. The inner liner 44 has a front access opening thereto closed by a lower, vertically hinged door member 46 on which is located a peripheral sealing gasket 48 that will sealingly engage the cabinet access opening into the freezer compartment 42 when the door is closed.

The refrigerator 10 includes an air flow cooling system of the type more specifically set forth in the above-mentioned copending United States application Ser. No. 606,999 to Bright et al. For purposes of the present invention it is only necessary to indicate that the cooling system includes a first motor driven fan 50 for directing air into and through the freezer compartment 42 thence through return grille openings 52 and across an evaporator unit (not shown) for removing heat from the compartment 42. The cooling system also includes a second fan (not shown) and a duct system for directing air through a closed circuit across the evaporator unit thence through a duct system between the outer cabinet 12 and the inner liner 14 surrounding the upper portions of the side walls 16 and 18 and rear wall 20 of the liner 14. Air flow through this duct system cools the upper parts of the side walls 16, 18 and rear wall 20 thereby to cool the space 34 above the divider shelf assembly 38 without passing a forced draft cooling air flow therethrough. As is more specifically set forth in the above-mentioned Bright et al. application, a certain predetermined proportion of the air flow for cooling the outer surface of the food compartment liner 14 is directed through an inlet opening 54 to the lower, separate food storage space 36 and is returned through an outlet opening 56 back to the evaporator unit for removing heat from the separated spaces 34, 36 in the food storage compartment 26. The cooling system preferably is controlled to produce a below freezing temperature condition in the compartment 42 and above freezing temperature conditions in the separated spaces 34, 36 of the food storage

compartment 26 and moreover by virtue of the cooling arrangement in the Bright et al. application, articles stored in the space 34 will not be dehydrated by forced draft cooling of the type found in the compartment 36. Since there is no direct air flow through the space 34, moisture therein tends to condense on the vertically oriented side walls 16, 18 and the rear wall 20. The divider shelf assembly 38 includes means for draining condensate from these vertically oriented walls while concurrently producing a positive seal against convective or forced draft air flow between the relatively quiet zone of space 34, henceforth referred to as a high humidity space and the forced draft or high velocity air flow through space 36 henceforth referred to as a flowing cold space.

The divider shelf assembly 38 more particularly comprises a tempered glass plate member 58 and a divider mounting rail 60 for supporting the plate 58 on the vertically oriented walls of the liner 14. The divider mounting rail 60 includes spaced apart side segments each of which extend from the rear wall 34 across part of the width of the side walls of the liner 14. In FIGURE 2, one of the side segments 62 is illustrated and a like side segment on the side wall 18 (not shown) are joined by a rear rail segment 64 that extends across the full width of the rear wall 20 of the liner 14. As seen in FIGURE 3, the rail segments have a cross-sectional configuration including a flange 66 located in close spaced relationship and in parallelism with the inside surface of an adjacent one of the vertically oriented side walls of the liner 14. Throughout the longitudinal extent of the flange 66 is directed a web member 68 extending interiorly of the refrigerated compartment 26 to join an upstanding ridge 70 formed continuously along the longitudinal length of the rail to the inside flange 66. The flange 66 includes an upstanding edge portion 72 raised above the web member 68 to define in cooperation with the longitudinally directed upstanding ridge 70 a trough space 74 throughout the longitudinal extent of the mounting rail extending across the side walls 16, 18 and rear wall 20 as best illustrated in FIGURES 1 and 2. A shelf 75 on ridge 70 supports plate 58. The trough space 74 is inclined from the front edge of each of the side segments of the rail 60 to the rear segment 64 and the rear rail segment 64 is inclined in the direction of a drain opening 76 formed in the rear rail segment 64 adjacent a corner of the divider mounting rail as best seen in FIGURE 2.

The divider shelf assembly 38 further includes a seal divider member 78 that extends continuously throughout the longitudinal extent of the mounting rail 60 to seal the inside flange 66 thereof to the vertically oriented walls of the food compartment liner 14 both against gravitational flow of condensate from walls around the space 34 into the space 36 and further to prevent flow of the forced draft air flow through the flowing cold space 36 into the high humidity space 34. The seal divider member is better illustrated in FIGURE 6 as including a flexible wall portion 80 that lies in juxtaposition relationship with the outer surface of the inner flange 66 as best seen in FIGURE 3. A bottom flap 82 on the wall portion 80 is fitted over the lower edge of the flange 66 as seen in FIGURE 4, and directed upwardly across part of the inner surface of the flange 66 through which a plurality of suitable mounting rail fastening means are directed so as to secure the mounting rail to the side walls of the inner liner 14. In the illustrated working embodiment of the invention, the fastening means are representatively illustrated as including spaced apart screws directed through the mounting rail, the side walls, and into threaded engagement with clips mounted on interiorly located plastic duct forming members. One such mounting detail as shown in FIGURE 6, includes a screw 84 having a head portion covered by the bottom flap 82 and the threaded shank thereof passed through openings 86, 88 in the rail flange 66 and side wall 16 and into threaded engagement with a button 90 seated in an inwardly directed embossment 92 in a plastic duct

forming member 94 that cooperates with the inner liner 16 to form an air flow passage 96 in a cooling system of the type set forth in the above-mentioned Bright et al. patent.

