

Dec. 8, 1942.

L. M. KEIGHLEY

2,304,411

REFRIGERATING APPARATUS

Filed Dec. 22, 1941

2 Sheets-Sheet 1

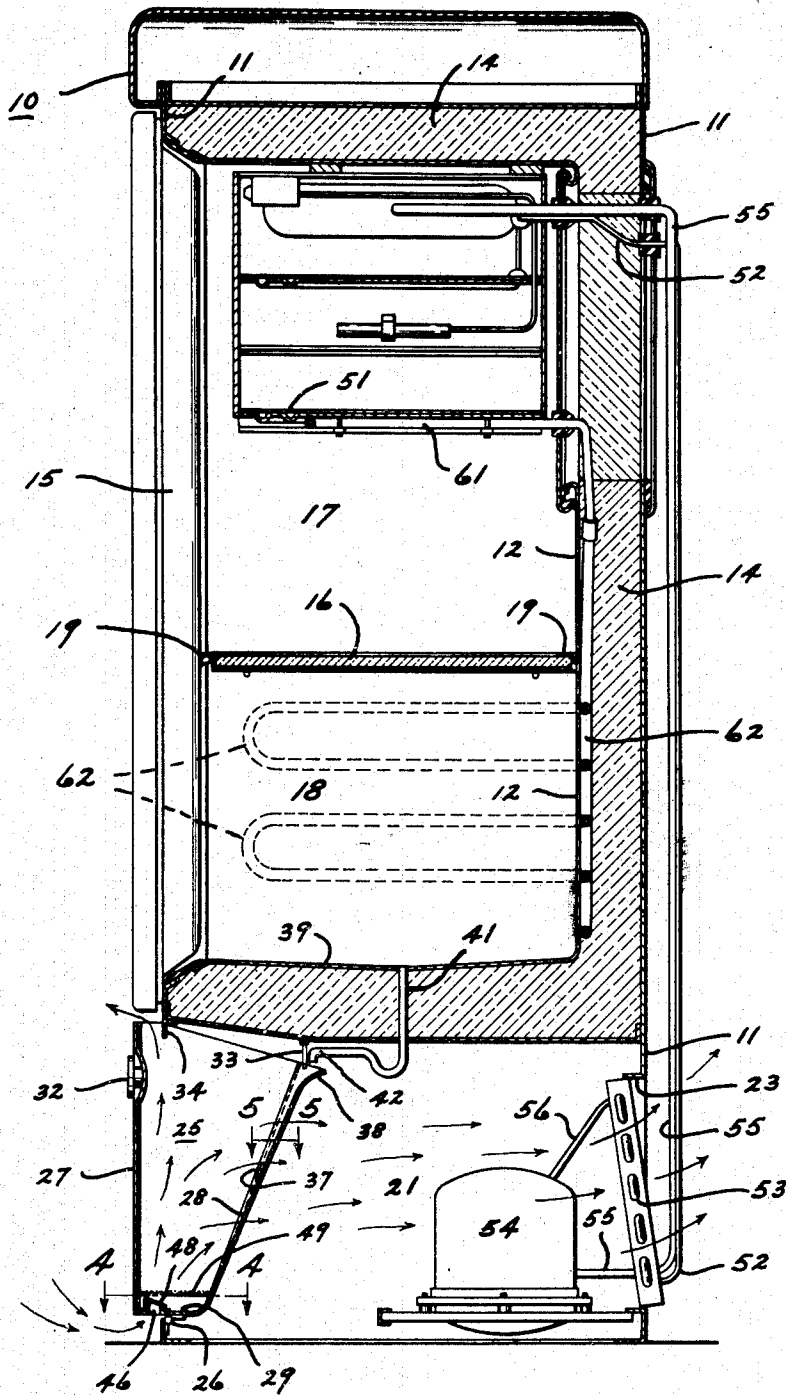


Fig. 1

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2 Sheets-Sheet 2

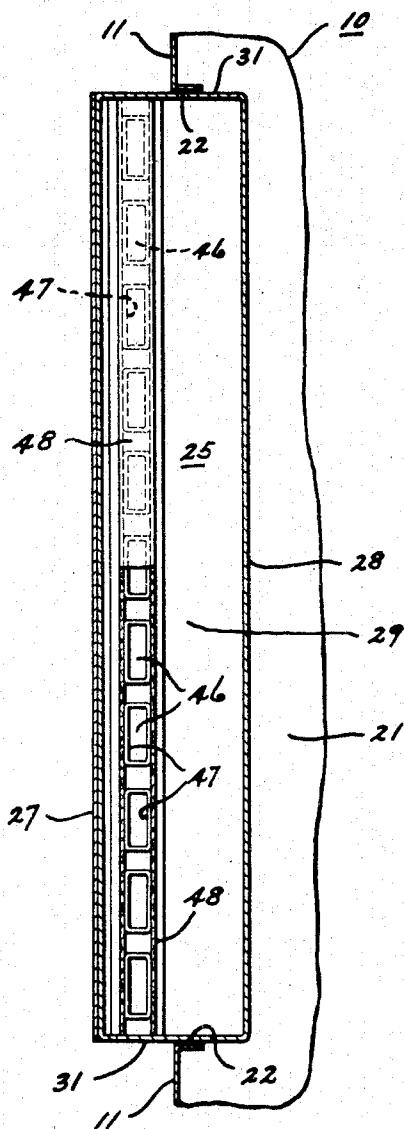


Fig. 4

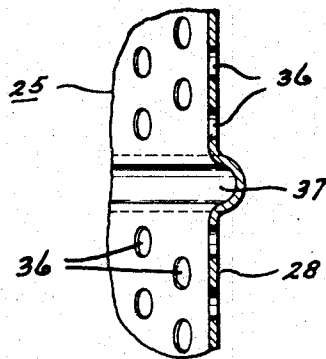


Fig. 5

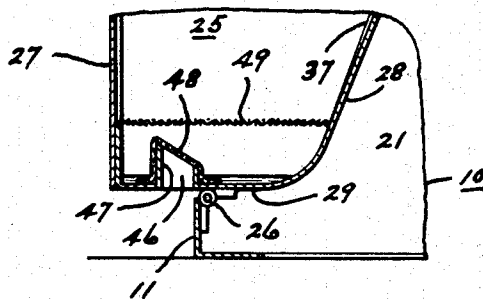


Fig. 2

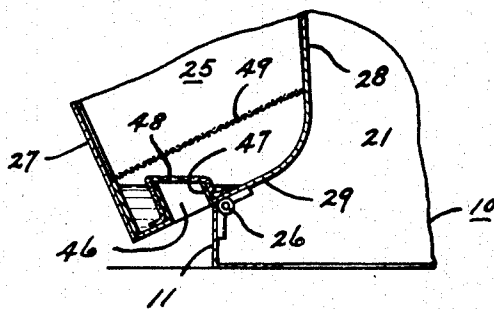


Fig. 3

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REFRIGERATING APPARATUS

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2 Claims. (Cl. 62-89)

This invention relates to refrigerating apparatus and particularly to household refrigerators.

In present day type household refrigerating apparatus, the cabinet thereof is ordinarily provided with a low temperature freezing chamber, isolated from a higher temperature high relative humidity chamber, and an auxiliary food storage bin associated with the machine compartment thereof. While this type of refrigerator has been favorably accepted by the public, there are two problems existing in such refrigerating apparatus. The first problem is that of preventing occurrence of an over-moist condition in the higher temperature high relative humidity chamber, which condition jeopardizes proper preservation of foods stored therein. The second problem is that of providing proper ventilation for the interior of the auxiliary food storage bin to prevent foods stored therein from becoming dried out by heat generated by heat dissipating elements of the refrigerating system associated with the refrigerator and located in the machine compartment thereof. By my invention, I contemplate the elimination of these problems in order to provide an improved household refrigerator.

An object of my invention is to remove excess condensate from a relatively high humidity food storage chamber of a refrigerator cabinet and to dispose of this condensate water into the atmosphere exteriorly of the refrigerator chamber of the refrigerator cabinet.

Another object of my invention is to provide means for adding moisture to air employed for ventilating the interior of an auxiliary food storage bin associated with the machine compartment of a refrigerator cabinet to prevent drying out of foods stored in the bin.

