July 6, 1948. R. M. HALL 2,444,824

REFRIGERANT EVAPORATOR

Filed Nov. 29, 1944

FIG. 1.

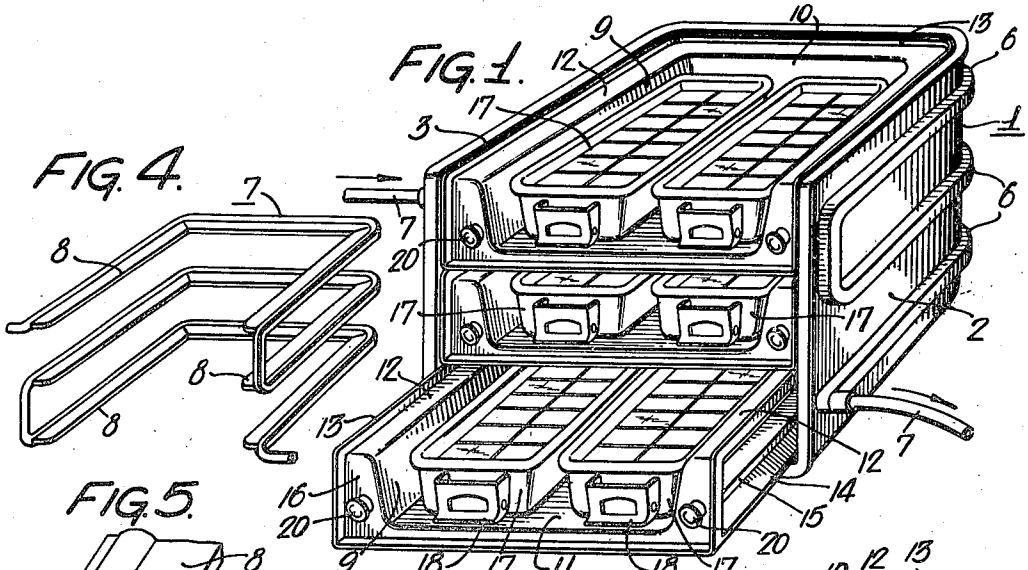


FIG. 4.

FIG. 5.

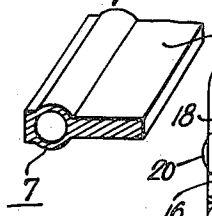
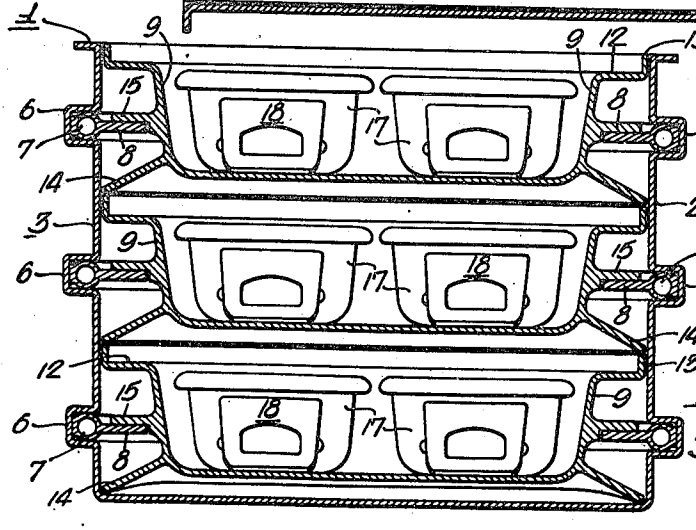


FIG. 2.

FIG. 3.



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REFRIGERANT EVAPORATOR

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9 Claims. (Cl. 62—126)

1

This invention relates to improvements in evaporators of the type employed in mechanical refrigeration systems and more particularly of a type found conventionally in domestic and like refrigerators.

Evaporators of this type are usually arranged with surfaces exposed in a storage compartment of the refrigerator, and are designed to receive ice trays or receptacles for foods which are to be frozen or cooled rapidly to a desired low temperature. To this end the evaporator is conventionally made in the form of a housing which contains flow channels for the refrigerant and which is provided with shelves to support one or more of the aforesaid trays or receptacles.

Since evaporators of this class are operated at temperatures well below freezing, the exposed surfaces are subject to frost accretion arising from contact therewith of moisture-laden ambient air. Such frost accretion not only progressively reduces the efficiency of the evaporator in its primary function of maintaining the storage chamber of the refrigerator at a predetermined relatively low temperature, but interferes also with efficient freezing or cooling of the water or foodstuffs in the aforesaid trays and receptacles. It is necessary, therefore, if efficiency is to be maintained, to periodically defrost the evaporator, which, in the conventional type of assembly, is accomplished by interrupting the operation of the refrigerating system until the frost melts from the surfaces.

