

June 4, 1946.

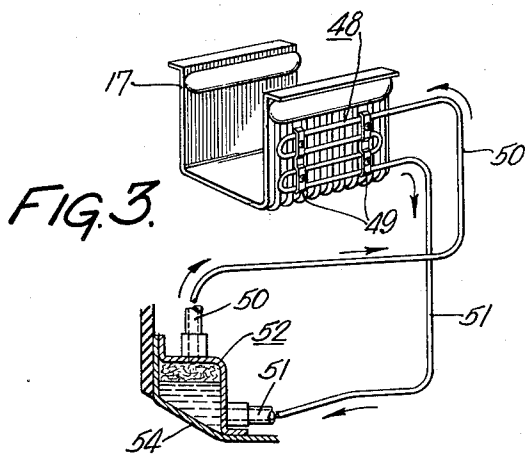
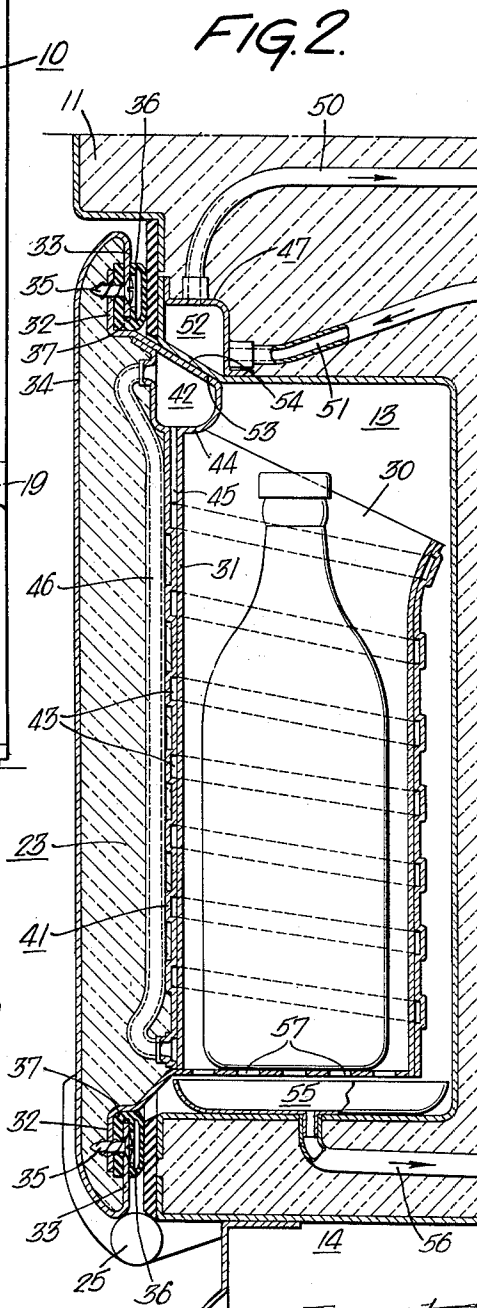
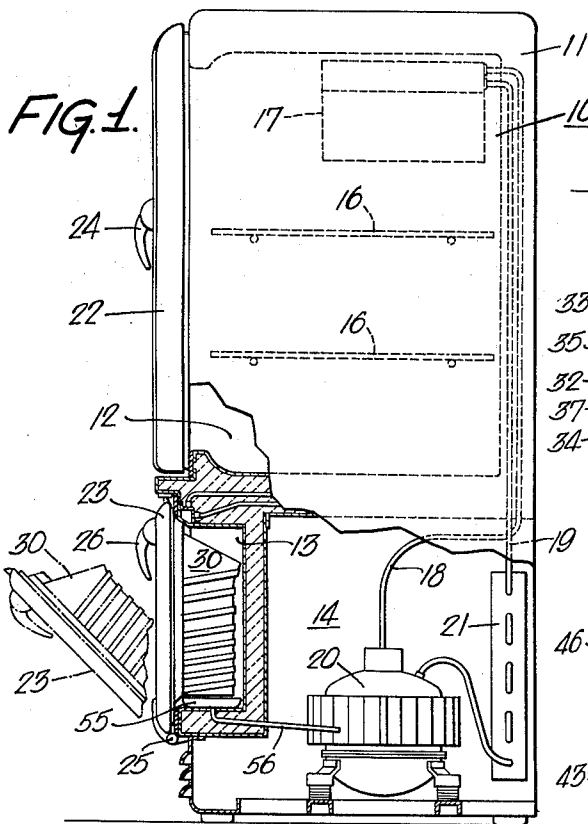
A. H. CHARLAND

