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2,748,573

REFRIGERATOR HAVING AN ADJUSTABLE EVAPORATOR CONSTRUCTION

Filed Jan. 21, 1953

3 Sheets-Sheet 1

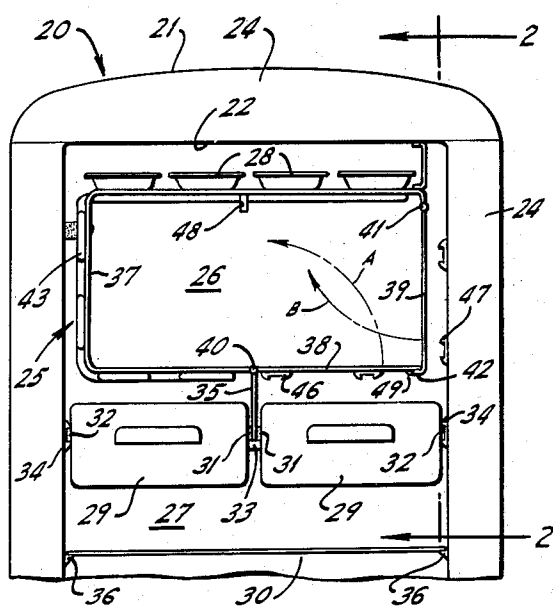


FIG. 1.

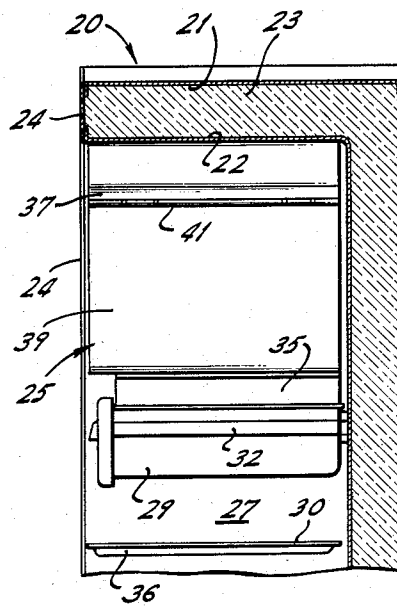


FIG. 2.

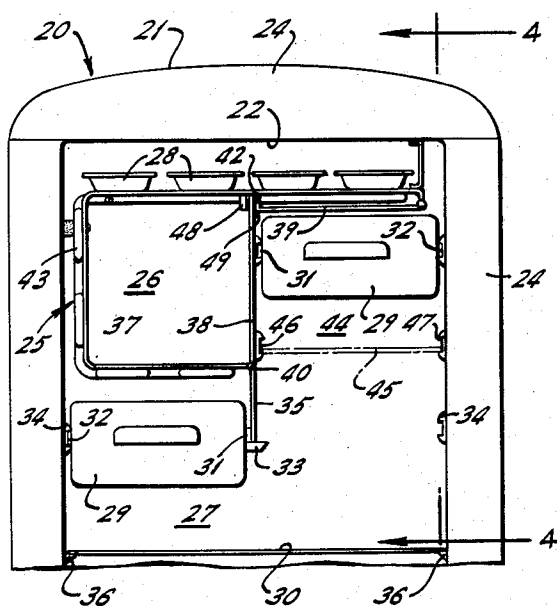
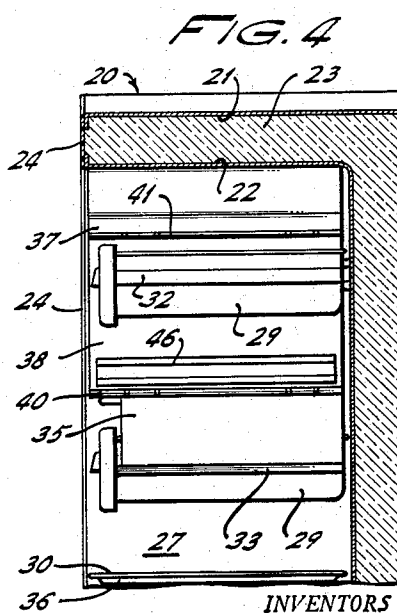


FIG. 3.