In carrying out the foregoing objects, a further and more specific or two-fold object of my invention is to remove condensate water from the high humidity food storage chamber of a refrigerator cabinet and to utilize this water for increasing the moisture content of air entering an auxiliary food storage bin associated with the machine compartment of the refrigerator to thereby more effectively prevent drying out of foods in the bin.

With the aforesaid objects in mind, the invention will best be understood from the following description of the embodiment thereof when read in conjunction with the accompanying drawings in which;

Fig. 1 is a vertical sectional view through a re-

frigerating apparatus having my invention incorporated therein;

Fig. 2 is an enlarged fragmentary sectional view of a part of the apparatus disclosed in Fig. 1;

Fig. 3 is a view similar to Fig. 2 showing the storage bin associated with the machine compartment of the refrigerator cabinet in an open position;

Fig. 4 is a horizontal sectional view taken on the line 4-4 of Fig. 1 showing apertures in a wall of the storage bin; and

Fig. 5 is a horizontal fragmentary sectional view taken on the line 5-5 of Fig. 1 showing apertures in another wall of the storage bin.

In order to illustrate my invention, I have shown a storage bin forming a closure element for the front of a machine compartment of a multi-temperated chamber household refrigerating apparatus of the type disclosed in the R. K. Miller Patent 2,228,144, dated January 7, 1941. My invention is particularly applicable to apparatus of the type referred to in the patent identified and, while I may herein only briefly describe such apparatus, a more detailed description thereof may be had by referring to this patent. Referring to the drawings, there is shown in Fig. 1, thereof, a household refrigerating apparatus comprising a cabinet generally represented by the reference character 10. Cabinet 10 includes a plurality of metal walls 11 forming an outer shell or wall surface of the cabinet and a metal liner member 12 within the upper portion of the cabinet surrounded by any suitable insulating material 14 and forming walls of a chamber. An opening providing access to the chamber is normally closed by an insulated door structure 15. A partition means 16 is disposed horizontally within the cabinet chamber and divides same into an upper food storage chamber 17 and a lower food storage chamber 18. Partition 16 has a rubber or the like gasket 19 extending therearound and cooperating with the upright walls of the cabinet chamber and with the inner surface of door 15 to form a seal between the food chambers 17 and 18 and normally isolating these chambers from air circulation therebetween. This partition 16 permits different temperatures as well as different humidities to be maintained in the different chambers, as will be hereinafter described.

The cabinet outer walls 11 extend downwardly beyond the insulated chambers 17 and 18 to enclose or surround a machine compartment 21

at the bottom of the cabinet. Front wall 11 of compartment 21 has an opening 22 therein (see Fig. 4) and the back wall of the compartment is provided with an aperture 23. Other walls 11 of cabinet 10 close the sides of the machine compartment 21 and this compartment is closed at its bottom by the floor upon which the refrigerator rests. In the present disclosure, a food storage bin-like element, represented as a whole by the reference character 25, is pivotally mounted by a hinge or hinges 26 upon the front wall 11 of the cabinet 10. Bin-like element 25 comprises a front wall 27, a back wall 28, a bottom wall 29 and two side walls 31. (See Fig. 4.) The bin 25 is mounted so that its front portion projects outwardly beyond the front wall 11 of cabinet 10 and is provided with a handle or knob 32 for facilitating tilting thereof about its hinged mounting. Bin element 25 forms a cover or closure means for the opening 22 in the front wall of machine compartment 21 of the refrigerator 10. A peg or the like 33, secured to the underside of the bottom insulated cabinet wall, forms a stop for the inward movement of bin 25. A bracket 34 may be secured to the front portion of compartment 21 and disposed in the path of the outward movement of the back wall 28 of the bin 25 so as to prevent tilting of the bin too far outwardly beyond the front of the cabinet. The front wall 27 of bin 25 is normally disposed substantially in the same vertical plane with the outer face of door 15 and the open top of the bin, or at least that portion of its top which projects outwardly beyond the cabinet front wall, is substantially concealed by the lower edge of door 15. A plurality of spaced apart apertures 36 are provided in the back wall 28 of the bin element 25 (see Fig. 5). This back wall 28 of the bin is also provided with a depressed portion forming a trough 37 along the inner surface thereof, which trough has a funnel-like upper part 38. The bottom of the food chamber 18 or the bottom wall 39 of liner member 12 is sloped toward a drain pipe 41 having its lower end 42 terminating above the funnel-like part 38 on the back wall 28 of bin element 25. The bottom of bin 25 has a plurality of elongated openings 46 therein bounded by flanged portions 47 which extend upwardly from the bottom wall 29 thereof. Flanges 47 provide dams about the openings 46 for retaining water adapted to be received in the bin 25 in the manner and for the purpose to be hereinafter described. A wick member 48 is disposed over the openings 46 in the bottom wall 29 of bin 25 and rests upon the tops of the flanges 47 with its edge portions depending into contact with the wall 29. A screen 49 is mounted in any suitable manner within the bin element 25 for supporting food products adapted to be placed in the bin in spaced relation to the wick 48. Wick 48 is adapted to draw water from the bottom of the bin and convey this water directly over the openings 46 and into the path of air entering the bin. Since air must flow through the wick 48, this wick must be rather porous and yet of sufficient density to draw water upwardly by capillary attraction.