2,401,613

REFRIGERATION

Filed Sept. 29, 1944

2 Sheets-Sheet 1



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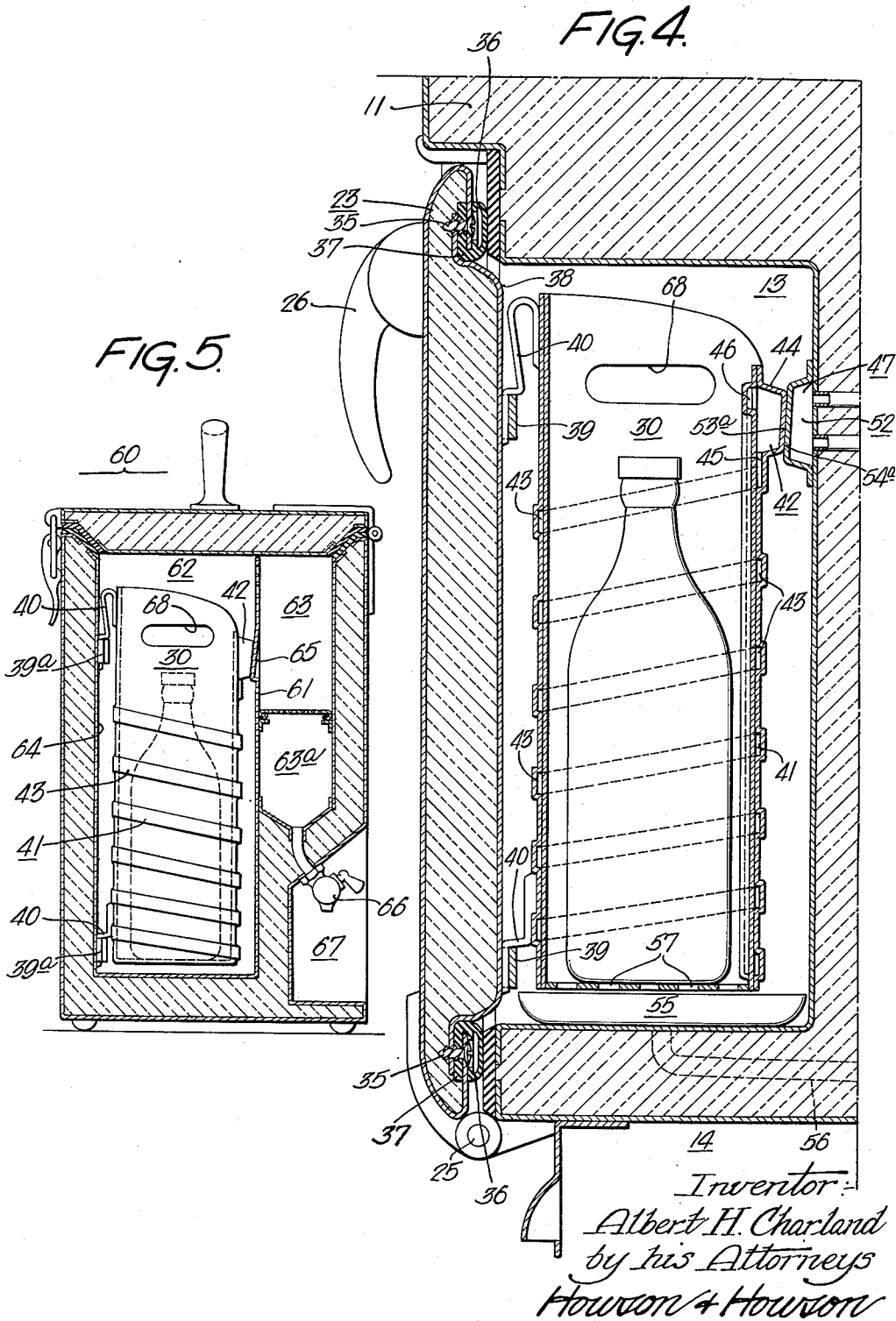
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UNITED STATES PATENT OFFICE

