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2,412,904

REFRIGERATING APPARATUS

Original Filed Dec. 10, 1941 2 Sheets-Sheet 1

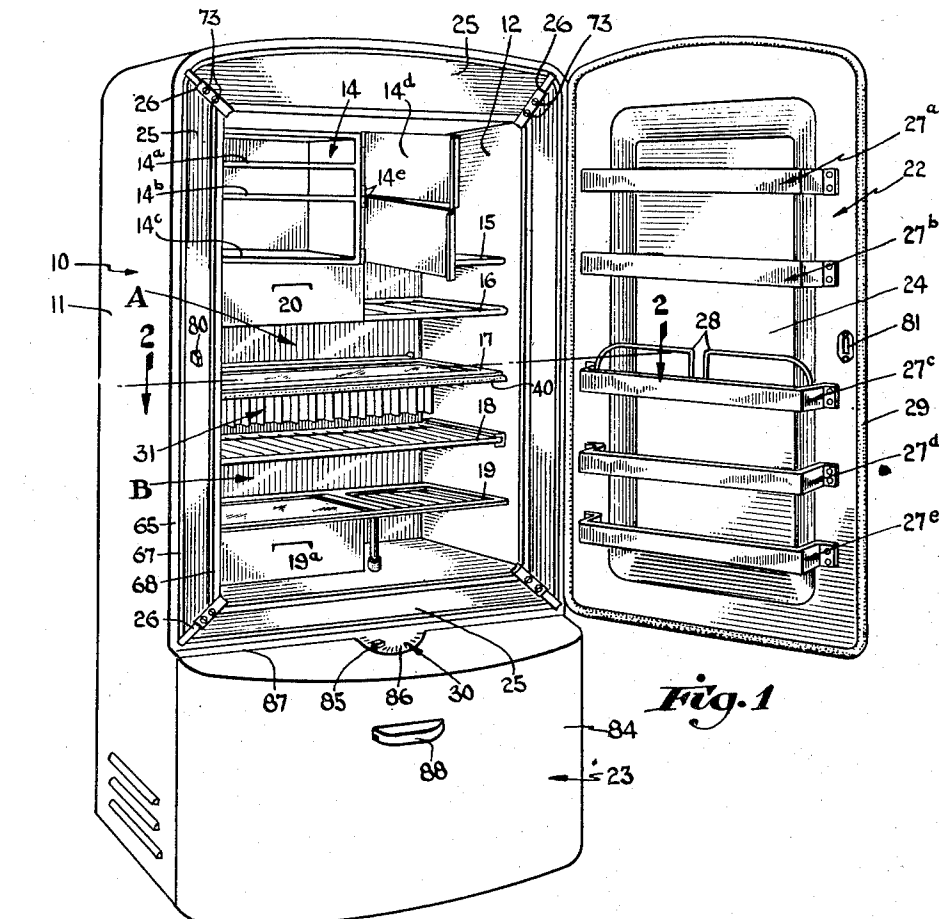


Fig. 1

