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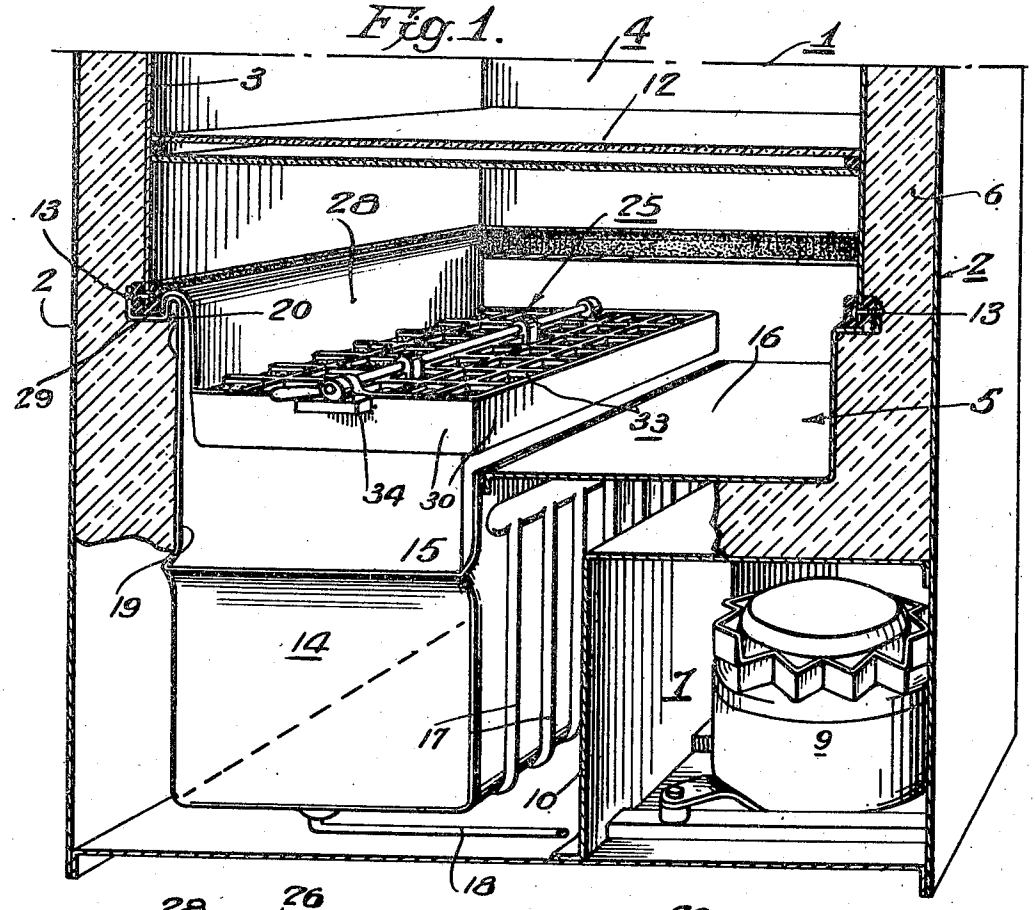
REMOVABLE SECONDARY COOLING UNIT FOR REFRIGERATOR EVAPORATORS

Filed March 28, 1944

Fig. 1.



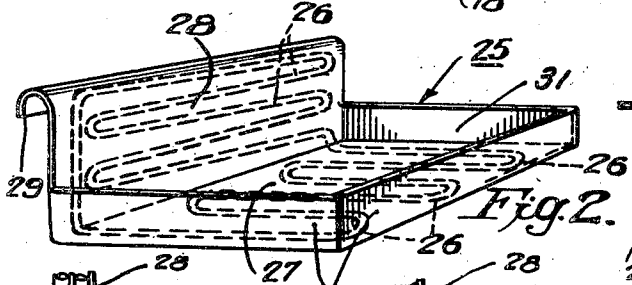


Fig. 2.

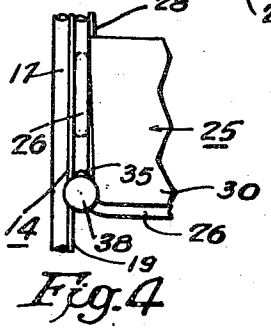


Fig. 4

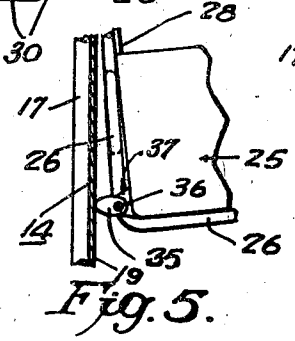


Fig. 5.