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FIG. 11.

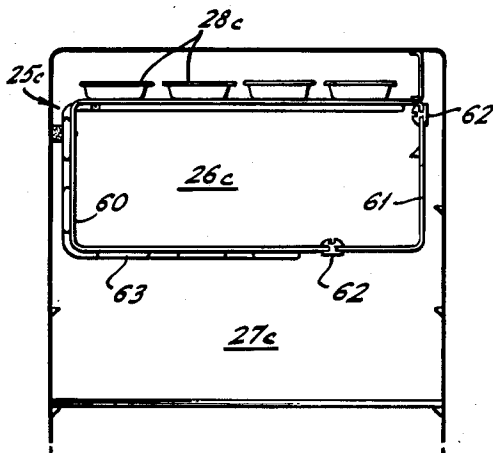


FIG. 12.

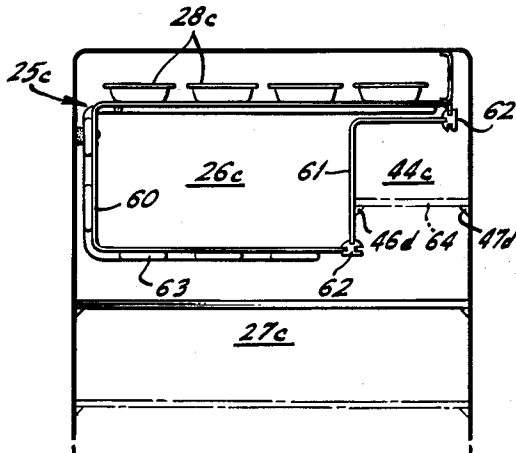


FIG. 13.

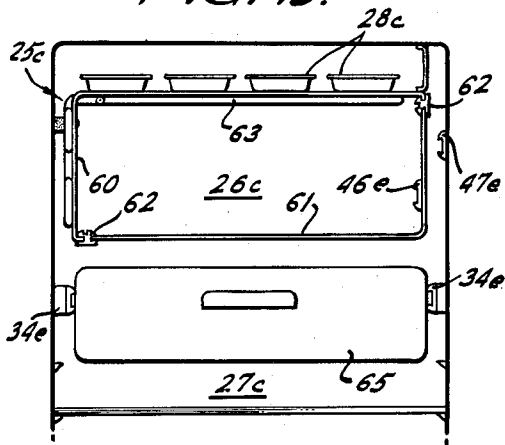


FIG. 14.

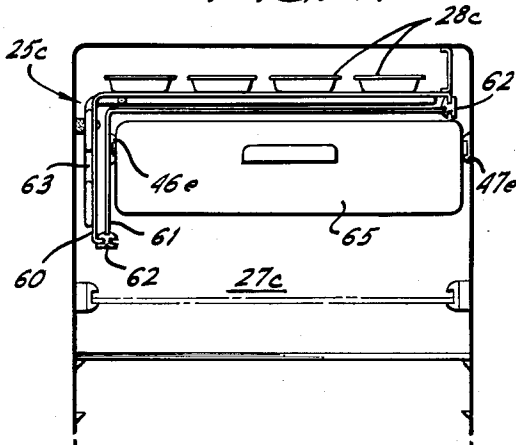
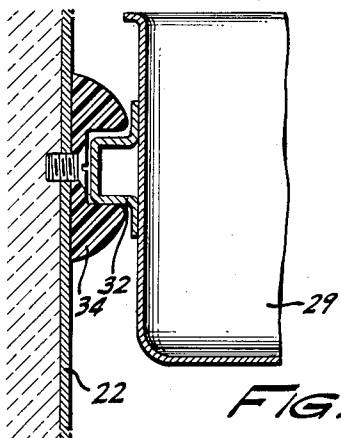


FIG. 15.

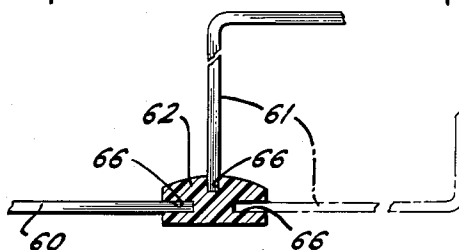


FIG. 16.