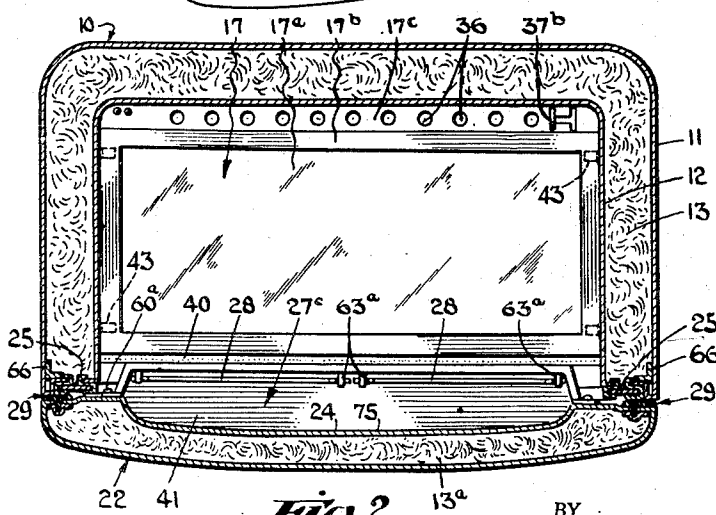


Fig. 2

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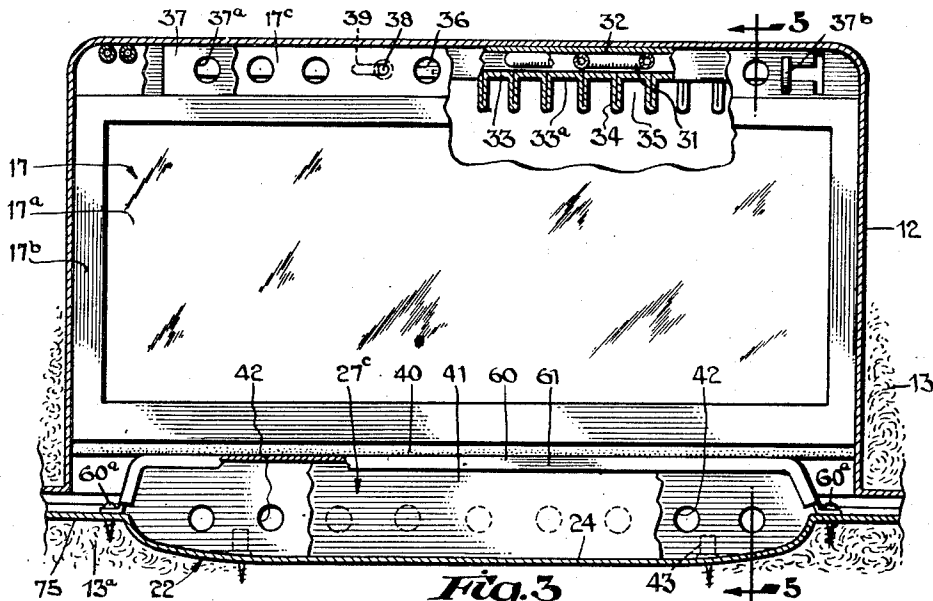
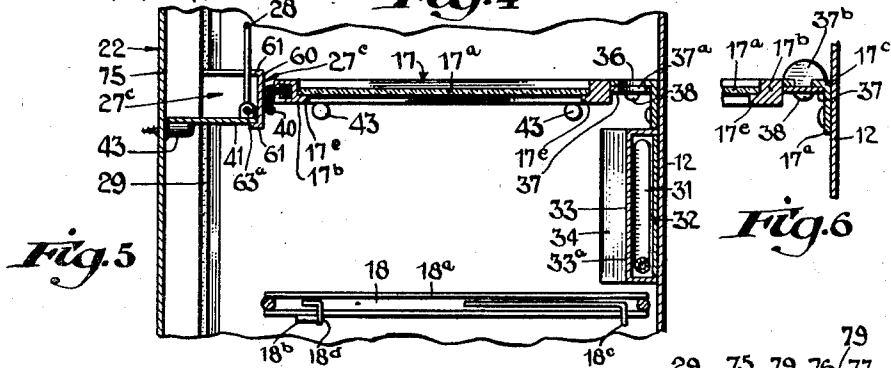