In order to cool the upper food storage chamber 17 to a low temperature, an evaporator 51 of any desirable construction or design and preferably of the sheet metal variety is mounted therein. This evaporator is connected by a liquid refrigerant supply conduit 52 with a condenser 53, mounted within the aperture 23 in the back wall of machine compartment 21, and is

connected with a sealed motor-compressor unit 54 located in compartment 21 by a gaseous refrigerant return conduit 55. Refrigerant evaporated within evaporator 51 to cool the interior of chamber 17 is drawn into the compressor unit 54 where it is compressed and forwarded under pressure through pipe 56 into the condenser 53. The refrigerant is cooled and liquefied in condenser 53 and returned to the evaporator 51 by way of the supply conduit 52. An expansion valve or restrictor interposed in the conduit 52 controls the flow of liquid refrigerant into the evaporator 51. Any suitable or conventional thermostatic switch or the like means may be provided for starting and/or stopping the motor compressor unit 54 to maintain a predetermined low temperature within the evaporator 51 and consequently chamber 17. In the present disclosure, air which is employed to cool the motor-compressor unit 54 and condenser 53 is also utilized to ventilate the interior of the food storage bin 25. Air enters the bin 25 through the openings 46 and flows outwardly thereof into machine compartment 21 by way of the apertures 36. Some air which enters the bin 25 may flow upwardly therein and outwardly thereof to a point exteriorly of cabinet 10 by way of the open top portion of the bin which projects beyond the front wall of the cabinet. The air leaving the bin 25 and entering the compartment 21 flows over the motor-compressor unit and over the condenser 53 in its passage outwardly of the compartment through aperture 23 to cool these heat dissipating elements.

A closed secondary refrigerating system or circuit associated with cabinet 10 comprises a refrigerant condensing portion in the form of a conduit 61 secured in intimate thermal contact with the bottom wall of the primary evaporator 51. The secondary circuit also comprises a refrigerant evaporating portion in the form of conduit 62 having loops thereof extending over and secured to the upright walls of food chamber 18. The evaporator 51 of the primary refrigerating system may be maintained at an average temperature of 15° to 20° F. to maintain the air within chamber 17 at a low relative humidity for the preservation of certain food products. The amount of conduit 61 in contact with the primary evaporator 51 is predetermined, so that the evaporating portion of the secondary refrigerating circuit is maintained at approximately 35° F. to cool the walls of chamber 18 in the neighborhood of 37° F.

