

May 20, 1947.

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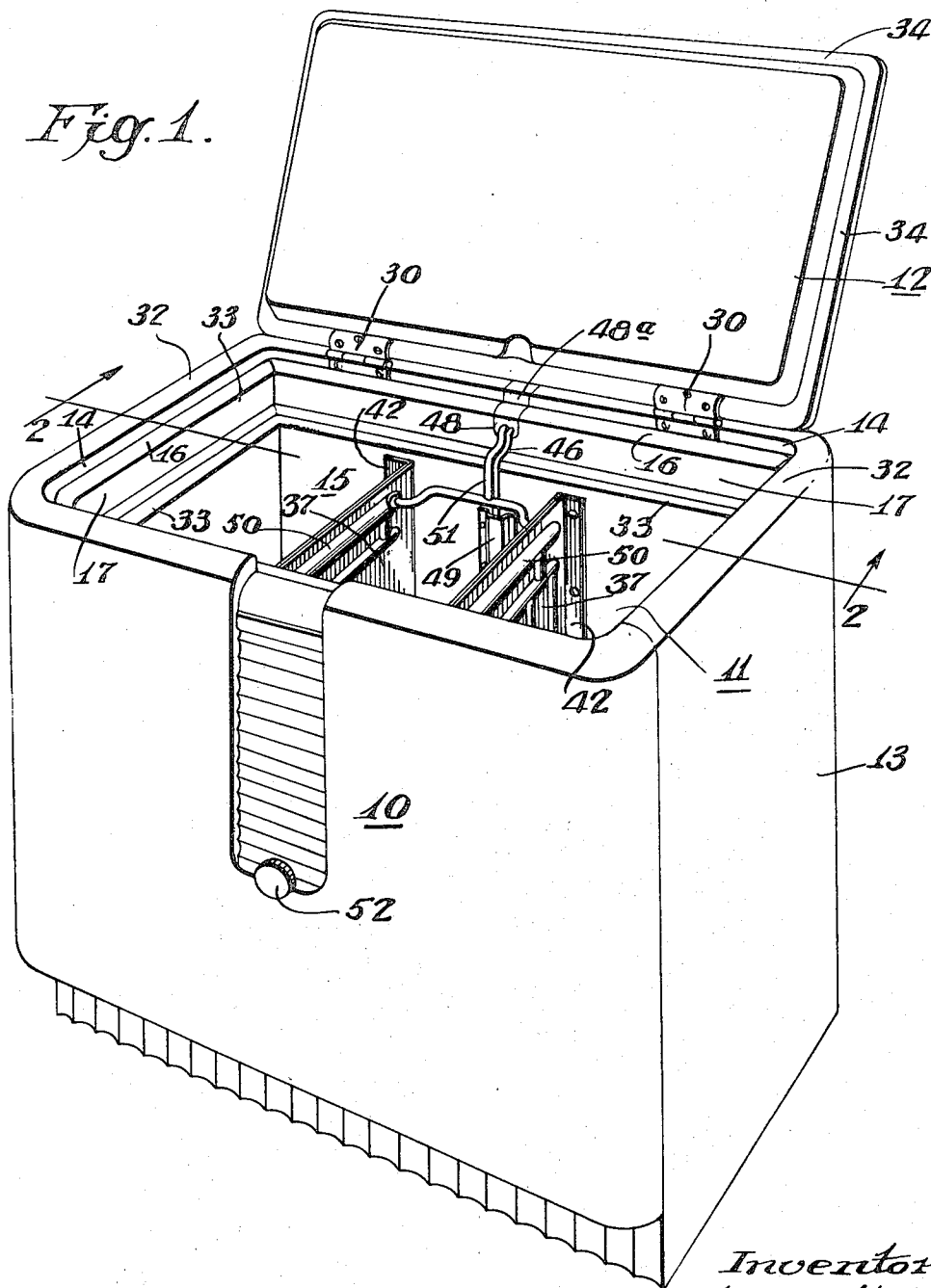
2,420,971

MULTI-TEMPERATURE REFRIGERATOR

Filed Dec. 31, 1943

5 Sheets-Sheet 1

Fig. 1.