Fig. 6

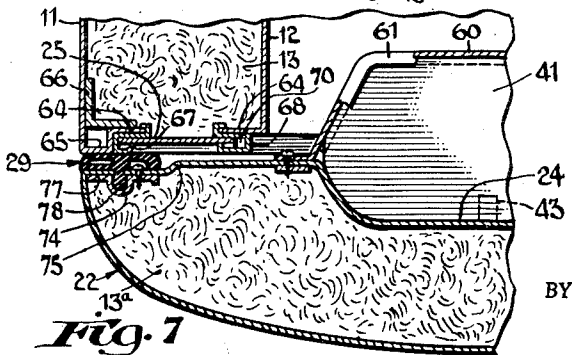


Fig. 7

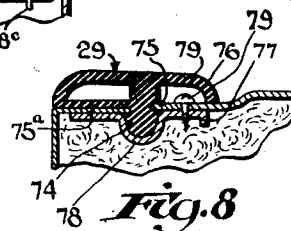


Fig. 8

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REFRIGERATING APPARATUS

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7 Claims. (Cl. 62—89)

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This invention relates to refrigerators, and is particularly concerned with cabinets and mechanisms for refrigerators of the household type. The invention will be described in connection with an electric refrigerator of the compression-expansion type, but is not limited thereto.

An object of the invention is to provide a household refrigerator which is simple in design, economical to manufacture, convenient and accessible to the user, and efficient in operation.

Other objects are to provide separate compartments for the storage and preservation of foods not requiring below freezing temperatures, to provide substantially independent heat absorbing means within said compartments, and to promote high humidity conditions within one of said compartments for the preservation of foods susceptible to damage by normal dry cold refrigeration.

Another object is to provide a simple and useful shelf structure within and upon the inner side of the door of the refrigerator. In this respect the invention is an improvement over that described and claimed in the patent to West, Reissue No. 19,008, dated November 21, 1933.

Another object is to provide a shelf or partition between the aforesaid separate compartment and to provide perforations therein which can be opened or closed at will.

A further object is to provide novel sealing means between the shelf or partition dividing the respective refrigerator compartments and the refrigerator door, and between the walls surrounding the access opening of the refrigerator and the door.

A still further object is to provide shelf constructions of simple and convenient design and of distinct utility.

This application is a division of our application Serial No. 422,422, filed December 10, 1941.

The novel features that we consider characteristic of our invention are set forth in the appended claims; the invention itself, however, both as to its organization and method of accomplishment together with additional objects and advantages thereof will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of a cabinet constructed in accordance with the principles of the invention.

Figure 2 is a horizontal section taken along line 2—2 of Figure 1, with the door closed.

Figure 3 is an enlarged view similar to Figure 2, 55

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with certain parts either omitted or broken away to show the underlying structure.

Figure 4 is a fragmentary view of the shutter device shown in Figures 2 and 3, with the shutter closed and with parts broken away to show the underlying structure.

Figure 5 is a fragmentary section taken along line 5—5 of Figure 3.

Figure 6 is a section along line 6—6 of Figure 4.

Figure 7 is a horizontal section through the refrigerator and door, showing the breaker strip construction and door gasket.

Figure 8 is a sectional view of the novel door gasket utilized with the cabinet structure of the invention.

Referring now to Figures 1 to 5, the cabinet 10 comprises a one-piece metallic casing 11 and an inner liner 12 also constructed of one piece and preferably made of porcelain covered metal. Between the members 11 and 12 is provided the usual insulation 13, which may be made of rock wool or other fibrous silicate. There is provided a primary evaporator 14, shelves 15—19, meat drawer 20, crisper pan 19a, and door 22. A refrigerating mechanism or operating unit, not illustrated, is disposed at the bottom of the cabinet to the rear of the vegetable bin 23. Within the evaporator may be horizontally disposed shelves 14a, 14b, 14c, one or more of which may be refrigerated, and evaporator doors 14d may conveniently be provided. The evaporator doors preferably are mounted on spring hinges 14e to keep them closed and avoid interference with the refrigerator door 22.

The door 22 is preferably recessed somewhat as at 24 after the fashion of the door described in the West reissue patent referred to, and providing a thickness 13a of insulation between the inner surface of said recess and the outer shell or covering of the door.

Other features shown in Figures 1 and 2 comprise breaker strips 25, strip 26, door shelves 27, 27a, 27b, 27c, 27d and 27e, retainers 28, door gasket 29 and temperature control 30 to which more detailed reference will hereinafter be given.