In the use of a refrigerator of the type disclosed, the apparatus functions to normally maintain a predetermined high relative humidity in the high temperature food chamber 18. However, during the storage of certain types of food within chamber 18, or due to the refrigerator being located in a climate where the air is of a very high relative humidity, normal leakage of air into chamber 18, or frequent opening and closing of door 15 causes moisture to condense out of the air within chamber 18 by the cooling of same. This creates an over-moist condition within the high temperature chamber 18, and under such a condition some of the condensate must be removed therefrom to provide for proper refrigeration of foods within this chamber. Heretofore, others have provided means for placing the high humidity chamber 18 in communication with the low humidity chamber 17 in order that the excessive moisture in chamber 18 will be removed therefrom and

collected upon walls of the low temperature evaporator 51 in the form of frost or ice. This necessitates too frequent defrosting periods of evaporator 51 and is not therefore entirely satisfactory. In the present disclosure, the excessive moisture within chamber 18 may flow into the drain pipe 41 whereupon it is directed onto the funnel-like top portion 38 of the back wall 28 of the bin 25. This excess moisture flows down the trough 37 formed in the back wall of bin 25 into the bottom of the bin. The condensate water is retained in the bin or is prevented from flowing outwardly thereof through the openings 46 in its bottom wall 29 by the flanges or dams 47 about the openings 46. Wick member 48 depends into the water contained in the bottom of bin 25 and therefore the wick draws the water by capillary attraction upwardly over the openings 46 to thereby convey the water directly into the path of air adapted to enter the bin through the openings 46. The air employed to ventilate the interior of bin 25 and to cool the motor-compressor unit 54 and condenser 53 is taken from the room in which the refrigerator is located and this air is usually dry. Thus, this air is not entirely satisfactory for preventing a reserve supply of food products stored within the storage bin 25 from being dried out by heat generated by the motor-compressor unit 54 and condenser 53 located within compartment 21. I therefore augment the ventilation of the interior of bin 25 by utilizing the condensate from the refrigerated chamber 18 for adding moisture to air circulating through the storage bin. Consequently, air circulating into the storage bin through openings 46 has moisture added thereto upon passing through the saturated wick 48, and this method of increasing the moisture content of the ventilating air insures better preservation of the reserve supply of food products stored in the bin 25. For example, potatoes, beets, turnips, onions, apples, pears and other food products placed in the storage bin 25 are prevented from being dried out by heat generated by the heat dissipating elements of the refrigerating system located in compartment 21 and by the circulation of dry air through the bin since the ventilating air in the present disclosure is laden with moisture before it flows over and around such food products in the bin.

From the foregoing, it will be apparent that I have provided a novel method of ventilating food products stored in a storage bin associated with the machine compartment of a refrigerator cabinet by increasing the moisture content of the ventilating air with water inherently associated with a refrigerated chamber of the refrigerating apparatus and which water should be removed from the chamber in order to attain proper food storage conditions therein. My invention provides an improved household refrigerator, and the addition of moisture to air

employed for ventilating a food storage bin, as disclosed, prevents drying out of the foods to thereby permit a reserve supply of foods to be satisfactorily stored in the bin over a considerable length of time. By my invention, I have eliminated the problem of disposing of excess condensate from the high temperature and high relative humidity refrigerated chamber of a two-temperated refrigerating apparatus while at the same time employing the condensate to perform a beneficial result in conjunction with the use of the apparatus.

While the form of embodiment of the invention, as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In refrigerating apparatus, the combination of walls defining a structure provided with first and second zones to be refrigerated and a compartment beyond said zones, means for cooling the air to said first zone to a low temperature, means for cooling the air in the second zone to a temperature higher than the temperature of said first zone whereby moisture condenses out of the air within said second zone, one wall of said compartment having an opening therein, cover means for the opening in said one compartment wall, said cover means comprising a bin-like element having opening means therein to permit air to circulate into and out of said element for ventilating the interior thereof, and means for conveying the condensate from the air in said second zone into the path of air entering said element to add moisture thereto.

2. In refrigerating apparatus, the combination of walls defining a structure provided with first and second zones to be refrigerated and a compartment beyond said zones, means for cooling the air in said first zone to a low temperature, means for cooling the air in the second zone to a temperature higher than the temperature of said first zone whereby moisture condenses out of the air within said second zone, a heat dissipating member of a refrigerating system in said compartment operatively connected with one of said cooling means, one wall of said compartment having an aperture therein and another wall thereof having an opening therein, cover means for the opening in the second mentioned compartment wall, said cover means comprising a bin-like element having opening means therein whereby air may circulate through said element into said compartment and outwardly of the compartment through the aperture in its one wall for ventilating the interior of said element and for cooling said member, and means for conveying the condensate from the air in said second zone into the path of air entering said element to add moisture thereto.

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