Feb. 21, 1956 S. J. WILLIAMS, JR 2,735,279

REFRIGERATOR EVAPORATOR

Filed Dec. 11, 1952

FIG. 1.

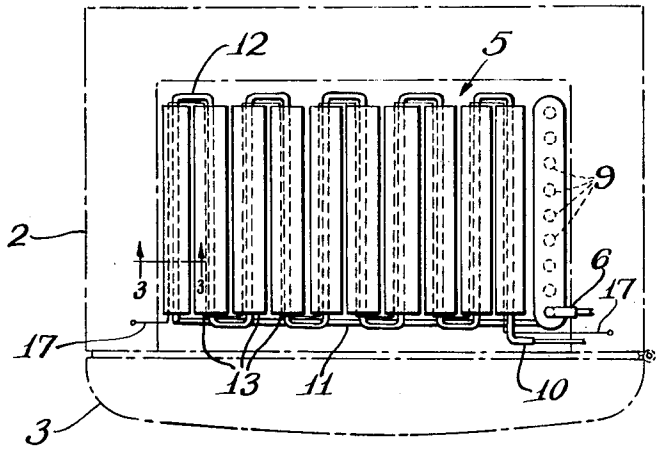


FIG. 2.

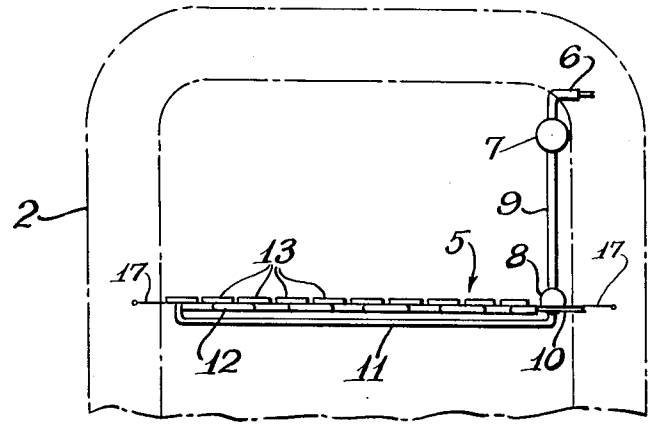
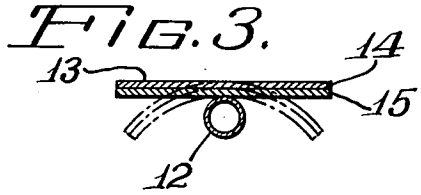


FIG. 3.



Inventor:
Si J. Williams Jr.
Paul O. Pippel
Atty.

United States Patent Office 2,735,279 Patented Feb. 21, 1956

2,735,279

REFRIGERATOR EVAPORATOR

Si J. Williams, Jr., Evansville, Ind., assignor to International Harvester Company, a corporation of New Jersey

Application December 11, 1952, Serial No. 325,322

8 Claims. (Cl. 62—126)

This invention relates generally to refrigerator evaporators, and more specifically to an improved type of evaporator for use in a refrigerator having a rapid defrost system.

The object of this invention is to provide means in an evaporator for efficiently removing defrost water.

Another object of this invention is to provide an evaporator in which food positioned within the evaporator will be protected from any puddles of water which may result when the accumulated frost upon the surface of the evaporator is melted.

Another object of this invention is to provide an evaporator which may be heated to melt any frost accumulation thereon, but which will reduce to a minimum the possibility of thawing any frozen food placed within the evaporator.

A feature of this invention is the use of bi-metallic strips for the horizontal surface of an evaporator upon which food may be placed for refrigeration.

Other objects and features of the invention will be apparent upon a perusal of the following specification and drawing of which:

Figure 1 is a top plan view of an evaporator constructed according to the invention;

Figure 2 is a side plan view of the evaporator shown in Figure 1; and Figure 3 is a cross sectional view of part of the evaporator shown in Figure 1 taken along the line 3—3.

The present embodiment is the preferred embodiment, but it is to be understood that changes can be made in the present embodiment by one skilled in the art without departing from the spirit and scope of this invention.

For a description of the invention reference is made to Figures 1 and 2. It is intended that the evaporator shown generally as 5, is mounted within a refrigerator cabinet having a cabinet door 3 pivotally mounted thereto. The evaporator 5 is shown generally as L-shaped, and food may be stored upon the horizontal portion of the evaporator between one inner side wall of the cabinet 2 and the vertical portion of the evaporator 5.

The vertical portion of the evaporator 5 comprises an upper header 7 and a lower header 8. Mounted between these headers are a number of vertical tubes 9, these vertical tubes 9 are connected in parallel between the headers 7 and 8. The header 7 has tubing 6 connected thereto and it is intended that the tubing 6 is connected to a conventional refrigerator compressor (not shown), so that the tubing 6 forms the suction line for the evaporator 6. To the header 8 one end of tubing 11 is connected.

