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2,709,900

## REFRIGERATOR WITH AIR CONDITIONED RECEPTACLE

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Our invention relates to refrigeration apparatus, being especially concerned with the provision of novel facilities for storing foods and maintaining them under optimum temperature conditions.

More particularly, the present invention has to do with the storage of certain types of food, for example meat, within the main storage compartment of a refrigerator of that type in which said storage compartment is refrigerated by vertically disposed cooling means.

In considering the invention, it is to be borne in mind that it has proven desirable to provide within a refrigerator cabinet both a freezer compartment and a main storage compartment maintained at a temperature above the freezing point of water, and in which may be preserved fresh fruits, vegetables, or other foodstuffs, which should not be subjected to sub-freezing temperatures. A desirable way of constructing such a refrigerator comprises dividing the space defined by the inner liner of the cabinet into upper and lower compartments by means of a generally horizontal partition which thermally isolates the two compartments and prevents contact of the air within the main, lower compartment with the low temperature evaporator which cools the upper compartment. In order to refrigerate the lower compartment, it is known to provide a vertically extending refrigerated surface associated with, or comprised of, at least a part of a wall of said lower compartment. One such refrigerator is disclosed and claimed in the co-pending application of Malcolm G. Shoemaker, bearing Serial No. 296,995, filed July 3, 1952, and assigned to the assignee of the present invention.

While constructions of this general character are well known and are advantageous, they have been found in practice to be subject to a disadvantage in that the lack of a horizontally extending refrigerated surface within, or in communication with, the main food storage compartment makes it difficult to provide within that compartment a zone or space maintained under conditions suitable for the storage of certain foods, and particularly meats. Meats which are to be used after a relatively short storage period should be maintained at a temperature intermediate the average temperature prevailing within the main food storage compartment and that maintained at the evaporator. In many conventional designs a meat storage receptacle is disposed just beneath a horizontally extending evaporator, but, as will be understood, this solution is not available in a refrigerator of the kind to which this invention relates. Also, mere provision of a covered receptacle within the main food storage compartment of such a refrigerator does not constitute an entirely satisfactory solution, since the temperature within that receptacle will be higher than that of said main compartment, and frequently too high for preservation of the foods stored.

Accordingly, and with the foregoing in mind, it is the primary object of our invention to overcome the foregoing difficulty by providing a novel meat receptacle, and by so relating it to the evaporator which cools the com-

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partment housing the receptacle as to result in maintenance within said receptacle of temperatures within a desired optimum range. In the achievement of this general objective the invention contemplates provision of a storage receptacle having apertures providing for inflow and outflow of cooling air, the receptacle being so disposed with respect to the vertically extending surface which cools the main compartment as to cause the convectional current of air which normally circulates downwardly past said cooling surface to flow into and through said receptacle. As will be clear from the following detailed description, such circulation of air through the receptacle may be achieved in a very simple manner by so disposing the receptacle that its inflow aperture lies directly in the path of the convectional current of air. However advantageously, and as illustrated in the drawing, ductwork or baffle means is provided to assist in confining the air current in a path such that it flows toward and through the inflow aperture.

The invention is also featured by providing for storage within the receptacle of moisture dropped from the vertically extending cooling means, and by controlling the flow of air through the receptacle in such manner that air entering the latter flows across the free surface of stored moisture prior to passage through and exit from said receptacle, thereby assisting in the maintenance of the moist atmosphere desirable in such receptacles and, to the extent that such moisture is vaporized and added to the circulating air, accomplishing further cooling of the contents of the receptacle.

In one aspect of the invention it is also an object that provision is made for varying the temperature within the receptacle.

The manner in which the foregoing objects and advantages of our invention may best be achieved will be understood from a consideration of the following detailed description, taken together with the accompanying drawing, in which:

Figure 1 is a front elevational view of a refrigerator embodying the invention, the view being taken with the door structure omitted;

Figure 2 is a side view, largely in section, illustrating the novel manner in which cooling air is caused to flow into and through the receptacle; and

Figures 3 and 4 are, respectively, fragmentary perspective and sectional illustrations showing certain constructional features of the receptacle.