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REFRIGERATOR HAVING AN ADJUSTABLE EVAPORATOR CONSTRUCTION

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Application January 21, 1953, Serial No. 332,416

13 Claims. (Cl. 62—89)

The present invention relates to refrigeration apparatus and, particularly, to evaporator construction for household refrigerators. More specifically, the invention herein disclosed and claimed has to do with a novel evaporator structure which makes it possible to adapt the storage space within a refrigerator cabinet to the needs of the user in storing food or food containers.

In modern household refrigerators, the evaporator body or shell which defines the freezing compartment, is mounted to span substantially the full distance between opposite interior side walls of the refrigerator cabinet and is constructed to occupy a predetermined portion of the total interior space of said cabinet, the remaining portion of said space providing a non-freezing compartment. It will be understood that with a construction of that kind, the storage capacity of the freezing compartment and the storage capacity of the non-freezing compartment are fixed with respect to each other and, because of the fixed ratio of freezing space to total storage space, it is impossible to utilize any unused portion of the freezing compartment for storage at non-freezing temperatures. In order to enhance the usefulness of refrigerators of the above mentioned kind, it has been proposed to construct the evaporator in two sections one of which is adjustable with respect to the other so that the freezing space normally defined by said evaporator can be reduced, and the non-freezing space proportionately increased, to provide for additional storage at non-freezing temperatures, when desired. An example of that type of arrangement is found in the patent to Malcolm G. Shoemaker and Elmer W. Zearfoss, Jr., No. 2,597,267, dated May 20, 1952. Although, arrangements of the latter variety are advantageous, they give rise to certain constructional difficulties and operational problems brought about by the necessity of providing some form of flexible connection between the cooling coils of the two sections of the evaporator.

It is an object of the present invention to overcome these difficulties and problems and still preserve freedom in adjustment of the freezing compartment or evaporator to suit the convenience of the user.

Another object of the invention is to provide a simplified arrangement and association of compartment-defining elements which, by simple manipulation, makes it possible for the user to rearrange the interior of the refrigerator cabinet to gain maximum storage usefulness.

Other features which characterize the invention have to do with versatility in correlating various component parts to effect a variety of food storage arrangements, with convenience in rearranging cooperative parts to provide for desired storage arrangements, and with simplicity in adapting companion fixture elements to facilitate the rearrangement of storage space.

Broadly, in achievement of the above noted objects and features, the invention utilizes an evaporator structure or shell including movable complementary parts or sections which can be located in different cooperative positions to attain various arrangements of storage space,

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pan, trays, shelves and like supports, interiorly of the refrigerator cabinet. In a narrower aspect, the invention employs an evaporator shell constructed of preformed sections, certain of said sections being connected, either pivotally or detachably, for placement in different positions. In one of said positions the preformed sections of the evaporator shell cooperate to constitute a freezing compartment of predetermined volume, and in another of said positions said sections cooperate to define a freezing compartment of reduced volume and to add to the non-freezing compartment a portion of the space which is normally allocated to the freezing compartment. In addition, the movable sections can be provided with fixture elements which cooperate with similar elements disposed on the interior wall of the refrigerator cabinet so that pans, trays, shelves or similar holding or supporting means can be arranged in the space which is added to the non-freezing compartment by selective relocation of said sections.

The manner in which the above recited and other objects and advantages are best achieved, will be fully understood from the following description of the embodiments and various forms illustrated in the accompanying drawings, in which:

Figure 1 is a front elevational view of a portion of a domestic refrigerator provided with an evaporator constructed in accordance with a preferred embodiment of the invention;

Figure 2 is a sectional view taken on lines 2—2 of Figure 1;

Figure 3 is a view similar to Figure 1 illustrating relocation of certain parts or sections of the evaporator to provide rearrangement of storage facilities within the refrigerator cabinet;

Figure 4 is a sectional view taken on lines 4—4 of Figure 3;

Figures 5 to 8 inclusive are fragmentary front elevational views illustrating constructional variations or modified forms of the embodiment shown in Figures 1 through 4;

