May 25, 1954 C. S. GRIMSHAW ET AL 2,679,144

DRAIN PAN ARRANGEMENT

Filed March 15, 1952

Fig. 1.

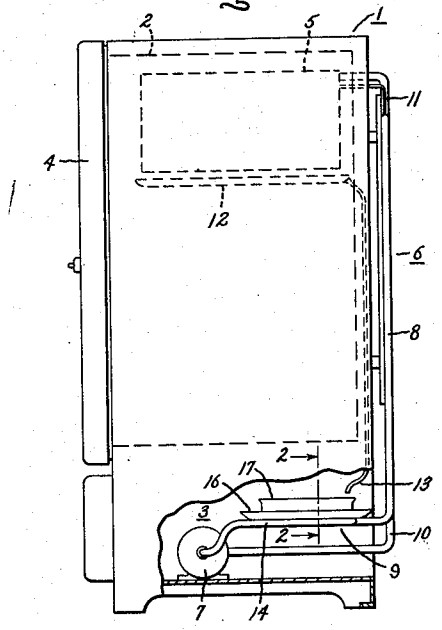


Fig. 2.

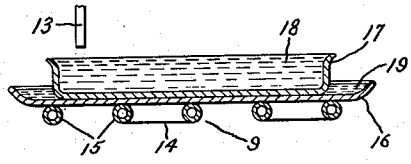
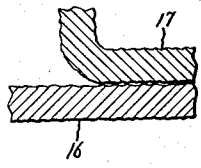


Fig. 3.



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Patented May 25, 1954 2,679,144

UNITED STATES PATENT OFFICE

2,679,144

DRAIN PAN ARRANGEMENT

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Application March 15, 1952, Serial No. 276,831

5 Claims. (Cl. 62—103)

1

The present invention relates to refrigerators and pertains more particularly to refrigerator defrosting apparatus.

Some refrigerators include means for automatically defrosting those surfaces in the food storage compartments thereof upon which frost forms and collects. Often such refrigerators also include means whereby moisture resulting from a defrosting operation is evaporated into the atmosphere outside the food storage compartments and thereby disposed of. One arrangement for so disposing of the defrost moisture includes an auxiliary condenser located in the machinery compartment of the refrigerator and a drain pan in heat exchange relationship with the auxiliary condenser. The defrost moisture is directed into the drain pan from the defrosted surfaces and is evaporated by heat from the auxiliary condenser. Usually, to reduce cost of manufacture and to conserve space in the machinery compartment, the drain pan is constructed just large enough to accommodate the maximum amount of defrost moisture resulting from ordinary frosting as determined by normal door opening, humidity, and temperature conditions. With such a construction, there is always the possibility of the defrost moisture exceeding the capacity of the pan and overflowing onto the floor, if and when the door is opened more than normally or the humidity and ambient temperature are higher than normal, so as to effect extraordinary frost formation in the refrigerator.

Without employing a pan of greater capacity, this situation has been heretofore coped with by bonding the pan to the auxiliary condenser, thereby to increase the thermal conductivity from the condenser to the pan for increasing the rate of moisture evaporation. In such an arrangement, however, it is difficult to clean the pan, which invites neglect, resulting in pan corrosion and the presence of malodorous residues. Substantially the same effect as bonding could, of course, be obtained by so constructing the auxiliary condenser and the bottom of the pan that no air gap exists therebetween when the pan rests on the auxiliary condenser. This, however, would prove prohibitively expensive in manufacture.

Accordingly, the primary object of the present invention is to provide in a refrigerator including means for periodically defrosting those surfaces in the food storage compartment thereof upon which frost collects, an improved arrangement for evaporating and thereby disposing of moisture resulting from a defrost operation.

Another object of the present invention is to

2

provide in a refrigerator including a defrost moisture evaporating pan, the size of which is determined by the amount of defrost moisture resulting from ordinary frosting conditions, improved means for avoiding overflow of the defrost moisture from the pan onto the floor when extraordinary frosting conditions prevail.