2,401,613

REFRIGERATION

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The present invention relates to refrigeration and more particularly to improvements in refrigerators of a type adapted for domestic use wherein provision is made for accommodation and cooling of a receptacle for storage of beverages and of foods such as butter, eggs, sandwiches, salads, vegetables and fruits.

The invention has for one of its objects, the provision of a container or receptacle comprising a self-contained refrigerating system, and adapted for placement in a convenient location within a refrigerator cabinet in operative association with suitable cold producing means thereby to produce adequate refrigeration for the substances stored in said container or receptacle.

Another object of the invention is to provide an improved system of refrigeration utilizing a plurality of distinct but cooperatively associated refrigerating circuits to provide separated refrigerated zones for accommodation and maintenance of foodstuffs at proper cold temperatures in various isolated locations within the refrigerator cabinet.

Another object of the invention is to provide a domestic refrigerator of the kind having a main storage compartment and an auxiliary storage compartment wherein a receptacle is provided for placement in the auxiliary compartment, said receptacle having its own refrigerating system so that articles placed in said receptacle may be cooled directly thereby.

The invention also contemplates utilization of the excess space in the machinery compartment of a domestic refrigerator as auxiliary refrigerating space by providing therein a bin-like structure having its own refrigerating system and adapted for storage of food articles.

A more specific object of the invention is the provision of means whereby beverages and prepared foods such as salads, sandwiches and the like, may be stored and chilled in a container or receptacle provided with its own refrigerating system and conveniently located within a refrigerator of substantially conventional form, said container being removable from said cabinet and being adapted for insertion in a portable case having means to cooperate with the refrigerating system of said container or receptacle to maintain the same at a chilling temperature.

Other objects and advantages of the invention will be apparent from the following description and accompanying drawings in which:

Fig. 1 is a side elevation and partial sectional view of a conventional domestic refrigerator hav-

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ing one form of the invention incorporated therein;

Fig. 2 is an enlarged cross-sectional view of a portion of the refrigerator shown in Fig. 1.

Fig. 3 is a somewhat diagrammatic view illustrating a possible structure for practice of the invention.

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

Fig. 5 is a sectional elevational view illustrating one of the uses of that form of the invention represented in Fig. 4.

Referring more particularly to the drawings, the domestic refrigerator therein illustrated and designated in its entirety by the reference numeral 10 is of the kind comprising a cabinet structure 11 having wall portions cooperating to provide an insulated main food storage compartment 12, an insulated auxiliary compartment 13 and a machinery compartment 14, said auxiliary and machinery compartments being located preferably below the main storage compartment.

As best shown in Fig. 1 of the drawings, the main storage compartment 12 may be provided with the customary shelves such as represented at 16 for carrying the food products to be chilled or cooled. Also, as shown in Fig. 1, the main compartment 12 is adapted to be cooled by means, for example, of a compression-expansion refrigerating system including a primary evaporator 17 which may be of the usual well-known type and which may be arranged within said compartment in the ordinary manner. The evaporator 17 is in fluid communication through refrigerant circulating lines 18 and 19 with a motor-compressor unit 20 and a condenser 21 of any suitable known constructions and conveniently mounted in the machinery compartment 13 in accordance with the usual practice. Preferably the main food storage compartment 12 and the auxiliary compartment 13 are provided with separate doors 22 and 23 respectively, so that either compartment may be opened without exposing the other.