The cabinet is divided by the shelf or partition 17, preferably of glass, into an upper compartment A for storing dry or enclosed foodstuffs and a lower compartment B for the storage of foodstuffs, such as leafy vegetables, requiring high humidity conditions. If desired a temperature differential between the two compartments may be maintained. Openings 36 are provided at the rear of said shelf and an adjustable shutter device, hereinafter to be more fully described, is

arranged to regulate such openings. Fast freezing is, of course, accomplished within the compartment enclosed by the evaporator 14.

The primary evaporator 14 in compartment A is of relatively large capacity and is adapted for the storage of meats and frozen foods as well as for ice-making. In the exemplary embodiment the evaporator is mounted to one side of the cabinet with the shelves 15 and 16 alongside the evaporator, supported on one side by a plurality of studs screwed into the wall of the compartment. The opposite sides of the shelves are supported by a pair of L-shaped brackets extending about the side and bottom of the evaporator and secured to the top and side wall of the cabinet preferably by screws and as shown in our copending application Serial No. 422,422, filed December 10, 1941. The shelves 15 and 16 rest upon angular lugs, secured to the respective brackets, and the shelves may if desired, be held in place by means of studs screwed into the brackets above the shelves, which, in conjunction with depending pins at the front and rear, prevent removal of the shelves.

Heat is absorbed from compartment B by a secondary evaporator 31 insulated from the wall or liner 12 by a gasket member 32. The secondary evaporator may be connected to a secondary condenser (not shown), which in turn may be secured to the primary evaporator in the manner described and claimed in our Patent 2,301,313, dated November 10, 1942.

In order to increase the rapidity with which heat may be absorbed by evaporator 31, the same may be secured to, as by a metallic connection, a finned structure 33a, the fins 34 of which may be formed by doubling over a metallic sheet 33 as shown in Figure 3. The space 35 between the fins are advantageously used to direct a current of air upwardly or downwardly within the compartment and toward or away from the openings 36 disposed at the rear of the shelf 17. The direction of the air current will depend on the temperature and humidity conditions within the compartment B.

It will be noted from an examination of Figures 3 to 5, that the illustrative shelf 17 consists of a glass panel 17a disposed in a frame 17b to the rear of which is provided a strip 17c in which openings 36 are provided. The shelf as a whole therefore may be considered a perforate shelf. Strip 17c may conveniently assume the form of an angle member having a depending portion adapted to be secured to liner 12. A sliding shutter 37 is provided with openings 37a arranged to register with the openings 36, and an up-turned handle 37b may extend through a slot in the strip for regulating the extent of the open space between the two compartments. The strip 17c may be provided with a screw 38 on its lower side and a slot 39 formed in the shutter 37 permits the sliding movement to take place.

The secondary evaporator 31 operates at a refrigerating temperature high enough to substantially eliminate frosting in the compartment B. The compartment B maintains a high degree of humidity to conserve the natural food moisture of its contents yet with a temperature sufficiently low for safe storage. These conditions are ideal for keeping certain classes of foodstuffs, for example, leafy vegetables, salads, fruits, and sliced meats which normally deteriorate when exposed to the dehydrating influence of the dry cold compartment A, a high percentage of the moisture derived from foods stored there being deposited on the evaporator 14 in the form of frost.

The shutter 37 provides for the ingress and egress of air between the compartments A and B and may be utilized to maintain a normal degree of moisture during excessively humid weather. During such periods, the shutter slide may be conveniently adjusted to a partial or full open position to permit a movement of air between the compartments. Any such movement tends to cause a partial dehydration of the air in compartment B. The shutter adjustment is likewise of utility in maintaining proper humidity for various kinds of foodstuffs. It is to be noted that when there is a temperature differential between the two compartments there will be some actual circulation of air therebetween, but when the temperature within the compartments is the same the movement of air will be derived from the difference in vapor pressure between the compartments and will be of small magnitude.