Figure 9 is a fragmentary elevational view showing a modified embodiment of the invention;

Figure 10 is a view similar to Figure 9 illustrating relocation of certain of the parts or sections to provide rearrangement of storage facilities within the refrigerator cabinet;

Figures 11 to 14 inclusive are views similar to Figures 9 and 10 and illustrate constructional variations of the embodiment shown in said Figures 9 and 10;

Figure 15 is an enlarged fragmentary sectional view illustrating convenient means adapted, in accordance with the invention, to support pans, trays or the like; and

Figure 16 is an enlarged fragmentary view, partly in elevation and partly in section, illustrating convenient connection and guiding means for the relatively adjustable sections of an evaporator shell constructed in accordance with the embodiment shown in Figures 9 and 10, and the constructional variations shown in Figures 11 to 14, inclusive.

With more particular reference to the drawings, and as is illustrated in Figures 1 to 4 inclusive, the refrigerator cabinet 20 is of the customary household or domestic type constructed of an outer shell 21, an inner liner 22, insulation 23 between said shell and liner, and strips 24 of low thermal conductivity extending about the forward edge of the cabinet and bridging the gaps between said shell and liner. In practice, a door (not shown) of usual construction is employed to close the open front of the cabinet.

A generally rectangular evaporator, designated in its entirety by the reference character 25, is conveniently mounted within an upper portion of the refrigerator cabi-

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net and is adapted to occupy most of the space between the opposite interior side walls at said upper portion of said cabinet. The evaporator defines a freezing compartment 26 of predetermined size or volume, and the space below said evaporator provides a non-freezing compartment 27. The top of the evaporator is advantageously spaced from the interior top wall of the cabinet to accommodate ice trays 28, said top of the evaporator serving as a shelf surface upon which the ice trays are supported.

Food receptacles such as meat pans 29 are suitably suspended within the non-freezing compartment adjacent the underside of the evaporator, and food supports or shelves, one of which is shown at 30, are conveniently supported within said non-freezing compartment below said pans. The pans are provided with lateral projections 31 and 32 which are slidably engageable with supporting tracks 33 and channel members 34, respectively. The supporting tracks 33 are advantageously carried on a plate 35 which depends from the bottom of the evaporator structure substantially mid-way thereof, and the channel members are suitably affixed to the inner liner 22, for instance in the manner more clearly shown in Figure 15. The shelves are slidably engaged on rails 36 which are provided on said inner liner.

From the several views in the drawings, it will be seen that the evaporator, in accordance with the invention, is constructed of sections adjustable with respect to each other, certain of said sections being adapted for selective placement in different positions so as to vary the ratio of freezing space to total storage space and to provide for selective arrangement of storage facilities. It will also be seen from the several views that certain of said sections of the evaporator are provided with means which, when said sections are adjusted in one position, cooperate to support trays, pans, shelves or the like.

Referring particularly to the embodiment illustrated in Figure 1, it will be seen that the evaporator is constructed of three complementary metallic plate sections 37, 38 and 39; one section 37 is mounted fixedly and is adapted to constitute the main portion of the evaporator and to provide the horizontal top wall, one vertical end wall and part (approximately half) of the horizontal bottom wall of the evaporator shell; another section 38 is pivotally mounted by means of a hinge 40 which swingably connects one end of said section 38 to the bottom wall part of said fixed section 37, said section 38 constituting the remaining part of said horizontal bottom wall of the evaporator shell; the other or third section 39 is pivotally mounted by means of a hinge 41 which swingably connects one end portion of said third section 39 with the top wall portion of the fixed section 37, said section 39 constituting the other vertical end wall of the evaporator shell. The free end portion of the swingable vertical end wall section 39 is provided with a laterally projecting flange or lip 42 adapted to serve as an abutment on which the free end of the swingable horizontal bottom wall section 38 rests, and by means of which said latter section is held in horizontal position.

With the section 38 in horizontal position and the section 39 in vertical position, these two sections cooperate with the main section 37 to define the full evaporator or freezing compartment 26, the air within said compartment being maintained at temperatures below freezing by means of a refrigerant circulating coil 43 arranged in intimate heat exchange relation with surfaces of said main section.