In addition to the bottom flap, the seal divider member also includes a top flap 98 formed continuously along the longitudinal length thereof which fastens over edge portion 72 of the mounting rail. The top flap includes a crest 100 formed continuously along the length thereof, which as seen in FIGURES 3 and 6, is maintained in a close sealing relationship with the side walls to define an inwardly and downwardly inclined surface across which condensate on the vertically oriented side walls of the high humidity compartment 34 will flow by gravity and thence be collected in the trough space 74 of the divider mounting rail 60, thereafter to flow through the drain opening 76 through suitable tubing (not shown) into a condensate receiving pan (not shown) of the type found in machinery compartments of refrigerators often in proximity to the condenser therein whereby heat from the condenser will serve to evaporate the drained condensate for return to the atmosphere surrounding the refrigerator.

Additionally, the divider shelf assembly 38 includes a longitudinally directed trough protector and shelf sealing gasket 102 which is formed continuously along the longitudinal extent of the divider mounting rail 60 in the same manner as is the seal divider member 78.

As best seen in FIGURES 3 and 5, the sealing gasket 102 includes a main body portion 104 that has an inverted channel shaped cross section. The main body portion 104 fits over the upper edge of the upstanding ridge 70 and is of a flexible plastic material such as a polyvinyl chloride having a hardness in the order of 78 Shore D durometer. An inclined outwardly directed edge 106 on the main body portion is formed continuously along the length thereof, and as seen in FIGURE 4, overlies the trough space 74 thereby serving as a protector against the entrance of foreign matter into the trough space 74 other than condensate collected from the side walls of the high humidity space 34.

One feature of the illustrated sealing gasket 102 is that it includes an integrally, continuously formed sealing edge 108 having greater flexibility than the remainder of the gasket 102. In the illustrated arrangement, the edge 108 is of an extruded polyvinyl chloride material having a hardness in the order of 70 Shore A durometer. It is found that this material is more flexible and will effectively spring bias against the upper surface of the outer edge of the sides and rear of the glass plate 58 to seal the periphery of the plate against air flow between space 36 and space 34 along the shelf supporting segments 75 of the divider mounting rail 60.

Another feature of the improved divider shelf assembly 38 is the manner in which the front edge thereof is sealed between spaces 34 and 36. As best seen in FIGURES 2, 4, and 7, the front edge of the assembly includes spaced apart trim divider brackets 110, 112 located respectively adjacent the liner side walls 16, 18. Referring now more specifically to the trim divider bracket 110, in FIGURES 4 and 7, it is seen to include a pair of mounting ears 114, 116 which are connected to a suitable fixed mounting point on the refrigerator cabinet, for example, a sheet metal flange 118 formed on the outer cabinet 12. The trim divider bracket 110 also includes a sealing surface 120 thereon inclined inwardly and rearwardly of the compartment 26 as seen in FIGURE 2 from the front edge of the side wall 16 to a point immediately forward of the front edge of the divider plate 58. In order to collect condensate from the portions of the side walls 16, 18 that extend vertically of the upper surface of the trim brackets 110, 112 each of the brackets, and as seen on the bracket 110 in FIGURE 2, includes an integral dam defining ridge 122 extending from the front to the rear on one side of the bracket 110 around a condensate collection space 124 which is drained through a channel way 126 that flows into the front edge of the previously described trough space 74.

Between each of the trim divider brackets 110, 112 ex-

tends a divider trim strip 128 that has a channel shaped cross section, as seen in FIGURE 4, fitting over the front edge of the divider plate 58. It will be noted that the divider trim strip 128 has a thickness exceeding that of the divider plate 58 being more suitable as a seal gasket engaging surface for preventing air flow across the front edge of the divider shelf assembly 38.

The sealing surfaces 120 on the trim divider brackets and a forwardly facing sealing surface 130 on strip 128 cooperate with a movable sealing gasket 132 that is supported on the lower edge of a door pan 134 on the upper door 30.