The forward edge of the shelf 17 is provided with a resilient sealing strip. The strip 40, clamped within a groove formed along the edge of the frame 17b, is preferably of rubber for making a sealing union with the door shelf 27c when the door is closed. As shown in Figures 2, 3 and 5, for this purpose the door shelf 27c is conveniently provided with a closed bottom 41, while the remaining shelves 27a, 27b, 27d and 27e disposed within the compartments A and B have their bottoms apertured as at 42 to permit free circulation of air within the respective shelves.

The dividing shelf 17 may be made of glass to render the contents of the lower shelves visible from above and to facilitate cleaning. The plate may be marginally supported within the frame 17b upon a flange 17e of the frame. The frame along its rear edge adjoins the apertured strip 17c, which is rigidly secured to the rear wall of the cabinet, and the side edges of the frame may be supported upon a plurality of studs 43 screwed into the side walls or liner of the cabinet.

Within the compartment B, directly beneath the dividing shelf 17 may be disposed a sliding shelf 18 supported along its opposite side edges within channels 18a secured to the side walls of the refrigerator compartment. The channel includes at its forward end a lug 18b, engageable by a stop 18c in the form of a rod secured to the shelf, the rod having its end bent at right angles to form a stop, see Figure 5. The shelf may be latched in place by a pivoted latch pin 18d engaged against the lug as shown in Figure 5. When this structure is provided and it is desired to withdraw the shelf, the latch pin is raised in an unlatching position permitting the shelf to be pulled outwardly. The bent portion of rod 18c engaging the lug 18b ordinarily prevents accidental dislodgement of the shelf from the channels when the shelf is drawn out merely to remove articles therefrom. When it is desired to entirely remove the shelf, the rod 18c is sprung clear of the lug, thus permitting complete removal.

The door shelves 27a, 27b, 27c, 27d and 27e, each constitute a vertical member or rail 60 secured at opposite ends to the door liner or frame, each rail having at least one stiffening flange 61, the opposite ends of the rails being bent outwardly and secured to the door, as by screws 60a. The lower flange 61 supports one edge of a removable base plate or bottom 41 and the opposite edge is supported upon the liner, for instance by a plurality of studs 43 screwed therein. One shelf of the series, for instance 27c may be provided with a pair of U-shaped folding racks 28, which

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in erected position, as shown in Figure 1, serve as retainers primarily for bottles and the like. The racks are individually pivoted at their lower ends upon the bottom 41, for instance on lugs 63a struck out from the bottom member 41 as shown in Figure 5. When not in use, the racks may be folded flat on the bottom of the shelf.

The inner and outer walls of the refrigerator cabinet are preferably of one piece stamped sheet metal construction, suitably finished in enamel or porcelain. In order to prevent the passage of heat from the outer shell or wall 11 to the interior liner 12 across the front of the cabinet, the continuity of the walls is interrupted by suitable heat insulating breaker strips 25 marginally framing the food storage compartment. In order to secure the strips, the respective edges of the inner and outer shells are bent toward each other, and outer wall 11 including a protruding longitudinal rib 65 upon which the door gasket seats. An angle iron or stile 66 is secured, as by welding, in the corner behind the rib 65 to reinforce the same.

The door of the refrigerator is adapted completely to overlie the front margin of the cabinet constituting the breaker strips 25, with the door gasket 29 seated upon the exterior frame extensions 65 of the outer wall. The door gasket 29 as detailed in Figures 7 and 8 is preferably of rubber or other resilient material, tubular in cross section and extending around the marginal edge of the door. The tubular configuration lends additional resiliency to the gasket for maintaining a close sealing engagement with the marginal member 65 and molding strip 67. The gasket is secured by means of longitudinal tongue 74 integral therewith, extending within the interior of the door and clamped between the edge of the door liner 75 and a marginal flange 75a bent inwardly from the exterior shell of the door.