The horizontal portion of the evaporator 5 comprises serpentine tubing 12. One end of the serpentine tubing 12 is connected to the other end of the tubing 11. The other end of the serpentine tubing 12 is connected to tubing 10. It is intended that the tubing 10 is connected to the outlet side of a conventional refrigerator condenser (not shown) with some conventional form of metering means (not shown) interposed therebetween so that the tubing 10 will form the liquid line for the evaporator 5. To the upper surface of the serpentine tubing 12 a number of parallel strips 13 are mounted, as can easily be seen in Figures 1 and 2. These parallel strips 13 are placed in

good thermal contact with the upper surface of the serpentine coil 12, such as by welding thereto. The parallel strips 13 are positioned only over the parallelly spaced straight portions of the serpentine tubing 12, and not over the bends or turns of the tubing 12 which serve to interconnect adjacent parallel portions of the tubing 12. As shown in Figures 1 and 2 the strips 13 are spaced apart some small distance. This distance is not essential to the invention, and the strips 13 may be mounted so that the sides thereof abut each other.

For a detailed description of the parallel strips 13 reference is made to Figure 3. Each of the parallel strips 13 is a bi-metallic strip constructed of two metals, 14 and 15, having different coefficients of expansion, bonded together. Metals of good thermal conductivity are chosen and these metals 14 and 15 are so bonded together that the strips 13 lie in a flat horizontal plane at the normal operating temperature of a refrigerator evaporator. The metal strips 14 and 15 are further so bonded together so that the strips 13 are bowed along their longitudinal center axis, the sides of the strips 13 bowing in a generally downward direction, when the strips 13 are raised to some temperature above the normal operating temperature of an evaporator.

To describe the operation of the evaporator 5, reference is made to Figures 1–3. When the evaporator 5 is connected, as described above, into a conventional refrigeration circuit, metered refrigerant is fed through tubing 10, through the serpentine tubing 12, through tubing 11, into the header 8, through the tubing 9, into the header 7, and through the tubing 6. The refrigerant as it proceeds through this path will absorb certain quantities of heat from objects with which the various tubings are in thermal contact, thereby lowering the temperature of those objects to a temperature normally below that required for the freezing of water. Since the parallel strips 13 are in good thermal contact with the tubing 12, the strips 13 will be cooled to the aforesaid temperature and will, as described above, assume a horizontal flat shape. Thus any food, frozen or otherwise, may be placed upon the upper surface of the strips 13. Because of the flat shape of the strips 13 any food placed thereon will be in good thermal contact therewith, and the strips 13 will thereby efficiently cool and maintain the food at the aforesaid temperature. Food may also be placed against the vertical tubes 9, which tubes will aid in maintaining any food disposed within the confines of the evaporator 5 at the aforesaid temperature.

Now as is well known in the art, frost will accumulate upon the surface of an evaporator due to the admission of warm, moist air to the interior of the refrigerator cabinet through normal use of the refrigerator. Also, as is well known in the art, periodic defrosting of the evaporator is required, and various systems for accomplishing this are well known in the art. One of these effects defrosting of the evaporator by reversing the flow of refrigerant within the system, thereby causing hot refrigerant to flow through the evaporator coils. This warm refrigerant will heat the evaporator coils and the evaporator coils will in turn heat any objects which are in good thermal contact therewith. It is advantageous that the evaporator surfaces upon which food is placed are heated to remove the frost accumulations, but it is disadvantageous that certain foods such as frozen foods be heated by the hot refrigerant during the defrost cycle. It is further disadvantageous to have puddles of defrost water collect on the various surfaces of the evaporator. This invention overcomes these disadvantages in a very efficient manner. As the hot refrigerant flows through the tubing 12 the bi-metallic strips 13 will be heated, and, as previously described, these strips 13 will then be bowed along their longitudinal center axis in a general down-

ward direction. As can easily be seen, this will very substantially reduce the area of contact between the upper surface of the parallel strips **13** and the lower surface of any food placed thereon. Because of this substantial reduction in contact over the area of thermal contact between the strips **13** and any food in contact therewith, any melting of frozen foods placed upon the strips **13** will be reduced to a minimum during the defrost cycle. Further, when the accumulated frost upon the evaporator surfaces is melted, the water produced thereby may easily run off of the surface of the strips **13** into any conventional drip pan (not shown) positioned below the evaporator **5**. The inclined surfaces of the bowed strips **13** and the edges thereof form excellent surfaces from which defrost water may drip. When defrosting is completed and the refrigerant is again conducted through the various tubings to cool the evaporator, the strips **13** will again assume a flat horizontal position.

Another system of defrosting utilizes an electrical heating element or wire **17** to melt the accumulated frost upon the surface of the evaporator. As can be seen in Figure 1, the wire **17** is mounted in good thermal contact to the underside of the strips **13** adjacent to and generally following the serpentine tubing **12**. The ends of the wire **17** are connected to any well known power means (not shown) for causing the wire **17** to emit heat during the defrost cycle of the refrigerator. The strips **13** when heated by the wire **17** will operate in a similar manner to that described above when hot refrigerant was conducted through the tubing **12**. The heating wire **17** is not shown in cooperation with the headers **7** and **8** or the tubing **9**, but it can easily be seen that the wire **17** may be positioned to also melt any accumulation of frost upon the headers **7** and **8** and the tubing **9**.

