July 26, 1955 H. E. SMITH 2,713,776

REFRIGERATORS

Filed March 15, 1954 2 Sheets-Sheet 1

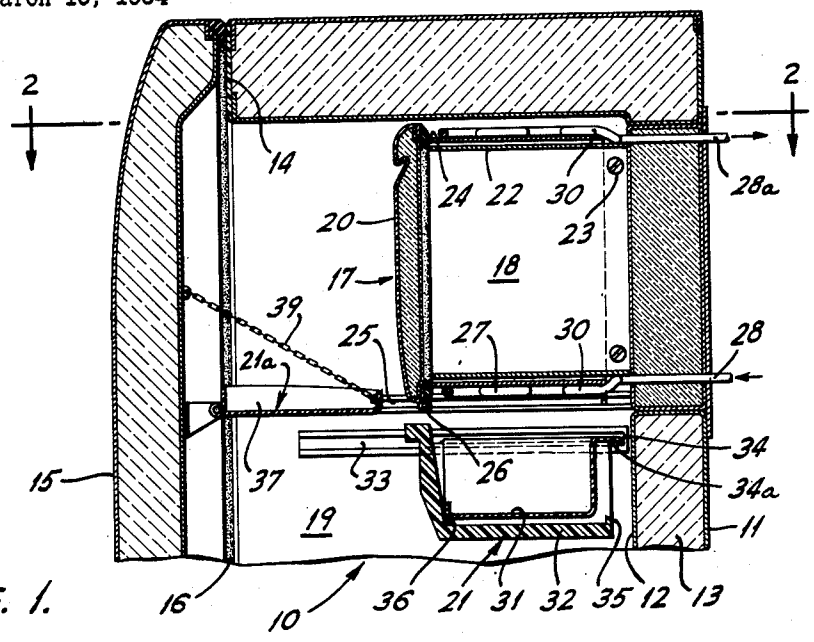


FIG. 1.

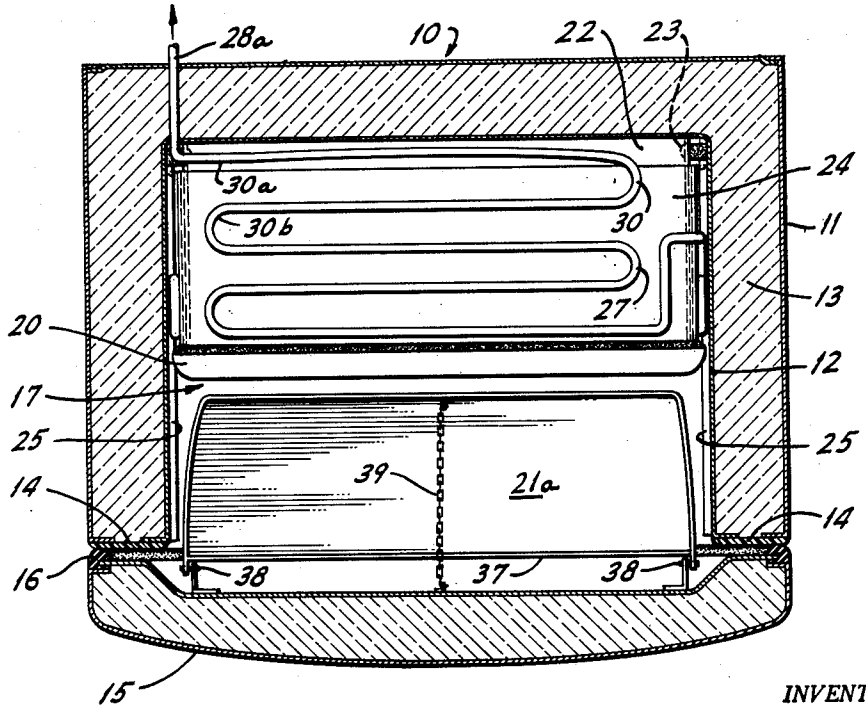


FIG. 2.