When the user desires a different storage arrangement than that above described, the bottom wall section 38 is swung upwardly from horizontal to vertical position, as is represented by arrow A in Figure 1, and the end wall section 39 is swung upwardly from vertical to horizontal position as is represented by arrow B in Figure 1. As best seen in Figure 3, this relocation of the evaporator

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section reduces the size of the freezing compartment and provides the non-freezing compartment with added space 44 which is normally allocated to the freezing compartment. Either or both of the meat pans 29 or other food supporting means such as shelves, one of which is represented at 45, may be placed within the space added to the non-freezing compartment. For that purpose, fixture elements or channel members 46 are so arranged on the pivotal section 38 so as to become aligned in confronting relation with similar elements or members 47 disposed on that interior side wall of the cabinet which is adjacent said section 38.

It will be noted that the section 38 is maintained in its vertical position, on one side, by means of a stop 48 which depends from the evaporator top and, on the other side, by means of the flanged end portion of the section 39, and that this latter section 39 is maintained in its horizontal position by means of a projection or embossment 49 conveniently provided on the section 38.

In Figures 5 and 6, there is illustrated a modified form of the embodiment shown in Figures 1 to 4 inclusive. It will be noted that in this modified form the evaporator structure is basically the same as that above described, in that the evaporator 25a of said modified form is constructed of three sections 37a, 38a and 39a. The section 37a constitutes the main portion of the evaporator and forms the horizontal top wall, one end wall and a part (approximately half) of the bottom wall of the evaporator. The section 38a is pivoted, as by means of a hinge 40a, to said part of the bottom wall of the evaporator main section. The section 39a is pivoted as by means of a hinge 41a to the upper wall portion of said main section. This latter hinged section 39a is provided with a lip 42a adapted for engagement with the other hinge section 38a to retain it in the position shown in Figure 5, in which position said hinged or swingable sections 38a and 39a cooperate with the fixed main section 37a to define a full size freezing compartment 26a cooled by means of refrigerant circulating coil 43a arranged in intimate heat exchange relation with said main section. It will be seen that in the form shown in Figures 5 and 6, the evaporator is mounted so that part of its top lies next to the interior top wall of the refrigerator cabinet, the remaining part of said evaporator top being offset, as at 50, to define a smaller freezing compartment 51 which can be used to advantage for storing ice trays 52. Other ice trays 53 may be placed on the floor or bottom wall of the evaporator.

By swinging the two sections 38a and 39a as represented by arrows A and B in Figure 5, said two sections assume the position illustrated in Figure 6, in which position the evaporator sections cooperate to reduce the size of the freezing compartment 26a and to add space 44a to the non-freezing compartment 27a. Either or both of the meat pans 29a or shelves, as the one represented at 45a, may be supported in said added space on companion fixtures or channel members 46a and 47a. The swingable sections 38a and 39a are maintained in the position illustrated in Figure 6 by means of an embossment 49a provided on the section 38a to engage the free end portion of the section 39a, and by means of the offset portion 50 which serves as a stop for said section 38a.

In Figures 7 and 8, there is illustrated a further modified form in which an evaporator 25b is constructed of three sections 37b, 38b, and 39b. The section 37b constitutes the main portion of the evaporator and forms the horizontal top wall, one end wall and a part (approximately half) of the bottom wall of the evaporator. The section 38b is pivoted as by means of a hinge 40b to said part of the bottom wall of the evaporator main section. The section 39b is pivoted as by means of a hinge 41b to the upper wall portion of said main section. This latter hinged section 39b is provided with a lip 42b adapted for

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engagement with the other hinged section 38b to retain it in the position shown in Figure 7 in which position said hinged or swingable sections 38b and 39b cooperate with the fixed main section 37b to define a full size freezing compartment 26b cooled by means of a refrigerant circulating coil 43b arranged in intimate heat exchange relation with said main section. It will be seen that in the form shown in Figures 7 and 8, the evaporator is mounted so that part of its top lies next to the interior top wall of the refrigerator cabinet, the remaining part of said evaporator top being offset, as at 50b, to define a smaller freezing compartment 51b which can be used to advantage for storing ice trays 52b. Other ice trays 53b may be placed on the floor or bottom wall of the evaporator.