A principal object of the present invention is to provide an evaporator of the aforesaid type wherein the shelves, constituting separable elements of the evaporator structure, are formed so as to enclose surface areas of the walls of the housing which otherwise would be exposed to the moisture-laden ambient air and to thereby shield said surfaces from the said moisture and the resultant frost accretion.

To this general end the invention contemplates provision of a shelf having exterior elements designed to cooperate with the walls of the housing to enclose the surface areas of the latter as aforesaid.

The invention further contemplates the mounting of a plurality of the aforesaid shelf elements in contiguous positions within the housing in a manner such that the aforesaid surface-enclosing means of the several shelves will jointly embrace substantially the entire adjoining surface area of the housing.

Another object of the invention is to provide a character of support means for said shelves

2

within the evaporator housing which will afford intimate heat transfer association of the shelves with the said refrigerant flow channels and which will be embraced within the aforesaid enclosed and shielded areas.

The invention extends further to certain novel structural details and arrangements hereinafter described and illustrated in the attached drawings wherein:

Figure 1 is a view in perspective of an evaporator structure made in accordance with the invention;

Figure 2 is a longitudinal sectional view of the evaporator;

Figure 3 is a transverse sectional view of the evaporator;

Figure 4 is a view in perspective of the conduit which constitutes the refrigerant flow channel of the evaporator shown detached from the other evaporator structure; and

Figure 5 is an enlarged fragmentary sectional perspective view showing a detail of the conduit structure.

With reference to the drawings, the evaporator therein illustrated as one embodiment of the invention comprises a housing 1 having side walls 2 and 3, respectively, a rear wall 4, and a bottom wall 5. In the present instance the housing is open at the top and at the front. The side and rear walls of the housing contain pressed-out portions which form a continuous recess 6 extending in three courses respectively at different levels in said walls, and within the recess is established a refrigerant flow conduit 7, said conduit being shown separated from the housing in Figure 4. The conduit may be secured within the recess 6 by any suitable means, and preferably is in intimate heat-transfer contact with the walls of the recess. As shown in Figures 4 and 5, the horizontal courses of the conduit 7 are provided with integral horizontally projecting flanges 8, and in assembly these flanges form within the housing 1 superimposed horizontal supports for the shelf elements now to be described.

The said shelf elements comprise side walls 9, 9, a rear wall 10, and a bottom wall 11. The walls 9 and 10 terminate at their upper edges in outwardly projecting flange portions 12, the outer edges of which are turned up as indicated at 13. From the neighborhood of the junctures of the side and rear walls 9 and 10 with the bottom wall 11, a flange 14 extends outwardly and downwardly as illustrated in Figures 2 and 3, this flange extending continuously around the sides

and back of the shelf. Projecting outwardly from the side and rear walls 9 and 10 of the shelf intermediate the flanges 12 and 14 is a flange 15, this flange also extending continuously at the sides and back of the shelf and being adapted in assembly to seat upon the flanges 8 of the conduit 7 so as to support the shelf within the housing 1. The side walls 9 and bottom wall 11 terminate at the forward end of the shelf in flanges 16 which extend outwardly to lines intersecting the outer edges of the flanges 14 and the outer faces of the turned up portions 13 of the flanges 12. All of these outwardly projecting flanges of the shelf are dimensioned so that when the shelf is inserted in the housing, the outer edges or faces thereof either contact or lie in very close proximity to the inner surfaces of the side walls 2 and 3 of the housing and the rear wall 4. The inner surface areas of said side and rear walls of the housing embraced between the said flanges 12, 14 and 16 are thus in effect enclosed and are shielded against exposure to moist air within the space surrounding the evaporator and against the frost accretions which would result from such exposure. It is to be noted that the shelf supporting flanges 8 are so positioned in the walls of the housing, and the said walls and the aforedescribed shelf structures are so relatively dimensioned, that when the three trays of the present embodiment are assembled in the housing they act jointly to enclose and shield the entire inner wall surface of the housing.

With the aforedescribed construction, the frost accretion will be limited to the exposed surfaces of the shelves, and when the frost deposit becomes excessive, the shelves may be readily removed from the evaporator housing and subjected to heat to melt the deposit and free the surfaces from frost. Since such defrosting operation may be effected very rapidly the normal operation of the evaporator may continue uninterruptedly. Continuous efficient refrigeration of the storage chamber within which the evaporator is installed is thus maintained.