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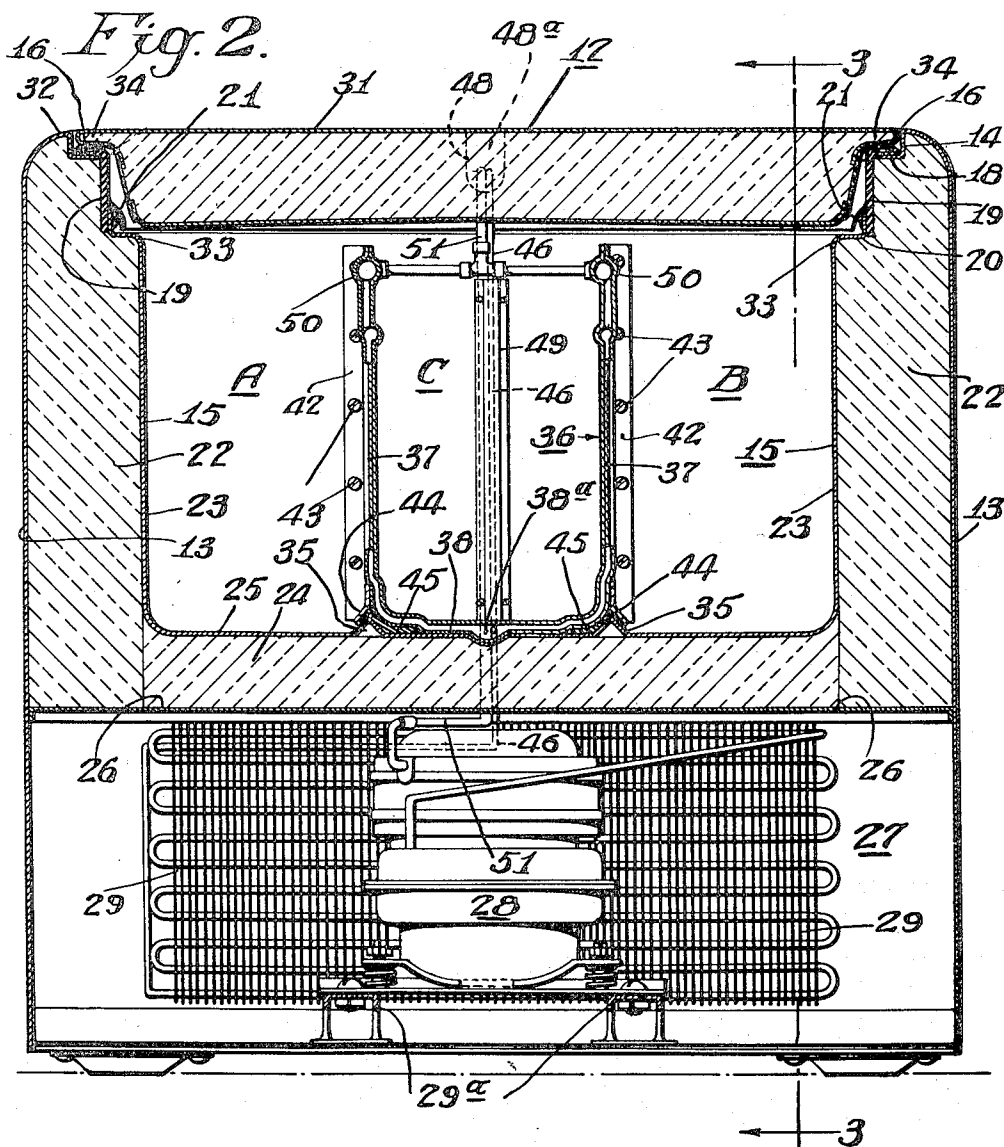
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