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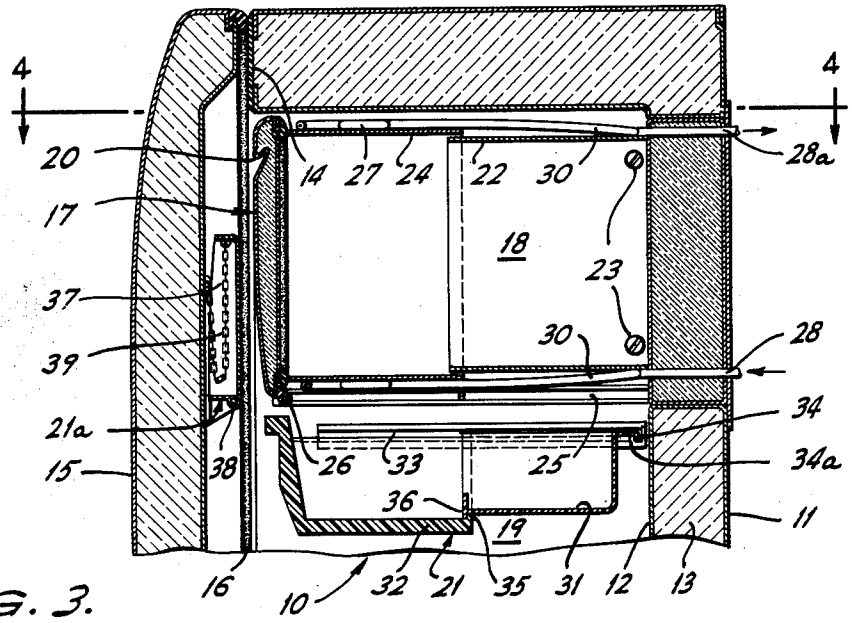


FIG. 3.

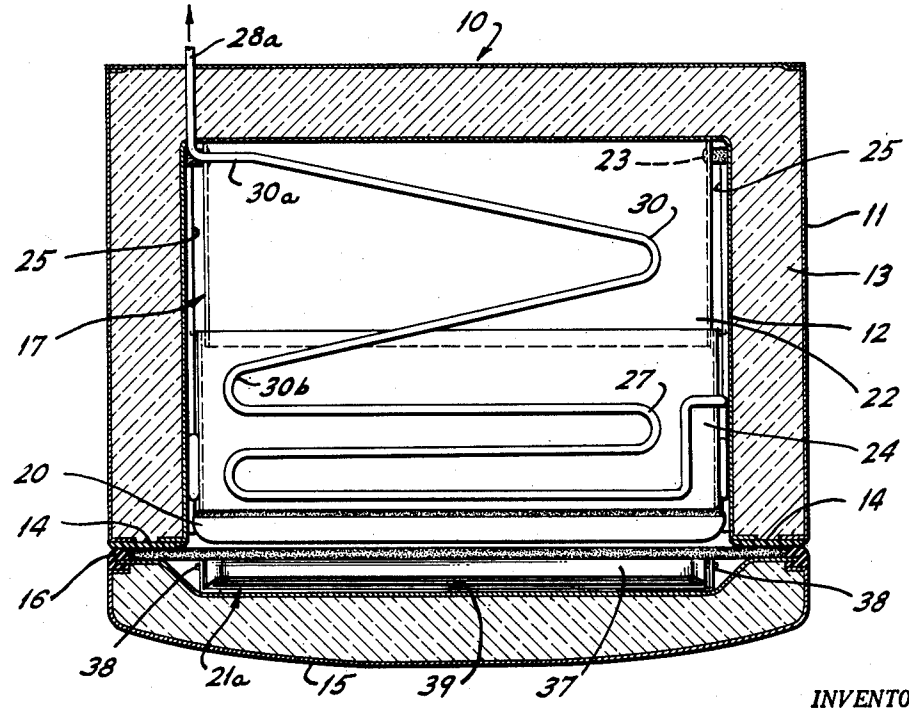


FIG. 4.

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REFRIGERATORS

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8 Claims. (Cl. 62—99)

The present invention relates to refrigerators. Particularly, the invention herein disclosed and claimed has to do with household refrigerators in which provision is made for selectively varying the ratio of freezing space to total storage space within a refrigerator cabinet of given size. In a more specific aspect, the invention concerns a novel "expandable" evaporator construction whereby a user may readily and easily adjust the evaporator within the cabinet so that part of the space normally allotted to the freezing compartment may be utilized for storage at non-freezing temperatures, when so desired.

Expandable evaporator structures by means of which a freezing compartment may be adjusted either in height or in width have been suggested. Although these previously proposed structures well serve their primary purposes, they give rise to constructional and handling problems. For instance, structures which provide for varying the height of the freezing compartment or evaporator shell, require the inclusion of intricate means so that the adjustable evaporator section may be disengaged from its support, lifted or lowered from one to another position, and reengaged with its support. With structures in which the width of the freezing compartment or evaporator shell is adjustable, it is necessary to provide means pivotally or detachably interconnecting the fixed and movable sections of the evaporator so that the movable section or sections may be swung from one to another position, or may be removed from one position and relocated in another position. One of the objections to said known structures has been the difficulty of providing an adequate sealing closure for the adjustable freezing compartment because, to be effective, such closure must be capable of adjustment to conform to the increased or decreased size of said compartment.