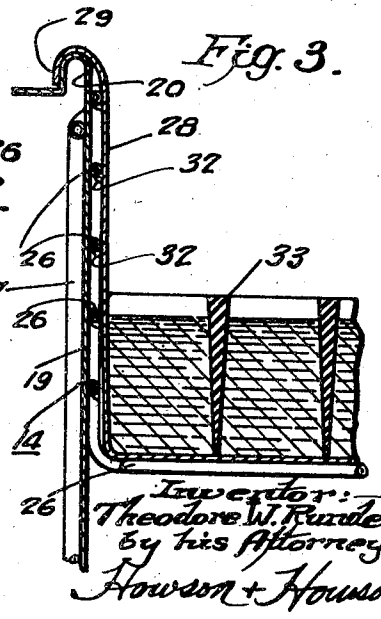


Fig. 3.

Inventor:
Theodore W. Rundell
by his Attorneys
Howson + Howson

UNITED STATES PATENT OFFICE

2,435,102

REMOVABLE SECONDARY COOLING UNIT FOR REFRIGERATOR EVAPORATORS

Theodore W. Rundell, Abington, Pa., assignor, by mesne assignments, to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

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5 Claims. (Cl. 62—125)

1

This invention relates to refrigeration and more particularly to the use of secondary freezing or cooling systems to effect localized refrigeration in domestic or other refrigerating apparatus.

One object of the invention is to provide a novel container incorporating a closed secondary refrigerant circuit and designed for operative association with the evaporator of the main refrigerating system of a refrigerator.

A more specific object of the invention is to provide a container of the stated character adapted for detachable suspension within a refrigerator with the condenser portion of the incorporated secondary refrigerant circuit in heat-exchange relation with the said main evaporator.

Another object of the invention is to provide a container of the stated character having means for regulating the degree of heat exchange between the secondary circuit and the said main evaporator with which it is associated.

A further object is to provide a container incorporating a secondary refrigerant circuit as described and adapted for production of ice, said container preferably including a detachable grid for forming ice cubes or the like.

Still further, the invention contemplates the provision of a container of the above type which is susceptible of extremely economical manufacture.

In the attached drawings:

Figure 1 is a fragmentary perspective view of the lower portion of a domestic refrigerator embodying the invention;

Figure 2 is a perspective view of the container removed from the refrigerator;

Figure 3 is a fragmentary sectional view of the container illustrating its manner of association with an evaporator of a refrigerator; and

Figures 4 and 5 are fragmentary sectional views illustrating a modified construction of the invention.

While the invention is not primarily concerned with the specific structure of the associated refrigerator, Figure 1 of the drawings shows the lower portion 1 of a modern deep-freeze domestic refrigerator of the mechanical type which may include an outer shell or housing 2 and an inner shell or liner 3, said liner encasing a food storage compartment 4 and the upper portion of a freezing compartment 5, and being separated from the outer shell by suitable thermal insulation 6. Certain features of this portion of the refrigerator structure are disclosed and claimed in a copending application of Donald E. Dailey, Serial No. 515,950, filed December 28, 1943, now Patent No. 2,430,456 issued Nov. 11, 1947.

2

The reference numeral 7 designates a machinery compartment which houses a motor compressor unit 9. This compartment is defined by a housing 10 which is separated by the insulation 6 from the refrigerated portions of the cabinet. As the particular refrigerant flow circuit employed to effect cooling of the food storage compartment 4 forms no part of the present invention, the flow passages and the connections thereto have not been illustrated in the drawings.

A double thickness partition 12 forms a floor for the food storage compartment 4, and attached to the lower edge of the liner 3 at points beneath this partition 12 by suitable connecting means shown at 13, is a low temperature evaporator 14 which comprises a deep-freeze storage bin 15 and a shelf area 16, said evaporator being provided with refrigerant channels 17 which are supplied with liquid refrigerant through a capillary 18. The vertical wall 19 of evaporator 14 is provided with an upwardly projecting rim portion 20 the purpose of which will be explained hereinafter.

In accordance with the present invention, and with reference to Figure 2 of the drawings, a substantially L-shaped member 25 is provided having a continuous closed refrigerant channel 26 partially filled with liquid refrigerant and forming a secondary refrigerating system. The member 25 includes a floor portion 27, a substantially vertical wall portion 28 which terminates at the top in a downwardly turned flange portion 29, and short upstanding walls 30 which form with the floor and lower portion of the wall 28 a shallow tray or container 31 for the reception of water or other liquid or of foodstuffs to be cooled or frozen.