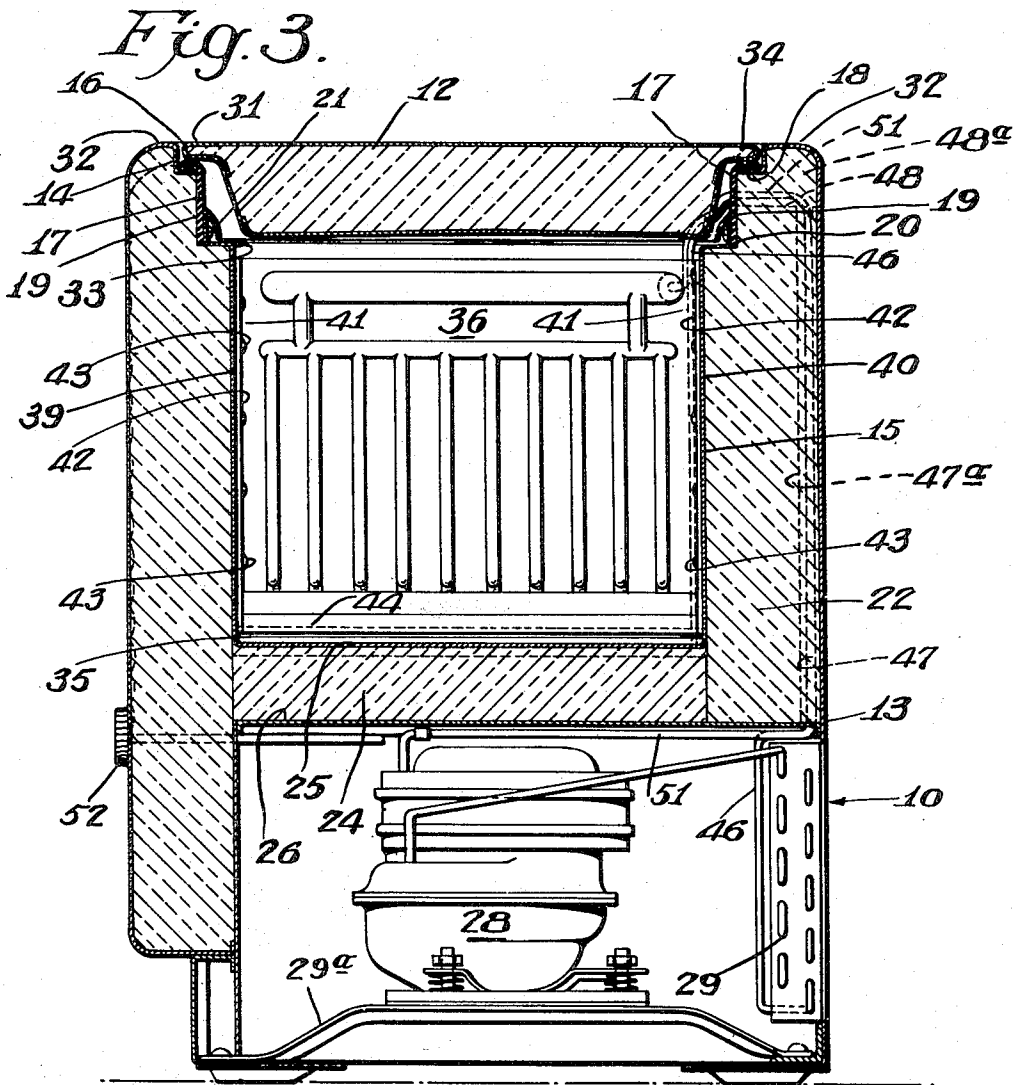
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MULTI-TEMPERATURE REFRIGERATOR