It is an object of the present invention to overcome the above-noted problems and difficulties by simplifying the construction of the adjustable evaporator and by so associating the adjustable related sections thereof that a simple evaporator door can be utilized to effect proper sealing of the compartment, regardless of the size to which it is adjusted.

Another object of the invention is to provide a sectional adjustable evaporator which makes it possible to vary the size of the freezing compartment without awkward lifting or lowering of a separate adjustable section of the evaporator assembly, or without having to move the adjustable section out of and into engagement with different supporting means to locate said sections in various positions.

Other features which characterize the invention have to do with the provision of means adapted to direct air in heat exchange relation with the evaporator regardless of the size to which it is adjusted, said means also being adapted to serve as food supports or receptacles which can be readily adjusted in accordance with the adjustment of the evaporator.

Broadly, in achievement of the above-noted objects

and features, the invention utilzes an evaporator structure adapted to vary the overall storage capacity of the freezing compartment by varying its depth while maintaining its other two dimensions uniform at all times. For that purpose and in accordance with the invention, the evaporator is constructed of telescoping sections, one of said sections providing the forward portion of the freezing compartment and being slidable in overlapping relation with respect to the other of said sections. In a narrower aspect, the invention employs a sectional evaporator shell, each section of the shell having the form of an elongated rectangular casing. These sections cooperate to define a freezing compartment and are arranged to slide one within the other so as to increase or decrease the volumetric dimensions of said compartment, depending upon the adjusted position of one of said sections with respect to the other of said sections. In one embodiment of the invention, a two-section evaporator shell is mounted in a refrigerator cabinet in such manner that one of the sections is fixedly supported within the cabinet in a position remote from the access opening thereof and is disposed so that an open end of said one of said sections confronts said access opening. The other of the sections is movably supported within the cabinet to slide therein in a direction toward and away from the access opening of the cabinet and is disposed to slip over the fixed section which fits into said movable section.

The manner in which the above-recited and other objects and features of the invention are best achieved will be fully understood from the following description of the embodiment illustrated in the accompanying drawings in which:

Figure 1 is a fragmentary sectional view taken substantially through the vertical mid-plane of a domestic refrigerator incorporating the invention and illustrating the parts in one of their adjusted positions;

Figure 2 is a horizontal cross-sectional view looking in the general direction of arrows **2—2** of Figure 1;

Figure 3 is a view similar to Figure 1 and illustrates the parts in another of their adjusted positions; and

Figure 4 is a horizontal cross-sectional view looking in the general direction of arrows **4—4** of Figure 3.

With more particular reference to the drawings, the refrigerator cabinet **10** is of the customary household or domestic type constructed of an outer shell **11**, an inner liner **12**, insulation **13** between said shell and liner, and strips **14** of low thermal conductivity extending about the forward edge of the cabinet and bridging the gaps between said shell and liner. A door **15** of usual construction, including a sealing gasket **16**, closes the open front of the cabinet.

A generally rectangular evaporator structure, designated in its entirety by the reference character **17**, is located within an upper portion of the cabinet and is adapted to span most of the distance between the opposite interior side walls of said upper portion of the cabinet. The evaporator structure defines a freezing space or compartment **18**, and the remainder of the cabinet interior provides a non-freezing space or compartment **19**. The forward end of the evaporator structure, that is the end which confronts the open front of the cabinet, provides the access opening of the freezing compartment, and a closure in the form of a hinged door **20** seals said compartment from the remainder of the cabinet interior.

Means which may conveniently take the form of a food receptacle **21** and a food support **21***a* disposed adjacent the evaporator structure, functions as a baffle to direct the air circulating within the non-freezing space or compartment in heat exchange relation with the evaporator and to prevent freezing-up of said space or compartment by the evaporator which, in normal usage, operates at sub-freezing temperatures. In accordance with one as-

pect of the invention, the baffle means, that is the receptacle **21** and support **21***a*, are constructed and arranged for adjustment to correspond to the adjustment of the evaporator as will be more fully described hereinafter, so that the desired relationship between said evaporator and baffle means may be maintained regardless of the size to which the evaporator is adjusted. It will be understood that, if desired, this relationship may be obtained solely by adjustment of the receptacle **21**, in which event the support **21***a* may be omitted. According to usual practice, suitable shelves (not shown) would be mounted within the non-freezing compartment below the food receptacle **21**.