The door 22 of the main compartment 12 may be of the usual construction and hinged to the side of the cabinet so that upon manipulation of a latch handle 24, the door may be swung open giving access to said main compartment. The door 23 of the auxiliary compartment 13 may be substantially of the same construction as the main door 22 but preferably is hinged to the lower portion of the cabinet as indicated at 25 so that upon manipulation of a latch handle 26,

the auxiliary door 23 may be swung downwardly as represented in dotted lines in Fig. 1.

The cabinet structure and refrigerating system as thus far described, are known in the art, (for example see U. S. Patent 2,222,543) and forms no part of the present invention except in the combination hereinafter set forth.

In accordance with this invention a receptacle 30 having its own refrigerating system is provided for placement in the auxiliary insulated compartment 13. As illustrated in the drawings, the receptacle 30 preferably has a bin-like shape and preferably is adapted to be carried on the inside of the auxiliary compartment door 23 so that when the said door is opened the receptacle will be withdrawn from said compartment to a position affording ready access to the receptacle, as shown in Fig. 1. Obviously, this arrangement provides also for return of the receptacle to its position in the compartment 13 when the door is closed.

The bin-like receptacle 30 may be permanently affixed to the door 23 as in the form of the invention shown in Fig. 2, or may be detachably suspended on the door as in the form of the invention shown in Fig. 4.

With reference to the form of the invention shown in Fig. 2, one wall 31 of the receptacle 30 may conveniently constitute the inner panel of the door 23. For that purpose the receptacle is provided with an extension flange 32, disposed for connection by means of screws or bolts 35 with a flange portion 33 on the outside shell 34 of the door, and a gasket strip 36 of rubber or like material is arranged on said door to effect a seal about the open front of the compartment 13, a portion 37 of said gasket strip being interposed between the flanges 32 and 33 to provide a thermal break therebetween.

In the form of the invention shown in Fig. 4, the door 23 has the usual inner panel 38, and this panel and the bin-like receptacle 30 are provided with complementary interengageable elements which, in the specific example illustrated, consists of brackets 39 fixed to the panel 38 and hooks 40 secured to portions of the receptacle 30. By utilizing a structure of this sort, the bin-like receptacle 30 is conveniently supported on the inner side of the door 23 to be moved in and out of the compartment 13 with the closing and opening movements of the door, and may readily be detached from said door whenever it is desired to do so.

As hereinbefore stated, the receptacle 30 is provided with its own refrigerating system, and as shown in the drawings, this system is of the closed secondary type including an evaporator portion 41 and a condenser portion 42. Preferably the evaporator portion 41 comprises a refrigerant circulating passage 43 arranged about the receptacle, and the condenser portion 42 comprises a header-like member 44 located at the upper part of the receptacle 30 and above said evaporator portion. Communication between the evaporator portion 41 and condenser portion 42 is established by means of ducts 45 and 46, the duct 45 leading from the lower section of the header member 44 to one end of the refrigerant circulating passage 43 and the duct 46 leading from the other end of said pathway to the upper section of said header.

The receptacle refrigerating system is preferably charged with a suitable known volatile refrigerant which will vaporize in the evaporator portion 41 of said system, the vaporized refriger-

ant passing through the duct 46 into the condensing header member 44, the latter being shaped and disposed for heat exchange association with suitable cold producing means 47 provided in the refrigerator cabinet structure so that such vaporized refrigerant is liquified in said header member, returned through the duct 45 into the evaporator portion 41 and recirculated throughout the passage 43 thereof for re-evaporation therein.