Still another object of the present invention is to provide in a refrigerator an improved arrangement including a defrost moisture evaporating pan for disposing of defrost moisture resulting from both ordinary and extraordinary frosting conditions and wherein the pan is removable for facilitating cleaning thereof.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In carrying out the objects of the invention, a drain pan of sufficient capacity to accommodate only the defrost moisture resulting from ordinary frosting conditions is provided and rests removably in a tray bonded to the passes of an auxiliary condenser. The pan has a substantial area of its bottom wall in heat conduction contact with the bottom wall of the tray, and in the operation of the refrigerator liquid overflow from the pan to the tray displaces the air between the bottom walls resulting in an increase in the thermal conductivity therebetween to accelerate the evaporation of moisture from the pan.

For a better understanding of the invention, reference may be had to the accompanying drawing in which Fig. 1 is a side elevational view of a refrigerator cabinet, partly broken away to illustrate an embodiment of my invention; Fig. 2 is an enlarged sectional view taken along the line 2—2 in Fig. 1 and looking in the direction of the arrows; and Fig. 3 is a greatly enlarged fragmentary sectional view illustrating the air gaps between the drain pan and tray.

In Fig. 1 is illustrated a refrigerator cabinet 1 including a food storage compartment shown in outline and indicated by 2, and a machinery compartment 3 disposed below the food storage compartment. A door 4 hingedly mounted on the cabinet 1 is provided for closing an access opening to the food storage compartment 2. Located in the food storage compartment 2 for providing cooling thereof is an evaporator 5. The evaporator 5 is included in a refrigerating system generally designated 6. The refrigerating system 6 includes further a refrigerating unit 7 located in

the machinery compartment 3 of the cabinet 1, a condenser 8 mounted vertically on the back of the cabinet 1, and an auxiliary condenser 9 arranged horizontally in the machinery compartment. The refrigerating unit 7 draws vaporous refrigerant from the evaporator 5 through a suction line 10. The vaporous refrigerant is compressed in the refrigerating unit 7 and conducted therefrom through, first, the auxiliary condenser 9 and then the condenser 8. Both the auxiliary condenser 9 and the condenser 8 cause heat to be dissipated from the vaporous refrigerant passing therethrough. In this manner, the refrigerant is liquefied for delivery to the evaporator 5 through a capillary tube 11. In the evaporator 5, the refrigerant effectively absorbs heat from the food storage compartment, thereby to refrigerate food items therein.

During operation of the refrigerating system 6, frost forms on the evaporator 5. By means not shown, the evaporator 5 is periodically defrosted. The water or moisture resulting from a defrost operation is collected by a drip tray 12, suitably supported in the food storage compartment 2 directly beneath the evaporator 5. A tube 13 is provided for conducting the defrost moisture from the drip tray to the machinery compartment 3.

As seen in Fig. 2, the above-mentioned auxiliary condenser 9 may comprise a single conduit 14 arranged in serpentine form and including a plurality of passes 15 in a common horizontal plane. Supported on the auxiliary condenser 9 and suitably bonded thereto, as by welding, is a shallow first receptacle or tray 16. It is to be understood that the auxiliary condenser 9 is only a convenient means for heating the tray 16. Various other means, for instance, the refrigerating unit 7 itself, could be employed to provide the heat required in the present invention. Resting removably in the tray 16 in heat transfer relationship therewith is a second receptacle or drain pan 17. The drain pan 17 is located for receiving the defrost moisture drained from the drip tray 12 through the tube 13.