According to the invention, the evaporator structure is made up of telescoping shell sections and, as seen in the drawings, includes a fixed inner section **22** mounted by means of suitable fastening elements **23** in predetermined position within a rearward portion of the cabinet interior, and a movable outer section **24** mounted to overlap and to slide over said fixed inner section in a general direction away from and toward the open front of the cabinet as is illustrated in Figures 1 and 2, and in Figures 3 and 4. It is to be noted that the relative sizes and shapes of the evaporator sections are such that when the outer section **24** is moved to a position in which the inner section **22** is within said outer section (Figures 1 and 2) the freezing compartment occupies approximately one-half the depth of the refrigerator cabinet at the upper portion thereof, and that when said outer section is moved in position in which said inner section is exposed (Figures 3 and 4) the freezing compartment occupies most of said depth. In this manner, the volumetric dimensions or storage capacity of the freezing compartment is made smaller or larger depending upon the adjusted position of the sliding section **24** with respect to the stationary section **22**. In order to guide the adjustable section **24** in its movement for placement in its various positions, track members **25** are conveniently mounted on the opposite side walls of the cabinet and disposed for engagement with guiding rollers or pins **26** associated with said adjustable section. In practice, the rollers or pins **26** advantageously form parts of the pintle of the hinged door **20** of the evaporator structure.

The temperature within the freezing compartment **18** is kept within a sub-freezing range by means of a refrigerated coil **27**. Although the coil **27** is conveniently disposed in heat exchange relation mostly with the surfaces of one evaporator section (the movable outer section **24**) it will be understood that by constructing the evaporator sections of metal of high thermal conductivity of the kind commonly employed in the fabrication of ordinary evaporators, the cooling effect of said coil will also adequately refrigerate the surfaces of the other section (the fixed section **22**) so as to insure freezing temperatures throughout said compartment **18**, regardless of the relative positions of said sections.

In practice, the coil **27** is welded or otherwise securely affixed to the wall surfaces of the one evaporator section with which the coil is associated. However, portions of the coil adjacent its inlet and outlet ends **28** and **28***a*, respectively, are left free and are formed to provide a pair of elongated flexible loops **30** which substantially parallel those wall portions of the evaporator sections which are adjacent said loops. These loops are suitably anchored, as indicated at **30***a* and **30***b*, to the inner and outer shell sections **22** and **24**, respectively, so as to insure that the branches of each of said pairs of loops will move nearer or farther away from each other with the adjustment of said sections. It will be understood that these loops **30**, because of their elongated formation and their freedom to flex, provide for circulation of refrigerant through coil **27** without interfering with the sliding displacement of the movable section of the evaporator structure to change the volumetric dimensions of the freezing compartment.

As can be seen in the drawings, the food receptacle **21** advantageously takes the form of a meat pan which is also made of telescoping sections so that its size can be adjusted to correspond to the adjustment of the evaporator structure. For that purpose, the meat pan comprises an inner section **31** and an outer section **32**, which sections are adjustable with respect to each other. In the construction illustrated in the drawings, the pan sections are suspended on tracks **33** mounted on the opposite side walls of the cabinet immediately below the evaporator structure, and the width and length of the inner pan section corresponds substantially to the width and length of the inner section of said evaporator structure, whereas the width and length of the outer pan section corresponds to the width and length of the outer section of said evaporator structure. The inner pan section **31** is formed with a downwardly extended flange **34** providing hook-like extensions which engage rigid projections **34***a* on the tracks **33** to lock said inner pan section in predetermined fixed position within the cabinet while the outer pan section is slidably moved on said tracks from the rearward position shown in Figures 1 and 2 to the forward position shown in Figures 3 and 4. The outward movement of the outer pan section **32** with respect to the inner pan section **31** is advantageously limited by means of interengageable stops which are in the convenient form of flanges **35** and **36** disposed along the rear edge portion of said outer pan section **32** and the front edge portion of said inner pan section **31**, respectively.