By swinging the two sections 38b and 39b as represented by arrows A and B in Figure 7, said two sections assume the position illustrated in Figure 8, in which position the evaporator sections cooperate to reduce the size of the freezing compartment 26b and to add space 44b to the non-freezing compartment 27b. Either or both of the meat pans 29b or shelves, as the one represented at 45b, may be supported in said added space on companion fixtures or channel members 46b. The swingable sections 38b and 39b are maintained in the position illustrated in Figure 8 by means of an embossment 49b provided on the section 38b to engage the free end portion of the section 39b, and by means of the offset portion 50b which serves as a stop for said section 38b. It will also be noted that in the form illustrated in Figures 7 and 8, the top wall of the evaporator terminates with a downwardly projecting extension 55 so that when the swingable sections are located in the position illustrated in Figure 8, a freezing space 56 is provided, which space can be utilized for storing the ice trays 53b.

In Figures 9 and 10, there is shown a modified embodiment of the invention, and in Figures 11 and 12 and Figures 13 and 14 there are shown various constructional variations or forms of said modified embodiment. As seen in these several views, the evaporator structure 25c is mounted within an upper portion of the refrigerator cabinet and occupies most of the space between opposite side walls in said upper portion. The evaporator defines a freezing compartment 26c, the space below said evaporator providing a non-freezing compartment 27c. The top of the evaporator is spaced from the interior top wall of the cabinet and serves advantageously to support ice trays 23c. The evaporator is constructed of two complementary metallic plate sections 60 and 61 which are connected together at adjacent edge portions by means of elongated slotted members 62. The section 60 is mounted in fixed position, and a cooling coil 63 is disposed in intimate heat exchange relation with surfaces of said section.

As viewed in Figure 9, the section 60 constitutes the main portion of the evaporator and provides the horizontal top wall, one vertical end wall and a part (approximately half) of the horizontal bottom wall of the evaporator. The other section is slidably retained by the slotted members 62 and is of generally L-shaped configuration to provide the remaining part of said bottom wall of the evaporator and also to provide the other vertical end wall of said evaporator.

The section 61, when positioned as illustrated in Figure 9, cooperates with the main section 60 to define the full evaporator or freezing compartment 26c. When a different storage arrangement is preferred or desired, the section 61 is disassociated from the section 60, is reversed and relocated in the position shown in Figure 10. As a result, the size of said freezing compartment is reduced, and the size of the non-freezing compartment 27c is increased by the addition of supplemental space 44c to said non-freezing compartment.

As viewed in Figure 9, food holders, such as meat pans 29c, may be supported beneath the evaporator by

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means of tracks 33c and channel members 34c and, as is shown in Figure 10, one of said meat pans can be placed in the space 44c when the section 61 is moved into the position illustrated in said Figure 10. For that purpose, companion supporting members 46c and 47c are provided on said sections and on the refrigerator interior wall, respectively.

In the form illustrated in Figure 11, the fixed section 60 is constructed so that it provides the larger part of the horizontal bottom wall of the evaporator, and the movable section 61 is constructed to provide a minor part of said bottom wall. Accordingly, when said movable section is located in the position shown in Figure 12, the greater part of the freezing compartment 26c remains available for storage at freezing temperatures. The smaller space 44c added to the non-freezing compartment 27c is usable to advantage for storing containers of the taller variety such as beverage bottles, or a shelf as represented at 64 may be mounted on supporting members 46d and 47d to accommodate smaller containers within said added space.