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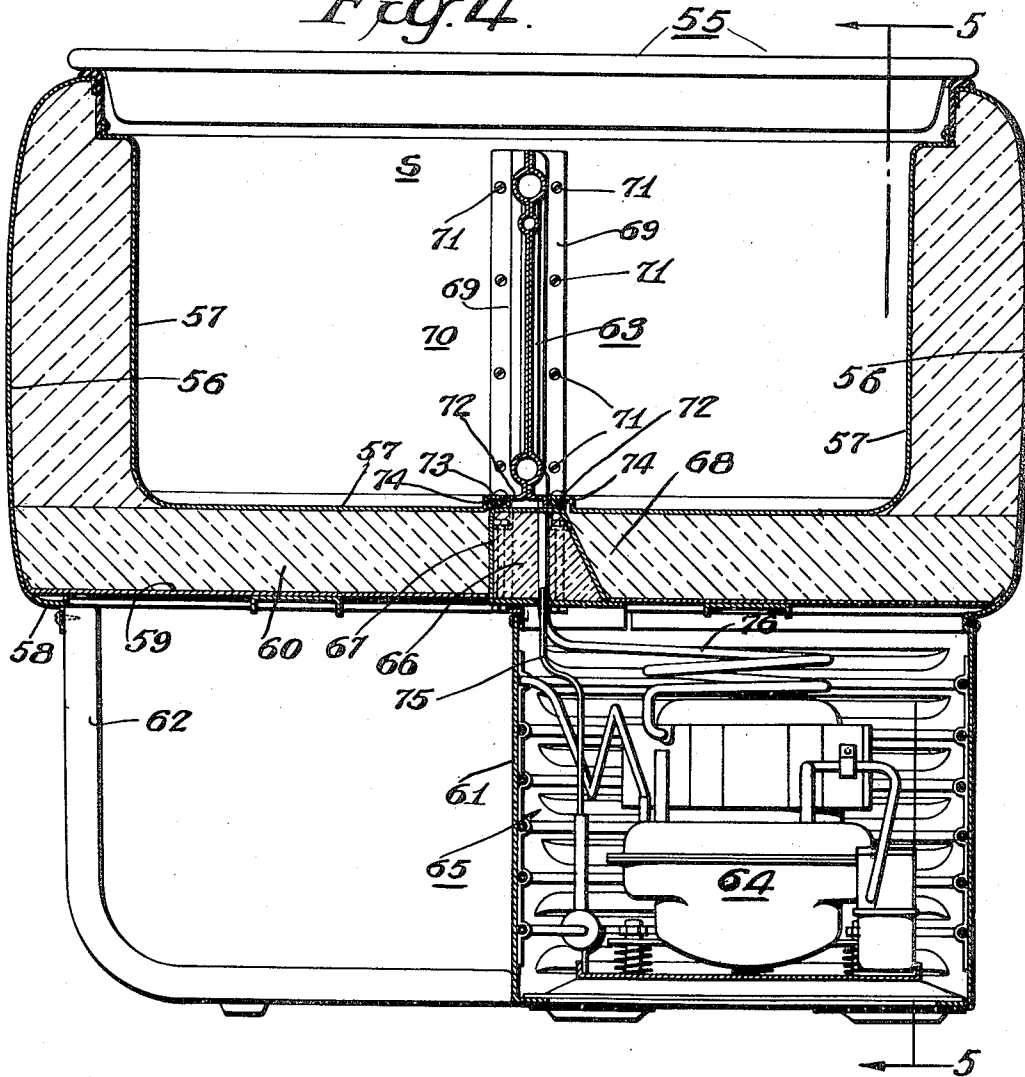
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Fig. 4.