The amount of frost formed on the evaporator 5 between consecutive defrosting periods depends upon the efficiency of the seal between the door 4 and the portion of the cabinet framing the access opening to the storage compartment 2, upon the accumulated time the door is opened between defrosting periods, the humidity, and ambient temperature. When a reasonably efficient door seal is provided and when door openings, humidity, and ambient temperature are within a normal range, the frost formed on the evaporator 5 between defrosting periods amounts to what may be termed ordinary frosting. The capacity of the drain pan 17 is such as to accommodate or correspond to the maximum defrost moisture resulting from ordinary frosting conditions. The heat dissipated from the refrigerant in the passes 15 of the auxiliary condenser 9 transfers first to the tray 16 and then to the drain pan 17. The bond between the passes of the auxiliary condenser 9 and the tray 16 affords maximum thermal conductivity therebetween. However, as shown in Fig. 3, the removability of the drain pan 17 from the tray 16 and the impracticability of providing positively mating surfaces between the tray and the drain pan results in air gaps existing between the drain pan and the tray. These air gaps might range from the substantially small ones seen in Fig. 3 and resulting from a multitude of small surface irregularities on either or both of the engaging surfaces between the drain pan and tray, to substantially large gaps resulting from a relatively few large surface irregularities as might occur during the mass production of the drain pan and tray. Air captured in these gaps acts as insulation between the tray and drain pan; and, therefore, the thermal conductivity between the tray and drain pan is not as great as between the auxiliary condenser and the tray. Nevertheless, the heat transferred to the drain pan 17 is sufficient to effect, in the interval between successive defrost periods, evaporation from the tray 17 and into the atmosphere in the machinery compartment 3 of all the defrost moisture resulting from ordinary frosting conditions.

With the same reasonably efficient door seal but under extraordinary frosting conditions, such as excessive door openings, high humidity and high ambient temperature, extraordinary amounts of frost form on the evaporator 5 between defrosting periods. Consequently, the moisture resulting when the evaporator 5 is defrosted and indicated by 18 in Fig. 2 is directed into the drain pan 17 at a rate greater than that which it can be evaporated from the drain pan between defrosting periods. This eventually results in the defrost moisture exceeding the capacity of the drain pan and overflowing into the tray 16. Adhesion and surface tension forces draw the overflow water or moisture, indicated by 19 in Fig. 2, between the tray 16 and the drain pan 17 where it displaces the air in the gaps existing between the tray and pan. This increases approximately 20 to 1 the thermal conductivity between the tray 16 and the drain pan 17, and accelerates proportionately the evaporation of defrost moisture from the drain pan. Thus, evaporation of the moisture from the drain pan 17 is accelerated when disposal of the defrost moisture in this manner is most urgent in order to prevent overflow in the machinery compartment 3 and onto the floor. While the primary purpose of the tray 16 is to hold the moisture 19 for displacing air from the gaps between the tray 16 and the pan 17, it also assists in preventing overflow of moisture onto the floor by quickly evaporating some of the moisture which initially overflows the drain pan 17.

It will be seen that the present invention includes many characteristics desirable in a defrost moisture evaporating arrangement. It is capable of disposing of extraordinary amounts of defrost moisture while the size of the drain pan from which the moisture is evaporated is determined by the defrost moisture to be disposed of normally. Also, the drain pan is removable for cleaning, and inasmuch as the drain pan overflows only under remote cases of extreme door opening, high humidity, and high temperature, there is little possibility of the tray 16 corroding or collecting malodorous residues between even infrequent cleanings.

While a specific embodiment of the invention has been shown and described, it is not desired that the invention be limited to the particular form shown and described, and it is intended by the appended claims to cover all modifications within the spirit and scope of the invention.

What we claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a refrigerator, defrost moisture disposing means comprising; a heated first receptacle, and a second receptacle resting removably in said first receptacle, said second receptacle having a substantial area of its bottom wall in heat conduct-

ing engagement with the bottom wall of said first receptacle, said second receptacle receiving defrost moisture for evaporation, said second receptacle being of sufficient capacity to accommodate only the defrost moisture resulting from ordinary frosting in said refrigerator, said first receptacle receiving the overflow defrost moisture when extraordinary frosting in said refrigerator results in said defrost moisture exceeding the capacity of said second receptacle, said overflow refrost moisture displacing air between the bottom wall of said first receptacle and the bottom wall of said second receptacle for increasing the thermal conductivity therebetween whereby evaporation of moisture in said second receptacle is accelerated.