In the form illustrated in Figure 13, the two sections 60 and 61 are L-shaped, the fixed section 60 being constructed to provide the horizontal top wall and one vertical end wall of the evaporator, and the movable section 61 being constructed to provide the horizontal bottom wall and the other vertical end wall of said evaporator. When the sections 60 and 61 are relatively disposed as shown in Figure 13, they cooperate to define the full size freezing compartment 26c. However substantially all of the space allotted to said freezing compartment becomes a part of the non-freezing compartment 27c, when the movable section 61 is placed in the position shown in Figure 14. The space thus added to the non-freezing compartment may be used to advantage for accommodating a comparatively large food holding pan 65 which can be suspended on channel or supporting elements 46e and 47e disposed on the section 61 and on the cabinet interior wall, respectively. When the sections are arranged as shown in Figure 13, the pan 65 can be suspended beneath the evaporator on suitable channel members 34e.

In Figure 16, there is shown a suitable construction for the slotted members 62 adapted to retain the movable section 61 in either of its two positions with respect to the main section 60. As seen in said Figure 16, each member is generally rectangular in cross-section and is provided with three slots 66, one on each of three sides of said rectangular member. One of said slots is engaged with an edge portion of the fixed section 60 of the evaporator shell, and the remaining two slots are adapted for engagement with an edge portion of the movable section 61 of the evaporator to maintain said movable section either in the position shown in full lines or in the position shown in broken lines, in said Figure 16.

From the foregoing description, it will be appreciated that the present invention makes it possible, through the utilization of simple means, to correlate associated evaporator parts in different cooperative arrangements so as to provide for rearrangement of the storage space within a refrigerator cabinet. By employing the invention as embodied in the forms, and in any of the structural variations herein shown and described, a household refrigerator can be made to conform to the preference or need of the user in storing foods within the refrigerator cabinet.

We claim:

1. A refrigerator comprising a cabinet, a generally rectangular evaporator shell defining a freezing compartment occupying a predetermined portion of the space within said cabinet, the space to one side of said shell providing a non-freezing compartment within said cabinet, two adjacent side wall portions of said shell being movably mounted on and supported by other wall portions of said shell, said adjacent side wall portions being disposable in a position to cooperate with the remaining wall portions

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of said shell including said other wall portions to define the aforesaid freezing compartment, said two adjacent side wall portions of said shell also being disposable in another position to provide said non-freezing compartment with added space which is normally occupied by said freezing compartment, and means provided on one of the two mentioned adjacent side wall portions to support food-supporting means within the space added to the non-freezing compartment when said adjacent side wall portions are disposed in said other position.

2. A refrigerator comprising a cabinet, a generally rectangular evaporator shell defining a freezing compartment of predetermined volume within the upper portion of said cabinet, the space below said evaporator shell providing a non-freezing compartment, said evaporator shell being constructed of three sections, the first of said sections forming the horizontal top wall, one vertical end wall and part of the horizontal bottom wall of said shell, the second of said sections forming the remaining part of said horizontal bottom wall of said shell, the third of said sections forming the remaining vertical end wall of said shell, a refrigerant circulating coil disposed in heat exchange relation with said first of said sections, and means pivotally mounting said second and third of said sections for movement of said second of said sections from horizontal to substantially vertical position and for movement of said third of said sections from vertical to substantially horizontal position to reduce said volume of said freezing compartment and to add to said non-freezing compartment part of the space normally allocated to said freezing compartment.

3. A refrigerator as set forth in claim 2, in which the mentioned means includes a pair of hinge devices, one of said devices swingably connecting said second of said sections to said horizontal bottom part of said first of said sections, and the other of said devices swingably connecting said third of said sections to said horizontal top wall of said first of said sections.

4. An evaporator comprising a generally rectangular evaporator shell defining a freezing compartment of predetermined volume, said shell being constructed of three sections, the first of said sections forming the horizontal top wall, one vertical end wall and part of the horizontal bottom wall of said shell, the second of said sections forming the remaining part of said horizontal bottom wall of said shell, the third of said sections forming the remaining vertical end wall of said shell, a refrigerant circulating coil disposed in heat exchange relation with said first of said sections, and means pivotally mounting said second and third of said sections for movement of said second of said sections from horizontal to substantially vertical position and for movement of said third of said sections from vertical to substantially horizontal position to define a freezing compartment of smaller volume.