In accordance with the invention, the additional space which is provided in front of the evaporator structure when the sections thereof are telescoped, as is shown in Figures 1 and 2, may be utilized for accommodating food to be stored at non-freezing temperatures. For that purpose, the food support **21***a* is made as a shelf or tray **37** conveniently disposed to occupy said space. As represented in the drawings, this tray is advantageously pivoted on the cabinet door, for instance by means of hinges **38** which allows said tray to swing out of operative position (Figures 3 and 4) and make way for placement of the evaporator section **24** in its extended position. Suitable means, for instance a hanging link or chain **39** secured to the tray and to the cabinet door, is used to retain the tray in horizontal and proper supporting position. It is to be noted that the tray is of such size and shape as not to interfere with opening and closing movements of the cabinet door, even when said tray is in its horizontal position.

From the foregoing description, it will be appreciated that the invention makes it possible to provide a household refrigerator in which the ratio of freezing space to total storage space may be readily varied to suit the needs of the user. Particularly, the provision of an evaporator constructed of telescoping sections has the advantage that the volumetric dimensions of the freezing compartment may be adjusted to suit convenience merely by slidably pushing in or pulling out one evaporator section with respect to another evaporator section. Moreover, the fact that the size of the freezing compartment may be changed without changing the dimensions of its access opening has the advantage of insuring proper sealing of said opening, because a solid and well fitting closure of predetermined fixed dimensions can be employed to close said compartment.

I claim:

1. A refrigerator comprising a cabinet, a freezing compartment occupying a portion of the interior of said cabinet, means for changing the depth of said compartment, said means including an evaporator consisting of sections constructed for sliding adjustment one within the other, and means disposed adjacent said evaporator to direct air circulating within the remaining portion of the interior of said cabinet in heat exchange relation with said evaporator, said last mentioned means including a

food receptacle constructed of sections corresponding to the sections of said evaporator and arranged for sliding adjustment one within the other to correspond to the adjustment of said evaporator sections.

2. A refrigerator comprising a cabinet having an access opening, an evaporator including a shell structure defining a freezing compartment within said cabinet, said shell structure consisting of separate complementary sections, means for securing one of said sections in a fixed position remote from said access opening and means carried by wall portions of said cabinet to support another of said sections for sliding adjustment with respect to said one of said sections in a direction either toward or away from said access opening to change the depth of said compartment in said direction.

3. A refrigerator comprising a cabinet having an access opening, an evaporator including a shell structure defining a freezing compartment within said cabinet, said shell structure consisting of separate complementary sections, means for securing one of said sections in a fixed position remote from said access opening, means to support another of said sections for sliding adjustment with respect to said one of said sections in a direction either toward or away from said access opening to change the depth of said compartment in said direction, and means for directing air within said cabinet outside of said compartment in heat exchange relation with said evaporator, said last-named means consisting of members mounted within said cabinet adjacent said evaporator and constructed for adjustment to correspond to the adjustment of said sections.

4. A refrigerator comprising a cabinet having an open front and defining a storage space of predetermined height, width and depth, a door for closing the open front of said cabinet, an evaporator adapted to occupy a part of the height of said space and to extend substantially across the full width and depth of said space, said evaporator being constructed of two generally rectangular sections arranged to slide one within the other in a direction toward and away from said door, means for securing one of said sections in a fixed position remote from said door, and means for supporting the other of said sections for sliding movement with respect to said one of said sections toward and away from said door.

5. A refrigerator comprising a cabinet having an open front and defining a storage space of predetermined height, width and depth, a door for closing the open front of said cabinet, an evaporator adapted to occupy a part of the height of said space and to extend substantially across the full width and depth of said space, said evaporator being constructed of two generally rectangular sections arranged to slide one within the other in a direction toward and away from said door, means for securing one of said sections in a fixed position remote from said door, means for supporting the other of said sections for sliding movement with respect to said one of said sections toward and away from said door, and means for directing air within said space outside said compartment in heat exchange relation with said evaporator, said last-named means consisting of members adjustable with respect to each other to correspond to the adjustment of said other of said evaporator sections.

6. A refrigerator as set forth in claim 5, in which the last-named means is in the form of food supports.

7. A refrigerator as set forth in claim 5, in which the last-named means includes a pair of food receptacles, one of said receptacles being mounted below said evaporator and consisting of two pan-like sections arranged to slide one within the other, and the other of said receptacles being pivotally mounted on said door and consisting of a tray-like member disposed forwardly of said evaporator and displaceable to a position to provide for movement of said other of said sections toward said door.

8. A refrigerator comprising a cabinet having an access opening, an evaporator disposed within said cabinet and including two sections arranged to slide one over the other, means for securing one of said sections in a fixed position, and means for supporting the other of said sections to slide with respect to said one of said sections and in a plane generally perpendicular to the plane of said access opening.

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