While the cold producing means 47 may be of any suitable type, the arrangement diagrammatically illustrated in Fig. 3 is preferred because of its simplicity of construction and its economy and efficiency of operation. This arrangement employs another or auxiliary closed secondary system linking the primary evaporator 17 in the main storage compartment 12 to the condenser portion 42 of the secondary refrigerating system of the receptacle 30. It includes a condenser portion 48 supported, for instance by means of clamping elements 49, in heat exchange relationship with said primary evaporator and communicating through tube extensions 50 and 51 with a secondary evaporator portion 52. This other or auxiliary secondary system is also charged with a suitable volatile refrigerant which will vaporize in the secondary evaporator portion 52, the vaporized refrigerant flowing through the tube extension 50 into the condenser portion 48 where the refrigerant will be condensed and liquified for return through the tube extension 51 into the secondary evaporator portion 52 for re-evaporation therein.

As hereinbefore indicated, the cooperating condenser portion 42 and evaporator portion 52 are respectively shaped and disposed for mutual heat exchange relationship and it is to be understood that such portions may be mounted in any suitable location with respect to the receptacle 30 and the walls of its accommodating compartment 13. For instance in the embodiment shown in Fig. 2 these portions are conveniently located at the upper forward edge section of the compartment 13 and the cooperating faces 53 and 54 of the evaporator portion 42 and condenser portion 52 respectively, are slanted downwardly and inwardly of said compartment so as not to interfere with the operation of the door 23 while assuring snug interengagement of said surfaces when the door is in closed position.

In the embodiment shown in Fig. 4 the cooperating evaporator portion 42 and condenser portion 52 are conveniently located at the upper rear section of the compartment 13, the cooperating faces 53a and 54a of said portions likewise being slanted in a direction to permit free movement of the door 23 to its opening position and to assure snug interengagement of said faces when the door is moved to its closed position. In the latter embodiment, the uppermost hooks 40 are preferably mounted to provide a yieldable connection between the door 23 and receptacle 30 to absorb shocks which may result when the door is slammed closed. Such a yieldable connection also assures proper contact between the cooperating faces of the evaporator and condenser portions 42 and 52 respectively.

The operation of the apparatus described above may be briefly summarized as follows:

The main refrigerating system functions to cool the main food storage compartment 12 in the usual manner, that is, the liquid refrigerant within the primary evaporator 17 absorbs heat from the air circulating within said compart-

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ment. The cold refrigerant within said primary evaporator 17 also absorbs heat from the vaporized refrigerant accumulated in the secondary condenser portion 48 of the auxiliary refrigerating system, thereby restoring such vaporized refrigerant to liquid state which then flows to and accumulates in the secondary evaporator portion 52.

When the receptacle secondary condenser portion 42 is in heat exchange relation with the secondary evaporator portion 52, the liquified cold refrigerant in the latter may absorb heat from the vaporized refrigerant accumulated in said secondary condenser 42 causing such refrigerant to be reconverted to its liquid state for circulation through the pathway of the receptacle evaporator portion 41, thus directly refrigerating the receptacle 30 and accordingly chilling the articles stored therein.

While the arrangement would operate as well if the receptacle secondary system were acted upon directly by a primary evaporator portion in series or in parallel with the primary circuit, one advantage to be gained by providing an intermediate secondary system linking the refrigerator primary system to the receptacle secondary system, is that it greatly simplifies assembly and maintenance problems.

Condensation which may form on the walls of the compartment 13 and on the surfaces of the receptacle 30 may be conveniently collected, for instance, in a pan 55 for discharge through a duct 56 to a point close to the hot motor-compressor unit where the condensate will evaporate. Openings 57 may be provided in the bottom of the receptacle 30 to allow condensate within the latter to drain into the pan 55. Any other means of condensation disposal, of course, may be used.

The arrangement such as shown in Fig. 4 wherein the receptacle 30, provided with its own refrigerating system, is removably mounted, possesses additional usefulness. For example, food may be prepared in advance and packed together with bottled beverages in the receptacle which may then be placed in position within the compartment 13 where such food and beverages may be chilled and kept cool for a period of time, say, over night. The receptacle may thereafter be transferred to a portable case such as shown at 60 in Fig. 5 to be transported for picnics, fishing trips, etc. Since the receptacle 30 is provided with its own refrigerating system, it is possible to maintain the food and beverages under the same refrigerating conditions when said receptacle is placed in the case 60 as when placed in the refrigerator cabinet. For that purpose the case 60, as shown in Fig. 5, is insulated and divided by means of a partition 61 into two chambers or compartments 62 and 63, one chamber, 62, being adapted to receive the receptacle 30 and the other chamber 63 being adapted to receive a cooling medium such as ice which may be ice cubes taken from the refrigerator.