Having described the invention what is considered to be new and desired to be protected by Letters Patent is:

1. An evaporator for a refrigerator comprising horizontally disposed shelf means for supporting and cooling food placed thereon, tubing means mounted in thermal contact to the underside of said shelf means, said tubing means operating to cool said shelf means when a cooling agent is conducted therethrough and operating to heat said shelf means when a heating agent is conducted therethrough, said shelf means comprising strip means operable responsive to the operation of said tubing means when a cooling agent is conducted therethrough to assume a substantially closed flat plane surface, and operable responsive to the operation of said tubing means when a heating agent is conducted therethrough to assume an irregular surface comprising a plurality of parallelly spaced apart strips bowed in a generally downward direction along the longitudinal axis of said strips.

2. An evaporator for a refrigerator comprising horizontally disposed shelf means for supporting and cooling food placed thereon, cooling means mounted in thermal contact to the underside of said shelf means and operable to cool said shelf means, heating means mounted in thermal contact to the underside of said shelf means and operable to heat said shelf means, said shelf means being formed to operate responsive to the operation of said cooling means to assume a substantially closed flat plane surface and operate responsive to the operation of said heating means to assume an irregular surface comprising a plurality of parallelly spaced apart strips bowed in a generally downward direction along the longitudinal axes of said strips.

3. An evaporator as claimed in claim 2, said shelf means comprising a plurality of bi-metallic strips disposed side by side in a substantially horizontal plane, said bi-metallic strips formed of two metals having good thermal conductivity and having different coefficients of expansion, said bi-metallic strips bonded together in a substantially horizontal plane.

4. In an evaporator as claimed in claim 2, said cooling means comprising a serpentine tubing having a plurality of straight sections interconnected by curved sections, said straight sections disposed substantially parallel to said longitudinal axis of said strips.

5. In an evaporator as claimed in claim 2, said heating means comprising a serpentine wire, said wire having the property of emitting heat when an electrical current is passed therethrough.

6. An evaporator for operation in a refrigerator comprising a horizontal portion and a vertical portion, said vertical portion comprising tubing means for the conduction of a refrigerant therethrough, said horizontal portion comprising a serpentine tube consisting of a number of straight parallel portions and a number of curved portions, said curved portions serving to interconnect adjacent ones of said straight parallel portions, a number of bi-metallic strips, each of said bi-metallic strips mounted on the upper surface of one of said straight parallel portions with the longitudinally center axis of each strip positioned longitudinally of said straight parallel portions and in good thermal contact therewith, tubing means interconnecting said vertical portion and said horizontal portion and providing an inlet to said evaporator at one end of said serpentire tube and providing an outlet from said evaporator at one end of said vertical portion, said bi-metallic strips comprising two dissimilar metals bonded together so that when said serpentine tube is connected to said refrigerator said bi-metallic strips assume a flat position in one horizontal plane when said evaporator is at a normal operating temperature, and so that said bi-metallic strips assume a bowed position in a generally downward direction along said center axis thereof when said evaporator is at a temperature above said normal operating temperature.

7. An evaporator for a refrigerator comprising a horizontally disposed portion, said horizontally disposed portion comprising a serpentine tube connectable in said refrigerator, said serpentine tube consisting of a number of parallelly disposed straight sections and a number of curved sections interconnecting adjacent ones of said straight sections, shelf means positioned on said serpentine tube for supporting any food placed thereon, said shelf means comprising a number of strips, each one of said strips positioned with its longitudinal center axis directly over one of said straight sections, each of said strips formed of two dissimilar metals bonded together along a horizontal plane, said dissimilar metals having different coefficients of expansion, said dissimilar metals so bonded together that each of said strips assumes a flat horizontal position when said evaporator is mounted within said refrigerator operating at the normal operating temperature of said refrigerator, and further bonded together so that each of said strips assumes a bowed position in a generally downwardly direction along said center axis of each of said strips when said evaporator is connected within a refrigerator operating to melt any accumulation of frost within said refrigerator.

8. An evaporator for a refrigerator comprising horizontally disposed shelf means for supporting and cooling food placed thereon, cooling means mounted in thermal contact to the underside of said shelf means and operable to cool said shelf means, heating means mounted in thermal contact to the underside of said shelf means and operable to heat said shelf means, said shelf means including a plurality of strip elements, said plurality of strip elements being formed of a material operable responsive to the operation of said cooling means to assume a substantially flat plane surface and operable responsive to the operation of said heating means to assume an irregular surface of downwardly bowed strips.

References Cited in the file of this patent

UNITED STATES PATENTS

486,157	Cloud	Nov. 15, 1892
2,268,885	McCullough	Jan. 6, 1942
2,601,466	Thomas	June 24, 1952