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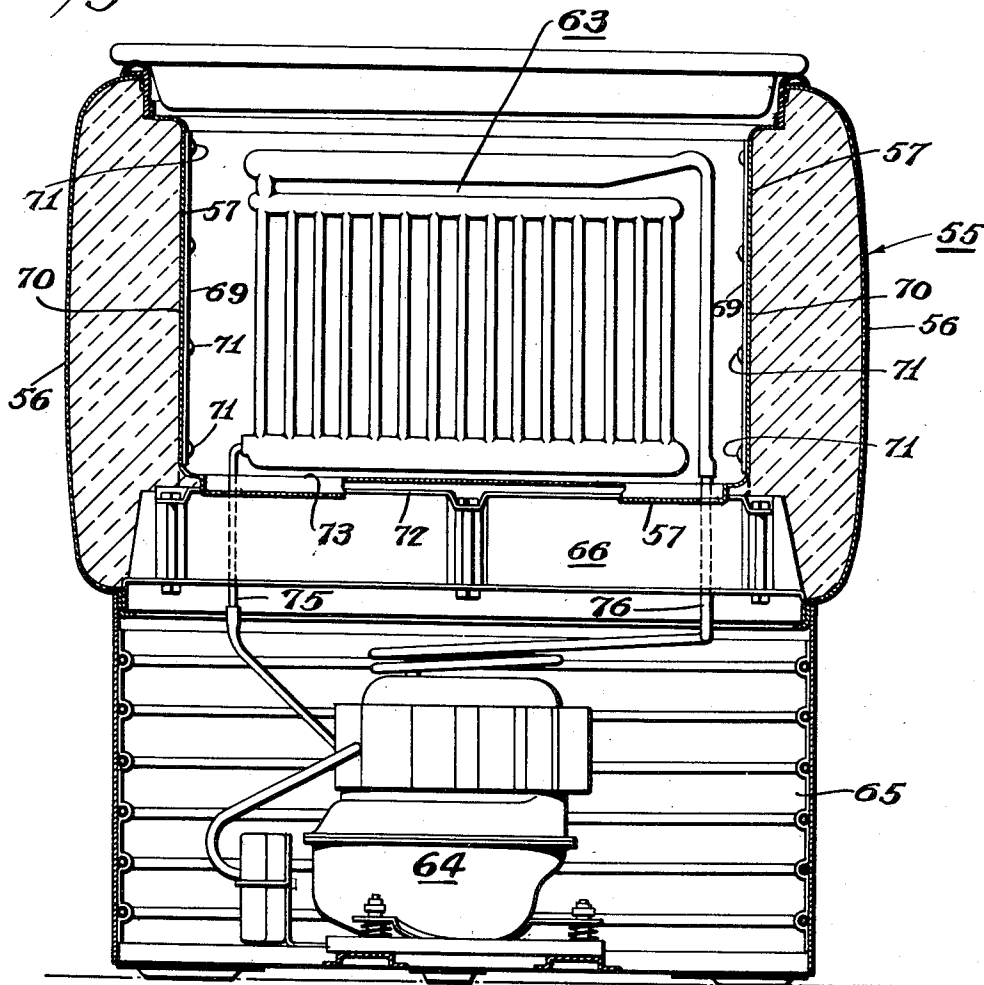
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MULTI-TEMPERATURE REFRIGERATOR