In order that the receptacle may be properly supported within the chamber 62, the wall 64 opposite to and paralleling the partition 61 may be provided with brackets 39a similar to brackets 39 employed on the refrigerator door inner panel 38 (Fig. 4) and adapted for engagement with the hooks 40 secured to said receptacle.

The partition 61 is preferably formed with a projection 65 disposed for heat exchange association with the condenser portion 42 of the receptacle secondary refrigerating system. In this manner the cooling medium or ice within the

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chamber 63 will absorb heat from the vaporized refrigerant which may accumulate in the condenser portion 42 and thus cause reconversion of said vaporized refrigerant to liquid state for circulation and reevaporation in the evaporator portion 41 of said receptacle secondary refrigerating system, thereby maintaining the direct refrigeration of said receptacle.

If desired, the chamber 63 may be formed to provide an ice water reservoir 63a supplied with a tap 66 preferably located in a recessed portion 67 in the body of the case 60. Said recessed portion being devised to protect the tap against accidental operation and also to accommodate a container so that ice water may be drawn for drinking purposes. The tap 66 may, of course, also be used to drain the water from the chamber 63.

The arrangement as shown in Figs. 4 and 5 may also be used for preservation of dairy products. For instance, when the case 60 with the receptacle 30 and ice therein is placed outdoors, products such as milk bottles when delivered and put in the receptacle will be kept cool until taken in by the customer who may merely remove the receptacle from the case and place said receptacle, with the contained milk bottles, in position on the door 23 for placement in the refrigerator compartment 13 where the refrigerating function of the receptacle is continued.

In order to facilitate handling of the removable receptacle, the same may be provided with suitable handle means such as shown, for instance, at 68 in Figs. 4 and 5.

It will be appreciated that the present invention, by providing a receptacle having its own refrigerating system and capable of cooperative association with cold producing means in the manner hereinbefore specified, makes it possible to utilize an otherwise waste space in a refrigerator cabinet for convenient storage of such articles as bottled goods, prepared foods and the like, which articles may be chilled and kept cool by refrigeration produced directly within said receptacle itself. Moreover, by providing a receptacle of the type above mentioned which is removable and transferable from one refrigerating structure to another, the invention makes it possible to maintain articles placed in such a receptacle under practically constant refrigeration by the refrigerating system incorporated in said receptacle when positioned in either refrigerating structure.

While a particular type of refrigerator cabinet 55 has been shown and described herein as an example of a possible structure, it is to be understood that the invention is not limited thereto. For instance, it is immaterial whether the primary evaporator or cooling coil is supplied with cooling medium from an electric, gas, or other circulating unit, and it does not matter what specific type of evaporator is employed. It is to be understood also that other modifications in the various structures herein set forth as possible embodiments of the invention, may be made within the scope of the appended claims.

I claim:

1. In a refrigerator cabinet, an insulated compartment having an open side, a receptacle movable into and out of said compartment through the open side thereof and provided with its own refrigerating system including a condenser portion and an evaporator portion, and cold-producing means in said cabinet disposed for heat exchange association with said condenser portion

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of the receptacle refrigerating system when said receptacle is moved into said compartment.

2. In a refrigerator cabinet, a compartment having an open side, a bin-like receptacle movable into and out of said compartment through the open side thereof and provided with its own refrigerating system including a condenser portion and an evaporator portion, and cold producing means in said cabinet disposed for heat exchange association with said condenser portion of the receptacle refrigerating system when said receptacle is moved into said compartment.