The door liner 75 forming the interior panel or face of the door, is of heat insulating material, preferably of a plastic composition of the synthetic resin type. It is secured by a series of screws 76 through the edge of the liner engaged in a plurality of mounting plates 77 welded or otherwise secured to the marginal flange 75a. The plates 77 include a semi-circular corrugation 78 to receive the tongue 74 of the gasket, as shown in Figure 8. The door gasket includes along its inner edge a flap 79 overlying and concealing the screws 76. In applying the screws, the flap is lifted back for access to the screws. After each screw 76 is secured in place the flap 79 springs back into the position shown in Figures 7 and 8 thus effectively sealing the joint. It will be noted that means 76 not only locks the gasket and seals it in place but also serves to secure the inner liner 75 in its proper place within the door 22. The flap 79 also serves as an additional seal for the door.

The door includes a suitable latching mechanism which may be of any desired construction. As illustrated in Figure 1, the stationary catch element 80 for the latch is mounted over the face of the breaker strip 25, the door having a recess 81 housing a strike to receive and engage the catch element when the door is closed. The catch element 80 is secured preferably by screws to a reinforcing plate 82, concealed beneath the breaker strips and secured to the respective margins of the shells.

A temperature control device 30 is located at the front of the cabinet on a bracket 86 formed

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on the outer bottom edge of the refrigerator. The refrigerator mechanism is preferably placed well back of the lower compartment in order to leave space for a vegetable bin formed integrally with a cover or door 84. The door 84 substantially duplicates the contour of the refrigerator door, so that when both doors are closed the cabinet front presents a relatively uninterrupted vertical surface, with the control device 30 concealed by the refrigerator door.

The control device may be of well known construction having a pointer arm 85 having one end pivotally connected in any desired manner to the temperature regulating apparatus of the refrigerator system. The pointer is arranged to swing in an arc relative to the bracket 86 which may conveniently take the form of a stationary sector plate. The plate may be provided with suitable graduations or indicia thereon for setting the refrigerator for various temperatures and for defrosting.

The pointer arm lies directly beneath the sector plate 86 and has its outer end or pointer extended around and hooked over the edge of the plate for registry with the indicia thereon.

The vegetable door 84 is preferably pivoted at the bottom so that its upper portion pulls away from the cabinet along the line 87, a hand hold 88 being provided at the front of the door for this purpose. In order to provide clearance for the pointer, the top of the vegetable door has a semi-circular cut-out sector complementary to the sector plate 86 and slightly larger than the plate to provide a narrow spacing therebetween for accommodating the pointer. Since the pointer is formed of relatively thin flat metal, the spacing or clearance between the plate 86 and the door may be relatively minute and inconspicuous for preserving a neat and finished appearance. The arrangement likewise facilitates manufacture and assembly, since it is not necessary to form a slot or opening in plate 86 for traversing the pointer. If desired, the pointer may be provided with a lug or finger hold to facilitate adjustment.

Since the refrigerating system forms no part of the present invention, it is not deemed necessary to illustrate the same in conjunction with the temperature regulator.

The various improved features of the invention promote cleanliness and provide a refrigerator of economical and rugged construction, extreme simplicity of manufacture and assembly, and give the refrigerator a neat and trim appearance. The door construction including the insulating door liner and improved door gasket promotes a high degree of operating efficiency.

The shelves 15 to 19 are removable and may be either of wire grid form or they may be of glass as desired. The top shelf 27 has its floor recessed for holding eggs.

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

1. In a refrigerator cabinet having a food storage compartment, the combination comprising a horizontal perforate shelf within the compartment for dividing the same into respective upper and lower sections, a heat absorbing unit for the upper section and a heat absorbing unit for the lower section for respectively maintaining relatively low humidity conditions in the upper section and relatively higher humidity conditions in the lower section, a door for said food compartment, the door having a recessed portion interiorly thereof and having a plurality of storage

shelves disposed within said recess, one of said door shelves being imperforate, a resilient sealing strip disposed along the forward edge of said first mentioned horizontal perforate shelf for making a sealing engagement with an edge of said imperforate door shelf when the door is closed, and an adjustable device disposed along the rear edge of the first mentioned horizontal perforate shelf for closing the perforations thereof.