It is to be noted also that by use of the integral flanges 8 of the refrigerant conduit 7 as a support for the shelves, an intimate heat exchange relation is established between the shelf structures and the refrigerant and that the principal paths of heat transfer between the refrigerant and the shelves occupy positions within the enclosed and shielded spaces previously described with consequent avoidance in these areas of frost accretion which might interfere with the efficiency of the thermal transfer process.

In the drawings, the shelves are illustrated as containing ice trays 17, which may be of standard form, and which in the present instance are provided at the front with pivotally attached handles 18. The lower ends of these handles are arranged to bear against the underlying surfaces of the shelves so that when the handles are turned in a counterclockwise direction (as viewed in Fig. 2) about the pivotal connection 19, the lower ends of the handles will have a camming action tending to elevate the tray and to break any frost adhesion that may exist between the bottom of the tray and the underlying surface of the shelf structure. Obviously, a force exerted on the top of the handle tending to withdraw the tray from the front of the evaporator will tend also to effect the aforesaid pivotal movement of the handle. In the present instance also, each of the said shelf structures is provided at the front and on each side with a handle element 20

by means of which the shelf may be withdrawn from the housing 1 for defrosting or cleaning purposes.

It is to be understood that the term "housing" is used in liberal sense and is not to be construed as imposing undue limitation on the structural form or shape of the evaporator. While, in the interest of simplicity, the evaporator structure alone has been illustrated and described, it should be understood that, in most installations, the evaporator would be employed in such a manner that its exterior surfaces would also be shielded against the access of moisture laden air. For example, in certain installations, its exterior surfaces may not be employed as active heat exchange areas, and may be embedded in the refrigerator insulation.

I claim:

1. An evaporator comprising a housing structure including refrigerant flow channels, and a plurality of shelves detachably mounted in said housing and acting jointly to shield substantially the entire inner surface of the housing against exposure to moisture and resultant rapid frost accretion.

2. An evaporator comprising a housing structure including refrigerant flow channels, and shelf means detachably mounted in said housing and having projecting flanges coactive with a wall of the housing to form an enclosure within which the included surface area of said wall is shielded against exposure to moisture and resultant rapid frost accretion.

3. An evaporator comprising a housing structure including refrigerant flow channels, and a plurality of shelves individually detachably mounted in said housing and having projecting flanges coactive with a wall of the housing and with each other to shield a substantially continuous surface area of said wall against exposure to moisture and resultant rapid frost accretion.

4. An evaporator comprising a housing structure including refrigerant flow channels, and a plurality of shelves individually detachably mounted in said housing and having projecting flanges, the said flanges of the several shelves coacting with the walls of the housing and with each other to shield substantially the entire inner surface area of the housing against exposure to moisture and resultant rapid frost accretion.

5. An evaporator comprising a housing structure including refrigerant flow channels, shelf means detachably mounted in said structure and having means cooperating with a surface area of an adjoining wall of the housing to form an enclosure, and a flange projecting from a wall of a refrigerant flow channel into said enclosure and constituting a support for said shelf, the surfaces of the evaporator and shelf means included in said enclosure being shielded against exposure to moisture and resultant rapid frost accretion.

6. An evaporator comprising a housing including refrigerant flow channels, flanges projecting from the walls of said channels into the interior of said housing, detachable shelf means supported on said flanges, and flanges projecting from the said shelf means toward the wall of the housing and forming with said wall an enclosure for the flanges first named within which said flanges are shielded against exposure to moisture and resultant rapid frost accretion.

7. An evaporator comprising a housing having side and back walls and including a horizontally disposed refrigerant flow channel extending continuously through all of said walls, a flange pro-

jecting inwardly from the wall of said channel, and a shelf supported on said flange and having flange portions projecting toward the wall of the housing and forming with said wall an enclosure for the first named flange operative to shield said flange together with the areas of the housing wall included in the enclosure against exposure to moisture and resultant rapid frost accretion.

8. An evaporator comprising oppositely disposed wall members having recesses in the confronting faces, conduit established in said recess and forming a refrigerant flow channel, integral flanges on said conduit projecting into the space between said walls and forming shelf-supporting ledges, and shelf means supported on said ledges and comprising means cooperating with the said wall members to enclose the ledges and the surrounding surface area of said walls.

9. An evaporator comprising a housing, a horizontally disposed refrigerant flow channel extending through the walls of said housing, a flange projecting inwardly from the wall of said channel, and a shelf supported on said flange and having portions projecting into proximity to the inner surface of the said housing walls so as to form with said walls an enclosure for said flange operative to shield the flange together with the surface areas of the housing wall included in the enclosure against exposure to moisture and resultant rapid frost accretion.

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