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Fig. 5.



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UNITED STATES PATENT OFFICE

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MULTITEMPERATURE REFRIGERATOR

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Application December 31, 1943, Serial No. 516,521

7 Claims. (Cl. 62-99)

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This invention relates to mechanical refrigerators, more particularly of the horizontal top-access type and to an improved evaporator for such refrigerators.

Refrigerators of this type usually employ evaporators of the "coldwall" type, that is, the coils of the evaporator are wrapped around the outside of the metallic liner or shell of the food storage compartment of the box. This type of construction has been found undesirable by reason primarily of service difficulties arising from the fact that the whole of said liner or shell must be removed to gain access when necessary to the evaporator coils. When, as is customary in the aforesaid "coldwall" construction, the tubing of the evaporator is bonded to the liner or shell, a repair job frequently becomes a major operation.

Another disadvantage of the prior "coldwall" system resides in its relative unadaptability to the desirable multicompartment differential temperature form of refrigerator designed to maintain a number of individual compartments at different temperatures best suited to particular requirements.

With these premises in mind, the present invention contemplates the provision in a refrigerator of the stated type, of an evaporator which serves to divide the food storage space into a number of individual compartments and which at the same time supplies the means for controlled cooling of the various compartments to desired temperatures, thereby providing adequate means for both freezing and storing various types of food.

Another object of the invention is to provide a refrigerator of the stated type wherein the evaporator constitutes an element of a "package type" refrigerating unit which may readily be removed for servicing or replacement without major disturbance of the cabinet structure.

The invention resides further in certain structural details and arrangements hereinafter described and illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of a horizontal top-access refrigerator having an evaporator constructed and arranged in accordance with the invention;

Fig. 2 is a vertical sectional view of the refrigerator, taken on line 2-2 of Fig. 1, showing the evaporator mounted therein, and with the door in closed position;

Fig. 3 is a vertical sectional view taken on the line 3-3, Fig. 2;

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Fig. 4 is a sectional view similar to Fig. 2 showing a modified form of the invention, and

Fig. 5 is a transverse sectional view taken on the line 5-5, Fig. 4.

Referring more particularly to Figures 1 and 2 of the drawings, which show the preferred embodiment of the invention, the numeral 10 designates a horizontal top-access refrigerator comprising a cabinet 11 having a closure lid or door 12. The cabinet 11 includes an outer shell 13 which terminates at the top in a depending angular portion 14 forming an internal shoulder for cooperation with the lid 12, as hereinafter described. The cabinet also comprises an inner liner or receptacle 15, which in accordance with the present invention is formed of a metal, such as aluminum, having a high heat conducting capacity.

The upper edge 16 of a combination gasket and breaker strip 17 is engaged with the upper surface of the horizontal flange 18 of the angular portion 14 of the outer shell, and the depending lower edge 19 of the strip is attached to the vertical rim portion 20 of the liner 15, by means, for example, of screws 21, the said liner being thereby in effect suspended by said strip from the outer shell. While this combination gasket and breaker strip 17 may be of any suitable design, the type shown and described in the co-pending application Serial No. 516,475 is preferred.

Suitable insulating material 22 fills the space between the outer shell 13 and the sides 23 of the inner liner 15, and insulating material 24 is supported beneath the bottom wall 25 of said liner by a horizontal partition or pan 26 the edges of which are secured to the outer shell 13, as by welding or other suitable means.

The pan 26 forms the top wall of a compartment 27 within which is housed the usual motor-compressor unit 28, which may be of the hermetically sealed type, together with a refrigerant condenser 29, the said condenser and the motor-compressor preferably being removably mounted as a unit on transverse brackets 29a the ends of which are fastened to the shell 13.

The lid 12 is attached by hinges 30 to the depending portion 14 of the shell 13, and preferably is of the plug type, so that when the lid is closed the outer surface 31 thereof will be substantially flush with the upper edges 32 of cabinet walls, while the body of the lid will project into the interior of the cabinet to a point adjacent to the offset upper edge portion 33 of the liner. To

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this end the lid is formed with a projecting flange portion 34 which seats upon the terminal flange 18 of the shell and cooperates with the gasket portion 16 of the combination gasket and breaker strip 17 to establish an air-tight and leak-proof joint between the lid and the cabinet walls.

Extending transversely across the bottom wall 25 of the inner liner is a pair of spaced ridges or "dams" 35 formed preferably by upwardly pressed portions of the said wall as shown in Fig. 3, but which may be formed by inverted V-shaped inserts welded or otherwise secured to the said bottom wall. Between these ridges 35 and resting on the bottom wall 25 of the liner is a substantially U-shaped evaporator 36 which may be of any desired type, but is herein illustrated as of parallel feed type.