Now making more detailed reference to the drawing, it will be seen that the invention is therein illustrated as embodied in a household or domestic refrigerator comprising an outer shell 10 and a liner member 11 spaced inwardly of an insulator from the outer shell 10 by any suitable insulation, shown at 12. A pair of doors seat against the forward face of the cabinet, sealing the same and providing access thereto. It will be understood that the refrigerator also includes circulating means, for example a compressor-condenser unit of any desired type, but illustration of this portion of the apparatus is not necessary herein since the present invention is not concerned therewith.

As indicated above, and as clearly appears in the drawing, the refrigerator is of the type in which the space within the inner liner 11 is sub-divided into an upper relatively low temperature freezer compartment which, in the embodiment shown, is defined by an evaporator 13, and a lower main food storage compartment 14, division being effected by means of a partition designated by the reference character 15. As is clear from consideration of Figures 1 and 2, the partition spans the width and depth of the space defined by the inner liner 11, and is so shaped and disposed within the cabinet as thermally to isolate the two compartments, preventing contact of



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the air within the main lower compartment with the low temperature evaporator 13.

In order to refrigerate the lower compartment, it is provided with a plate-type evaporator 16 which defines a cooling surface extending vertically within said lower compartment and associated with the rear wall of the latter. While, in the broader aspect of the present invention, a wall portion of the cabinet may comprise the cooling surface, it is preferred that separate evaporator means be utilized for this purpose. A circulatory, thermo-syphonic movement of air is set up by such an evaporator, the air flowing downwardly past the refrigerated surface, and upwardly along the opposite side of the compartment.

As will be understood without further description the two evaporators 13 and 16 form parts of a refrigerating circuit which includes the circulating means (not shown), the system being operated and controlled in accordance with known practice and in such manner as to achieve desired, predetermined storage temperatures within each of the compartments. As indicated hereinabove the system may advantageously be of the type fully described and claimed in the co-pending Shoemaker disclosure and, as such, the evaporator 16 may be caused to operate between upper and lower temperature limits such that moisture deposited in the form of frost upon the plate-like surface of the evaporator 16 is periodically melted, dropping freely therefrom to be disposed of in a manner presently to be described.

Preferably, and as shown, the refrigerator includes in the lower portion thereof a pair of drawers or trays 17 and 18, these latter providing for storage of fresh fruits, vegetables, and the like. Disposed above the drawer 17, and supported upon a shelf 19, is a receptacle 20 adapted for the storage of certain foods, for example, meats.

In particular accordance with the present invention this receptacle, which is box-like in form, is provided with ingress and egress openings 21 and 22, respectively, through which may flow air adapted to cool the contents of the receptacle.

As has been mentioned, meats which are to be used after a relatively short period of time should be maintained at a temperature somewhat lower than the average temperature prevailing within the main storage compartment 14, and this result is achieved by use of the receptacle of our invention, in novel combination with the vertically extending evaporator 16. To effect the desired reduction in temperature within the receptacle 20 provision is made to insure that at least a portion of the convectional current of air, which normally circulates downwardly past the evaporator 16, flows into and through the receptacle.

It will be noted that the receptacle is disposed beneath the evaporator 16, in order to obtain the greatest possible benefit from the aforesaid convectional current, the ingress opening 21 being so disposed as to lie in the path of the mentioned current. It will be appreciated that there will be a tendency for cooled air entering the receptacle 20 to stratify therein, thus insuring that at least those portions of the receptacle which lie below the level of the egress opening 22 will be maintained at a temperature intermediate the operating temperature of the evaporator 16 and the average temperature of the air within the compartment 14.

Whereas disposition of the ingress opening 21 in the manner described, that is, in a position in which it lies in the path of the air circulating downwardly past the evaporator 16, is alone sufficient to achieve substantial cooling of the receptacle, it is desirable that means be provided to increase this cooling effect. As clearly appears in the drawing a duct 23 extends from a region beneath the lower edge of evaporator 16 and into communication with the inflow opening 21. This duct serves a dual purpose, not only confining the air stream and thus promoting the desired circulation of air through the re-

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ceptacle, but also providing for delivery to the receptacle of moisture dropped from the evaporator under certain conditions of operation. In this connection it will be noted that a trough shown at 24 underlies those portions of the evaporator which are not spanned by the duct 23, and delivers moisture falling from said portions to the interior of the duct. A limited part of the receptacle, shown at 20a, is configured to provide a sump to which moisture is delivered from the interior of the duct 23, the moisture being retained therein as shown in Figure 2. As is apparent from the drawing, the direction of air flow through the receptacle is such that the cooling air flows across the free surface of the retained moisture, prior to passage through and exit from the receptacle.