As best seen in FIGURE 9, the movable sealing gasket 132 is a continuous strip having a shape corresponding to the recessed configuration formed by the trim brackets 110, 112 and divider trim strip 128. The strip thus includes a forward strip portion 136 with a plurality of tabs 138 integrally formed thereon for sealing the forward strip to suitable fixed points on the door pan 134. The strip 132 also includes side strips 140, 142 inclined rearwardly of the forward strip 136 in the direction of the side walls of the door pan 134 along an angle complementary to that of the sealing surfaces 120 on the brackets 110, 112. On the opposite ends of the gasket 132 are end segments 144, 146 each of which includes a foamed urethane reinforcing insert 148.

As seen in FIGURE 10, the forward strip 136 at the tab portion 138 thereon has a cross-sectional configuration forming a hollow hemispherical nose portion 150 connected by a web 152 to a bayonet cross-sectional shaped connector 154 including barbs 156, 158 adapted to maintain the interior edge of the forward strip 136 in a good compressed sealing relationship with the supporting door pan 134. When the upper door 30 is closed, the movable sealing gasket 132 on the door pan 134 is positioned so that the forward strip 136 thereon engages across the full length of the divider trim strip 128 and the side strips 140, 142 thereof engage the sealing surfaces 120 on the brackets 110, 112 to maintain a complete air flow seal across the divider plate 58 whereby the high humidity conditions within space 34 are unaffected by the forced draft air cooling process within the space 36.

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

What is claimed is:

1. In a refrigerator construction the combination of, means defining a refrigerator compartment including an inner liner having spaced apart side walls, a rear wall joining said side walls, a top and a bottom, divider means for separating said refrigerator compartment into first and second regions, means for cooling said first region by passing air into heat transfer relationship with the outer surface of said liner without directing air through said first region, means for cooling said second region by passing air flow therethrough, said divider means including a support rail extending continuously across said rear and side walls of said compartment forming inner liner, said support rail including a peripheral support shelf thereon located in spaced relationship to said rear and side walls of said liner means, a solid divider member mounted on said shelf portion of said support rail, seal means on said support rail engaging said solid divider member for preventing air flow across it and said support rail between said regions, said seal means including an upwardly directed protector strip thereon overlying said mounting rail in spaced relationship thereto throughout the longitudinal extent thereof, said mounting rail including a trough therein for draining condensate collected on said liner walls within said first region, said protector strip having a downwardly inclined surface thereon for diverting foreign matter from collecting in said trough.

2. In a plural compartment refrigerator including a high humidity section with an inner liner having condensate collected thereon and a flowing cold section, the combination of, means for sealing between the high hu-

7

midity compartment and flowing cold compartment comprising liner means having spaced apart side walls, a rear wall joining said spaced apart side walls, a support rail extending across said rear wall and said side walls intermediate the upper and lower edges thereof, said support rail including a flange thereon in juxtaposition with said liner walls, means for securing said flange to said side walls, means forming an upwardly facing trough on said rail at a point inwardly of said liner walls, said rail further including a shelf segment thereon on the opposite side of said support rail from the flange, an air impervious member located in a horizontal plane extending through said liner walls and occupying substantially the full planar extent bounded by said walls, said air impervious member having an outer edge thereof supportingly received by said shelf segment of said support rail for dividing the space bounded by said liner walls into an upper region and a lower region, a sealing strip supported by said trough portion of said rail including an inwardly directed continuously formed lip overlying and sealingly engaging the upper surface of said air impervious member at the outer edge thereof for sealing against air flow from said upper region to said lower region between the outer edge of said air impervious member and said support rail, and a second seal member located continuously between the flange of said support rail and said liner walls including a segment thereon sealingly biased between said support rail and said liner wall for preventing air flow between said upper region and said lower region therebetween, said air impervious member including a front edge thereon extending between said side walls, a pair of spaced apart brackets secured to said liner side walls adjacent said

8

mounting rails and extending forwardly thereof from the front edge of said air impervious member forming side sealing surfaces, a member supported on the leading edge of said air impervious divider member between said forwardly directed bracket members and forming in cooperation therewith a forwardly located sealing surface between said upper and lower regions, a door member including a door pan, means for supporting said door member for movement relative to said forwardly located sealing surface, a divider seal supported on said door pan including side portions thereon directed inwardly of said refrigerator compartment when the door is closed and a segment thereon joining said side portions transversely of said door member, said transversely extending seal segment sealingly engaging said member on the leading edge of said divider member with the door member in a closed position and said side sealing members sealingly engaging the sealing surfaces on said side brackets for preventing air flow between the upper and lower regions of said compartment when the door is in a closed position.

References Cited

UNITED STATES PATENTS

25	2,501,540	3/1950	Ryan	312—214
	2,593,305	4/1952	Hunter	49—476
	2,682,754	7/1954	Eck	312—214 X
	3,222,114	12/1965	Stentz	312—214
30	3,291,546	12/1966	Traycoff	312—214

JAMES T. McCALL, *Primary Examiner*.