The side walls 37 and a bottom wall 38 of the evaporator extend from one wall 39 of the inner liner to the opposite wall 40 thereof. The said side walls 37 also extend upwardly into close proximity to the door 12 when the latter is closed, and thereby effectively divide the space within the liner into a plurality of compartments, in this embodiment two end compartments A and B, and an intermediate compartment C. In this embodiment, also, the evaporator forms one wall of each of the end compartments A and B and two of the side walls and the bottom wall of the compartment C. The vertical edges 41 of the evaporator 36 which abut the walls 39 and 40 of the inner liner 15 are provided each with a flange 42 for fastening the evaporator, as by screws 43, to the said walls in intimate heat conducting relation therewith.

An outwardly flaring skirt 44 is provided at the bottom of each side wall 37 of the evaporator, and these skirts, in effect, form saddles with the adjoining lower edge portions of the walls which straddle the "dams" 35 and function to direct any drip water, caused by defrosting or otherwise, away from the bottom 38 of the evaporator and into the bottoms of the end compartments A and B. The dams 35 provide a means for rapidly and accurately positioning the evaporator with respect to the liner during assembly, and also for retaining moisture, which may collect in the bottoms of the tank compartments A and B, out of contact with the evaporator. A waterproofing compound 45 is preferably placed between the bottom 38 of the evaporator 36 and the bottom wall of the liner, and between the aforesaid saddles and the dams 35 to positively prevent water from collecting beneath the evaporator where it might freeze and cause damage.

The refrigerating system illustrated is of the capillary control type and comprises the motor-compressor 28 which discharges into the condenser 29. From the condenser liquid refrigerant passes to a capillary tube 46, which extends upwardly in a groove 47 at the back of the cabinet and through a recess 48 at the top of the rear wall to the interior of the receptacle 15 and downwardly through a channel 49 on the rear wall of the receptacle to a feeding header 38a in the bottom wall 38 of the evaporator 36, which header parallels the side walls 37 of the evaporator. The evaporated refrigerant is collected in a pair of return headers 50, 50 located at the tops of the side walls 37 of the evaporator and returns to the compressor through a common suction line 51 which extends through the recess 48 and groove 47 in heat-exchange relation with the tube 46. A temperature control knob is shown at 52 on the front wall of the cabinet, see Figure 1, and may

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be associated with a suitable temperature control means, not shown.

The groove 47 is preferably closed by a detachable strip plug 47a indicated in broken lines in Fig. 3; and a detachable plug 48a of similar type normally closes the recess 48 over the tubes which pass therethrough. The channel member 49 is also detachably secured against the rear wall of the receptacle. The tubes 46 and 51 are flexible so that when the plugs 47a and 48a, and channel 49 are removed, the compressor unit and condenser may be withdrawn from its compartment and the evaporator, after release of the screws 43, may then be lifted from the receptacle while still in connection with the compressor and condenser units.

Figures 4 and 5 illustrate a modified embodiment of the invention. In this case, also, the refrigerator comprises a cabinet 55 including an outer shell 56 and an inner liner or receptacle 57. Unlike the previously described embodiment of the invention, the lower edge 58 of the outer shell 56 terminates at the pan 59 which, as in the preferred embodiment, supports the insulation 60 at the underside of the liner 57. Jointly supporting the cabinet 55 is a motor-compressor housing 61 and an angular support member 62.

In this embodiment, the evaporator 63 is of the single plate type and forms an integral part of a "package unit" which includes the motor-compressor 64 and condenser 65, the coils of the latter being secured against the inside of the motor-compressor housing 61. The evaporator 63 is mounted directly upon an insulating plug 66 carried by the housing 61, and the plug is designed to snugly fit and to close an elongated opening or slot 67 in the bottom wall 68 of the cabinet 55, to thereby complete the insulating shield 60 of the said bottom wall.

The evaporator 63, which may be of any desired type, has flanges 69 extending outwardly at right angles therefrom, through which the evaporator may be fastened to the side walls 70 of the inner liner 57 by means, for example, of screws 71. Corresponding flanges 72 at the bottom of the evaporator underlie the edge portions 73 of the inner liner which bound the opening 67, through which the evaporator is admitted to the interior of the receptacle 57, and gaskets 74 inserted between the flanges 72 and the edge portions 73 and seal the joint between these elements. The tubes 75 and 76 which connect the evaporator to the compressor 64 and condenser 65 extend in this instance through the plug 66, so that when the screws 71 are released the cabinet 55 may be lifted as a whole from the evaporator and away from the "package unit" of which it forms a part.