5. A refrigerator comprising a cabinet, a generally rectangular evaporator structure defining a freezing compartment within said cabinet, said evaporator structure including three walls, two of said walls confronting each other and the third of said walls extending at right angles to said confronting walls one of said confronting walls being longer than the other of said confronting walls, said evaporator structure further including a pair of angularly related wall portions, means movably mounting said portions with respect to said walls, said means providing for placement of said portions in a position to define a larger freezing compartment in which one of said portions projects continuously from and longitudinally of the shorter of said confronting walls with the other of said portions extending from the terminating end of the longer of said confronting walls and in a direction transverse to these latter walls, said means also providing for placement of said portions in a position to define a smaller freezing compartment in which one of said portions projects continuously from and transversely of the shorter of said confront walls and in a direction intersecting the longer

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of said confronting walls with the other of said portions extending from the terminating end of said longer of said confronting walls and in a direction parallel to these latter walls.

6. A refrigerator as set forth in claim 5, in which one of the mentioned three walls constitutes the top wall of the mentioned evaporator structure defining the mentioned freezing compartment, said top wall being located adjacent the interior top wall of the mentioned cabinet and being provided with an offset portion cooperating with part of said top wall of said cabinet to define a second freezing compartment, said top wall further being provided with a downwardly projecting extension cooperating with said offset portion and with one of the mentioned movably mounted portions to define a third freezing compartment when said movably mounted portions are placed in the last named position.

7. A refrigerator comprising a cabinet having food storage space therein, a generally rectangular evaporator structure defining a correspondingly shaped freezing compartment occupying a predetermined part of said space, the walls of said evaporator structure except two angularly related adjacent portions, namely a portion included in one side of said structure and a portion included in another side adjacent to said one side of said structure, being fixedly mounted, said portions normally being disposed in such angular position with respect to said walls as to provide a corner for said freezing compartment, and means movably mounting said portions and providing for reversal of said angular position of said portions with respect to said walls so as to transfer said corner to a location intermediate the ends of one of said fixedly mounted walls of said shell to modify the shape of said evaporator structure so that said structure occupies a lesser part of said storage space.

8. A refrigerator as set forth in claim 7, in which refrigerant circulating means is arranged in heat exchange relation with the mentioned fixedly mounted walls of the mentioned evaporator structure.

9. A refrigerator as set forth in claim 7, in which one of the mentioned fixedly mounted walls constitutes the top wall of the mentioned rectangular evaporator structure defining the mentioned freezing compartment, said top wall being located adjacent the interior top wall of the mentioned cabinet and being provided with an offset portion cooperating with part of said top wall of said cabinet to define a second freezing compartment.

10. A refrigerator as set forth in claim 7, in which a generally L-shaped member incorporates the mentioned two angularly related adjacent portions, and in which the last named means consist of slotted members slidably receiving edge portions of said L-shaped member.

11. A refrigerator as set forth in claim 7 in which the mentioned fixedly mounted walls form the top wall and one end wall of the mentioned evaporator structure, the mentioned movably mounted adjacent portions form a bottom wall and another end wall for said structure, and a generally L-shaped member incorporates said portions.

12. An evaporator comprising a generally rectangular shell adapted to define a freezing compartment, said shell including a section configured to provide two confronting walls continuously connected at one of their ends by a third wall extending transversely of said confronting walls, one of said confronting walls being longer than the other of said confronting walls, said shell further including two wall portions movably mounted on and supported by said section, said wall portions being placeable in one position to define a larger freezing compartment in which one of said portions project continuously from and longitudinally of the shorter of said confronting walls with the other of said portions extending from the terminating end of the longer of said confronting walls and in a direction transverse to these latter walls, said wall portions also being placeable in another position to define a smaller freezing compartment in which one of said portions projects con-

tinuously from and transversely of the shorter of said two confronting walls and in a direction intersecting the longer of said confronting walls with the other of said portions extending from the terminating end of said longer of said confronting walls and in a direction parallel to these latter walls. 5

13. An evaporator as set forth in claim 12, in which the two mentioned, movably mounted wall portions are in the form of a generally L-shaped plate detachably connected to the mentioned section to be removed from and replaced in either one of the two mentioned positions with respect to the mentioned walls of the shell. 10

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