Although the mentioned circulatory flow of air through the receptacle is alone sufficient to effect considerable cooling, collection of moisture within the receptacle is advantageous, since gradual evaporation of the accumulated drain water assists in cooling the receptacle and moistens the air passing therethrough to an extent sufficient to minimize any slight drying of stored meat which might otherwise occur. In practice it has been found that operation of the described apparatus results in a considerable lowering of the storage temperature, as compared to that which prevails within a completely closed pan, and the relative humidity within the receptacle is maintained within an optimum range.

In order that it may be possible to control the temperature within the receptacle, the apparatus includes means for impeding the flow of air therethrough. This means is embodied in a combined damper device and handle element (see Figures 3 and 4) having a forward portion 25, which may be gripped when it is desired to remove the receptacle, and a rearward portion 26 extending downwardly between the forward wall of the receptacle and the removable cover member 27. The portion 26 is provided with an elongated aperture 28 which, through suitable manipulation of screw threaded adjusting elements 29, may be brought into registry with the egress opening 22. As will be apparent, the size of opening 22 may be varied by suitably adjusting the position of aperture 28 and, in this manner, control of the temperature within the receptacle is achieved.

From the foregoing description it will be understood that by our invention there is provided improved refrigeration apparatus in which the problem of providing adequate storage facilities for meats and the like is met in a highly advantageous manner, the invention being particularly characterized by the fact that it is possible to realize completely the benefits inherent in two-compartment refrigerators of the kind described, without any sacrifice of proper meat storage facilities.

We claim:

1. In refrigeration apparatus, a storage compartment, means providing a cooling surface extending generally vertically within said compartment, a generally box-like storage receptacle extending in horizontal subagency to at least major portions of said surface, the rear portion of said receptacle being provided with an inflow passage and the forward portion of said receptacle being provided with an outflow passage, said receptacle being so disposed with respect to said cooling surface that said inflow passage lies in the path of the current of air which circulates downwardly past said cooling surface, said receptacle further including, in a region subjacent to said inflow passage, a portion adapted to receive and retain moisture dropped from said cooling surface, and a combined air flow and water delivery duct extending from a region beneath the lower edge of said cooling surface and communicating with said inflow passage.

2. In refrigeration apparatus, a storage compartment, means presenting a cooling surface extending generally vertically within said compartment, a substantially closed food storage tray extending in horizontal subagency to at least a substantial portion of said surface and having



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air ingress and egress openings, a limited portion of the space within said tray being configured to receive and retain moisture dropped from said cooling surface, and means defining a passage disposed to receive said moisture and to deliver the same to said ingress opening from whence it flows to said limited portion, the construction and arrangement further being such that cooling air which circulates downwardly past said cooling surface also flows through said ingress opening, and thence passes through said tray and outwardly through said egress opening, said moisture retaining portion of said tray being so disposed with respect to the direction of air flow through the tray that air entering said tray flows across the free surface of the retained moisture prior to passage through and exit from said tray.

3. In refrigeration apparatus, a generally rectangular storage compartment having forward, rear and lateral walls, a plate type evaporator extending generally vertically within said compartment and disposed in close adjacency to one of said walls, a storage receptacle disposed at a level below the lower edge of said plate type

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evaporator and having a back portion substantially underlying the said plate edge and a forward portion extending toward a wall opposite said one wall, said receptacle being provided with an air ingress opening disposed in an upper part of the back portion thereof and an air egress opening disposed in the forward portion thereof, and duct means extending between said lower edge of said plate type evaporator and said ingress opening and through which air flowing downwardly past said evaporator is caused to flow into said receptacle from whence it passes outwardly through said egress opening and into said compartment.

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