In both of the illustrated embodiments, other suitable means than that shown may be used to obtain the intimate thermal coupling between the evaporators and the walls of the liner 57 which is the primary object in securing the evaporator directly to the said walls.

It will be noted that in accordance with the invention, the evaporators serve both as a means for dividing the receptacle in a plurality of separate compartments, and as a means for controlled cooling of the said compartments. In the embodiment illustrated in Figs. 1, 2 and 3, the evaporator also serves to form within the receptacle a centrally disposed low temperature or freezing compartment, while the end compartments are cooled to a lesser degree and in part by conduction through the metal walls of the receptacle. It is evident that the evaporator may

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readily be removed from association with the cabinet, or vice versa, while still maintaining connection with the other elements of the "package unit."

It will be understood further that the apparatus described and shown herein, including the configuration of the several parts thereof, is merely illustrative of the inventive principles involved, and that these principles may find physical embodiments within the scope of the claims without departing from the spirit of the invention.

I claim:

1. A refrigerator comprising an outer shell, an inner liner within and in spaced relation to said shell and having a bottom and side walls, said bottom wall having transverse dam members, and a substantially U-shaped evaporator having outwardly flaring flange portions at the bottom of each vertical side wall thereof and forming with the latter saddles for straddling said dam members thereby to provide means for rapidly and accurately positioning said evaporator in the liner.

2. A refrigerator comprising an outer shell, an inner liner within and in spaced relation to said shell and having a bottom and side walls, said bottom wall having transverse dam members, a substantially U-shaped evaporator, and means associated with said evaporator and cooperating with said dam members for directing liquids flowing from the walls of said evaporator away from the latter.

3. A horizontal top-access refrigerator comprising an outer shell, a food storage receptacle within and in spaced relation to said shell, and a substantially U-shaped evaporator dividing said receptacle into an intermediate compartment of low temperature and two end compartments of relatively higher temperature wherein said evaporator forms at least one wall of the two end compartments and two walls and the bottom of the intermediate compartment.

4. A refrigerator comprising a base structure, a cabinet detachably supported in elevated position on said structure and having an opening in the bottom, refrigerating apparatus in the form of a unit package including compressor and condenser elements mounted in the base structure independently of the cabinet and an evaporator located in the interior of the cabinet, said opening affording access for the evaporator to said interior, and a plug on said structure at the base of the evaporator and cooperating with the cabinet to seal said opening.

5. A horizontal top-access refrigerator comprising an outer shell, a metal inner shell forming a food storage receptacle within and in spaced relation to said shell, and a substantially U-

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shaped evaporator mounted in said receptacle with its U-shaped end edges in contact respectively with opposite side walls of the receptacle so as to divide the latter into an intermediate compartment of low temperature and two end compartments of relatively higher temperature, wherein said evaporator forms at least one wall of the two end compartments and two walls and the bottom of the intermediate compartment.

6. A refrigerator comprising an outer casing, an inner liner of high thermal conductivity mounted within and in spaced relation to said casing, and a substantially U-shaped evaporator located generally centrally of the inner liner and dividing the space within said liner into a zone of relatively low temperature and two zones of higher temperature, said evaporator having direct thermal transfer contact with the liner along at least a portion of its U-shaped edges whereby heat absorbed by the liner may pass freely by conduction to said evaporator.

7. A refrigerator comprising an outer casing, an inner liner of high thermal conductivity mounted within and in spaced relation to said casing, and an evaporator having edge portions in direct contact with said liner whereby heat absorbed by the liner may pass freely by conduction to the evaporator, said inner liner and evaporator being provided with intermating elements constituting positioning means facilitating assembly of said evaporator within the liner.

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