While the refrigerant channel may be continued about walls 30 if desired, it has been confined in this embodiment to a sinuous path extending over the floor 27 and vertical wall 28. That part of the channel associated with the floor and lower area of wall 28 forms the evaporator portion of the secondary system, while the part associated with the upper area of wall 28 forms the condenser portion of the system. This channel may be formed in any convenient manner but is herein shown as a continuous tube suitably bonded to the outside of said floor and wall portions by welding or soldering as indicated at 32 in Figure 3. Preferably the channel portion associated with the wall 28 is sloped downwardly in a manner to facilitate movement of

liquid refrigerant from the upper condenser portion of the system to the lower evaporator portion.

When the tray is to be used for the production of individual ice cubes, it is provided, as illustrated in Figures 1 and 3, with a grid member 33 which may be of the mechanical release type, as indicated at 34 in Figure 1, or plastic or other suitable type.

In the operation of the device and assuming that the tray is to be used for forming ice cubes, the grid is placed within the tray and the latter filled with water. It is then suspended within the freezing compartment of the refrigerator by engaging the hooked flange 29 of wall 28 with the upstanding rim portion 20 of evaporator 14 so that the weight of the tray may act to urge the condenser portion of the secondary system into intimate heat exchange relation with evaporator 14. Heat from the water in the tray will be absorbed by the liquid refrigerant in the evaporator portion of the secondary system and the resultant gas will course upwardly through channel 26 to the condenser portion on wall 28 wherein it will be condensed to its liquid state by transfer of heat to the evaporator 14, the liquid refrigerant then returning to the evaporator portion of the secondary system.

Upon completion of the freezing cycle the cubes may be made individually accessible by removing the grid 33 through actuation of the mechanical means 34 and without removing the tray from the freezing compartment. Exposure of the ice cubes to melting temperatures outside of the freezing compartment is thereby avoided and there will be no tendency for the cubes to freeze together during storage. Or, if desired, the tray may readily be removed from the refrigerator by lifting the flange 29 from engagement with the rim 20 of evaporator 14. Refilling the tray may be accomplished while the tray is still within the refrigerator or it may be removed for that purpose. Such frost as may be formed upon the surface of the member 25 during the freezing cycle will be melted off upon introduction into the tray of the relatively warm water to be frozen.

A desirable feature of this construction lies in the fact that the single tray is capable of producing substantially the same quantity of ice as the conventional freezing unit consisting of permanent shelves and separate ice trays, and the cost of construction is considerably below that of the said conventional unit.

It is frequently desirable to use the tray for cooling or freezing other liquids or foodstuffs such as gelatinous desserts, ice cream, etc., and it may be found desirable in such instances to modify the cooling effect of the secondary system so as to prevent crystallization or other undesirable effect arising from too rapid cooling of the product. One means for modifying the cooling effect of the system is illustrated in Figures 4 and 5 and comprises a cam 35 pivotally mounted upon a pin 36 journalled in a pair of lugs 37 secured to the outer lower edge of wall 28. A turning knob 38 is fitted to the outer end of pin 36 for turning the cam against wall 19 of evaporator 14 to urge wall 28

of member 25 from its normal position, see Figures 3 and 4, and angularly about its point of engagement with rim 20 as a pivot to a position removed from direct contact with evaporator 14, as illustrated in Figure 5. Thus the cooling effect of evaporator 14 upon the condenser portion of the secondary system is reduced to a degree determined by the adjustment of the cam which may be adapted to remain in any adjusted position.

I claim:

1. A refrigerating apparatus including a refrigerated compartment, a main evaporator for cooling said compartment, and a container for liquids having integral therewith a closed secondary refrigerant circuit including an evaporator portion and a condenser portion, said condenser portion being normally disposed in heat exchange relation with said main evaporator, and means for adjusting the degree of heat exchange between the secondary condenser and said main evaporator.

2. In combination, an evaporator for refrigerating systems, a shelf-like member, means for detachably supporting said member in surface contact with the evaporator, and means for applying pressure to displace the member with respect to the evaporator so as to break a frost bond between the contacting surfaces.

3. An evaporator in accordance with claim 2 wherein said force-applying means comprises a rock shaft journaled on the member, and cam means carried by said shaft and arranged for forcible engagement with an adjoining surface of the evaporator when the shaft is turned.

4. In combination with the evaporator of a refrigerating system, a member comprising a bottom wall and a side wall and being substantially L-shaped, means at the top of said side wall for removably suspending the member on the evaporator structure with the side wall in contact with an active area of the evaporator and with the bottom wall free from such contact, means at the lower part of said side wall for exerting pressure against the structure tending to separate the wall from said contact area, and a closed refrigerant circuit in said member having portions in both of said walls.

5. In combination an evaporator for refrigerating systems, a member detachably supported in surface contact with the evaporator and comprising a closed refrigerant circuit, and means for applying pressure to displace the member with respect to the said evaporator so as to break a frost bond between the contacting surfaces.

THEODORE W. RUNDELL.

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The following references are of record in the file of this patent:

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