2. In a refrigerator, a defrost moisture disposing means comprising; heating means, a shallow first receptacle, said first receptacle being bonded to said heating means, and a second receptacle resting removably in said first receptacle, said second receptacle having a substantial area of its bottom wall in heat conducting engagement with the bottom wall of said first receptacle, said second receptacle receiving defrost moisture for evaporation, said second receptacle being of sufficient capacity to accommodate only the defrost moisture resulting from ordinary frosting in said refrigerator, said first receptacle receiving the overflow defrost moisture when extraordinary frosting in said refrigerator results in said defrost moisture exceeding the capacity of said second receptacle, said overflow defrost moisture displacing air between the bottom wall of said first receptacle and the bottom wall of said second receptacle for increasing the thermal conductivity therebetween whereby evaporation of moisture in said second receptacle is accelerated.

3. In refrigerating apparatus including refrigerant evaporating means subject to frosting and adapted to be defrosted, refrigerant condensing means, a tray arranged in maximum heat transfer relationship with said refrigerant condensing means, and a pan resting removably in said tray in heat transfer relationship therewith, said pan receiving defrost moisture from said refrigerant evaporating means, the capacity of said pan corresponding to the defrost moisture resulting from ordinary frosting of said refrigerant evaporating means, said tray receiving the overflow defrost moisture when extraordinary frosting of said refrigerant evaporating means results in said defrost moisture exceeding the capacity of said pan, said overflow moisture displacing air between said tray and the bottom of said pan whereby thermal conductivity therebetween is increased and evaporation of moisture in said pan is accelerated.

4. In refrigerating apparatus including an evaporator subject to frosting and adapted to be defrosted, and a condenser associated with said evaporator, means for disposing of defrost moisture collected from said evaporator comprising; an auxiliary condenser, a tray bonded to and heated by said auxiliary condenser, and a pan resting removably in said tray in heat transfer relationship therewith, said pan receiving and evaporating defrost moisture collected from said evaporator, the capacity of said pan corresponding to the defrost moisture resulting from ordinary frosting of said evaporator, said tray receiving the overflow defrost moisture when extraordinary frosting of said evaporator results in said defrost moisture exceeding the capacity of said pan, said overflow moisture displacing air between said tray and the bottom of said pan whereby thermal conductivity therebetween is increased and evaporation of moisture in said pan is accelerated.

5. Refrigerating apparatus comprising a cabinet including a food storage compartment and a machinery compartment, an evaporator cooling said food storage compartment, said evaporator being subject to frosting and adapted to be defrosted, a condenser associated with said evaporator, an auxiliary condenser arranged horizontally in said machinery compartment, a tray bonded to and heated by said auxiliary condenser, a drain pan resting removably in said tray in heat transfer relationship therewith, the capacity of said drain pan corresponding to the defrost moisture resulting from ordinary frosting of said evaporator, and means for collecting said defrost moisture from said evaporator and draining said defrost moisture into said drain pan for evaporation, said tray receiving the overflow defrost moisture when extraordinary frosting of said evaporator results in said defrost moisture exceeding the capacity of said drain pan, said overflow moisture displacing air between said tray and the bottom of said drain pan whereby thermal conductivity therebetween is increased and evaporation of moisture in said drain pan is accelerated.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,485,115	Saunders	Oct. 18, 1949
2,525,342	Frie	Oct. 10, 1950
2,555,968	Harbison	June 5, 1951
2,585,736	Burr	Feb. 12, 1952
2,594,073	Robbins	Apr. 22, 1952