3. In a refrigerator cabinet, an insulated compartment having an open side, a receptacle movable into and out of said compartment through the open side thereof and provided with its own refrigerating system including a condenser portion and an evaporator portion, and refrigerating means in said cabinet including an evaporator portion disposed for heat exchange association with said condenser portion of the receptacle refrigerating system when said receptacle is moved into said compartment.

4. In a refrigerator cabinet, an insulated compartment having an open side, a structure including a receptacle hinged to the cabinet for swinging movement into and out of said compartment through the open side thereof, a self-contained refrigerating system carried by said receptacle and including a condenser portion, and refrigerating means in said cabinet including an evaporator portion disposed for heat exchange association with said condenser portion of the receptacle refrigerating system when said receptacle is moved into said compartment.

5. In a refrigerator cabinet having an insulated compartment and a door for closing the same, a receptacle supported on the door, a secondary refrigerating system carried by said receptacle and provided with a condenser portion, and cold-producing means arranged in said cabinet for heat exchange association with said condenser portion when the door is in closed position.

6. In combination with a refrigerator cabinet having cold producing means therein, an insulated compartment provided with an access opening, a door mounted on said cabinet to extend across said opening, a food receptacle supported on said door, and refrigerant evaporator and condenser means carried by said receptacle, said condenser being disposed for heat exchange association with said cold producing means.

7. In combination with a refrigerator cabinet having cold producing means therein, an insulated compartment provided with an access opening, a door mounted on said cabinet to extend across said opening, a food receptacle removably suspended on said door, and refrigerant evaporator and condenser means carried by said receptacle, said condenser being disposed for heat exchange association with said cold producing means.

8. In combination with a refrigerator cabinet having cold producing means therein, an insulated compartment provided with an access opening, a door mounted on said cabinet to extend

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across said opening, a food receptacle having a wall forming an inner panel for said door, and refrigerant evaporator and condenser means carried by said receptacle, said condenser being disposed for heat exchange association with said cold producing means.

9. Refrigeration apparatus comprising a cabinet having a main food storage compartment and an auxiliary compartment isolated from said main compartment, a receptacle in said auxiliary compartment and provided with its own refrigerating system including a condenser portion and an evaporator portion, a main refrigerating system in said cabinet including an evaporator portion for cooling said main food compartment, and an auxiliary cold-producing means in heat exchange relation with said evaporator portion of the main refrigerating system and with the said condenser portion of the receptacle refrigerating system.

10. Refrigeration apparatus comprising a cabinet having a main food storage compartment and an auxiliary compartment isolated from said main compartment, a receptacle in said auxiliary compartment and provided with its own refrigerating system including a condenser portion and an evaporator portion, a main refrigerating system in said cabinet including an evaporator portion for cooling said main food compartment, and a supplementary refrigerating system linking the evaporator portion of the main refrigerator system to the condenser portion of the receptacle refrigerating system.

11. Refrigeration apparatus comprising a cabinet having a main food storage compartment and an auxiliary compartment isolated from said main compartment, a receptacle in said auxiliary compartment, a secondary refrigerating system carried by said receptacle and including a condenser portion and an evaporator portion, a primary refrigerating system in said cabinet including an evaporator portion for cooling said main food compartment, and a supplementary secondary refrigerating system linking the evaporator portion of the primary refrigerating system to the condenser portion of the secondary refrigerating system carried by said receptacle.

12. A closure member for the open side of a compartment in a refrigerator cabinet, said closure comprising a panel positionable in confronting relation with the open side of said compartment, a receptacle carried by said panel, and a closed secondary refrigerating system carried by said receptacle.

13. A closure member for the open side of a compartment of a refrigerator, said closure comprising a panel positionable in confronting relation with the open side of said compartment, a receptacle detachably supported on said panel, and a closed secondary refrigerating system carried by said receptacle.

14. A refrigerator door comprising a bin-like receptacle having a wall forming an inner panel for said door, and a closed secondary refrigerating system carried by said receptacle.

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