2. In a refrigerator cabinet having a food storage compartment, the combination comprising a horizontal perforate shelf within the compartment for dividing the same into respective upper and lower sections, a heat absorbing unit for the upper section and a heat absorbing unit for the lower section for respectively maintaining relatively low humidity conditions in the upper section and relatively higher humidity conditions in the lower section, a door for said food compartment, the door having a recessed portion interiorly thereof and having a plurality of storage shelves disposed within said recess, one of said door shelves being imperforate, means for permitting the circulation of air between certain other of said door shelves, a resilient sealing strip disposed along the forward edge of said first mentioned horizontal perforate shelf for making a sealing engagement with an edge of said imperforate door shelf when the door is closed, and an adjustable device disposed along the rear edge of the first mentioned horizontal perforate shelf for closing the perforations thereof.

3. In a refrigerator cabinet having a food storage compartment, a door for the compartment, a horizontal perforate shelf within the compartment for dividing the same into respective upper and lower sections, both accessible from the front through a door, a heat absorbing unit for the upper section and a secondary heat absorbing unit for the lower section, the secondary heat absorbing unit extending across the rear wall of the lower section and being insulated therefrom, said unit including a plurality of heat absorbing fins for conducting heat from said lower section and for directing circulating air, an adjustable device disposed along the rear edge of said shelf above said fins for controlling the openings between the respective sections, and a sealing strip disposed along the front edge for contact against a part of said door when the same is closed.

4. A refrigerator cabinet comprising in combination a food storage compartment divided horizontally by an imperforate partition forming upper and lower compartments, an evaporator in each compartment for maintaining different conditions therein, a door for said compartments, said door being recessed interiorly and having

an imperforate storage shelf disposed at least partially within said recess, said shelf including a vertical member serving as a retaining means for articles placed thereupon, said partition having a resilient sealing member in its forward edge, cooperating with said vertical member when said door is closed, said partition, sealing member and shelf cooperating so that the conditions within each compartment of the cabinet may be maintained substantially independent of the other.

5. A refrigerator cabinet comprising in combination a food storage compartment, an imperforate partition disposed horizontally within said compartment, and dividing it into upper and lower sections, a refrigerant evaporator within each section for absorbing heat therefrom, a door for said compartment, a recess in said door, shelves in said recess, an intermediate shelf disposed adjacent said partition, an imperforate bottom for said shelf, a resilient sealing member disposed between said intermediate shelf and said partition, and cooperating therewith whereby when said door is closed the respective sections may be separated from one another.

6. A refrigerator cabinet comprising in combination a food storage compartment, an imperforate partition disposed horizontally within said compartment, and dividing it into upper and lower sections, an evaporator within each section, a door for said compartment, a recess in said door, shelves in said recess, an intermediate shelf disposed adjacent said partition, an imperforate bottom for said shelf, a resilient sealing member disposed between said intermediate shelf and said partition, and cooperating therewith whereby when said door is closed the respective sections may be separated from one another, the other shelves having perforate bottoms whereby circulation of air within each separate section including the shelves therein is uninterrupted.

7. A refrigerator cabinet comprising in combination a food storage compartment, an imperforate partition disposed horizontally within said compartment, and dividing it into upper and lower sections, a refrigerant evaporator for each section for absorbing heat therefrom, a door for said compartment, a recess in said door, shelves in said recess, an intermediate shelf disposed adjacent said partition, an imperforate bottom for said shelf, a resilient sealing member disposed between said intermediate shelf and said partition, and cooperating therewith whereby when said door is closed the respective sections may be separated from one another.

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