Jan. 12, 1954 R. E. KING ET AL 2,665,567

EVAPORATOR DEFROSTING ARRANGEMENT

Filed Dec. 12, 1951

Fig. 1.

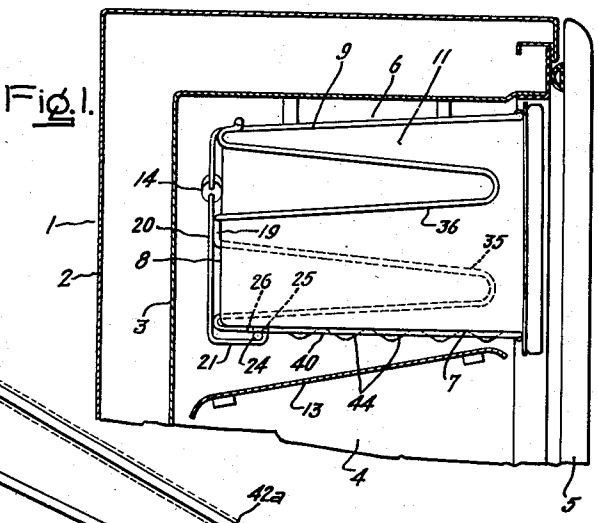


Fig. 2.

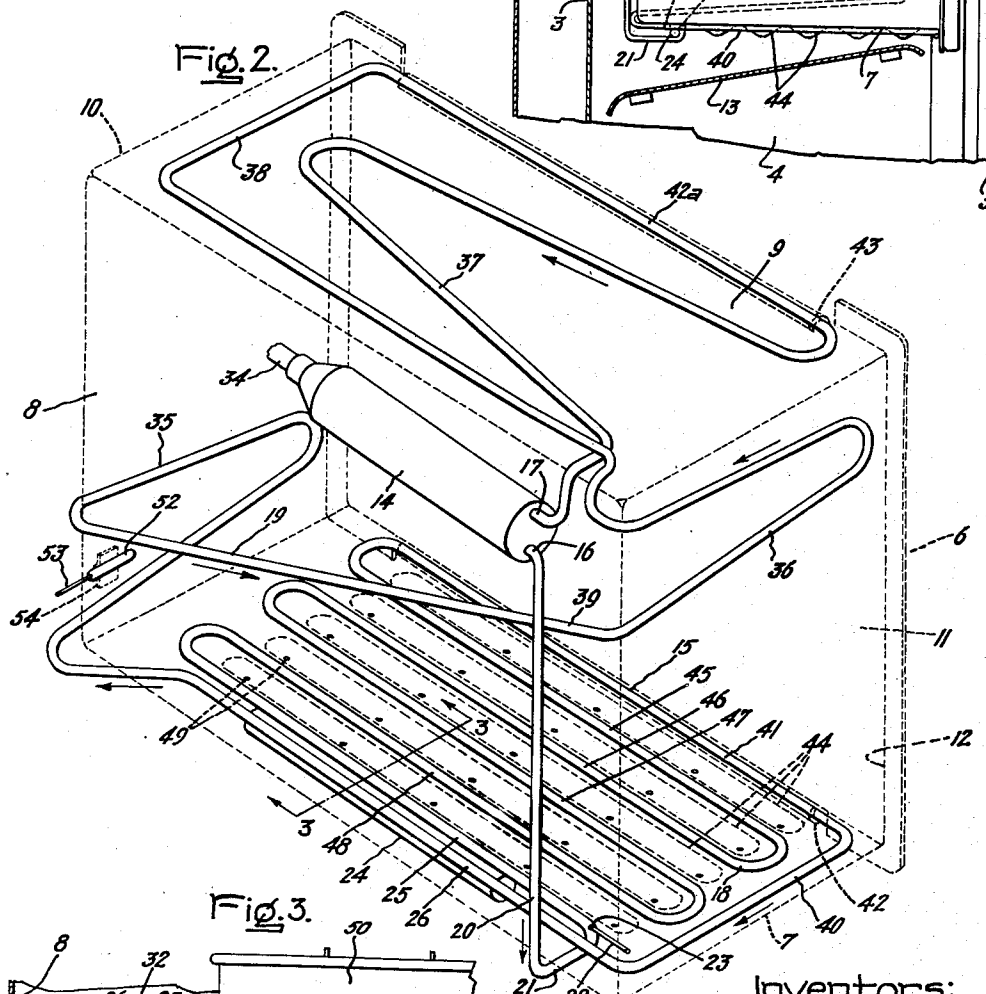
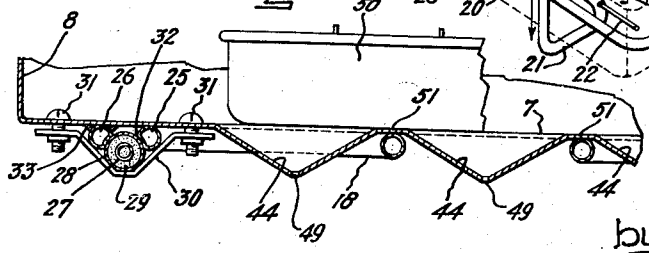


Fig. 3.



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EVAPORATOR DEFROSTING ARRANGEMENT

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16 Claims. (Cl. 62—126)

1

This invention relates to refrigerators or evaporators and more particularly to defrosting arrangements for evaporators.

In many household refrigerators, the evaporator for cooling the food storage compartment is exposed to the air within the compartment and is operated at a temperature below the freezing point of water. As a result the moisture in the air within the storage compartment condenses on the evaporator and collects thereon in the form of frost. This layer of frost on the surface of the evaporator has an insulating effect reducing the efficiency of the evaporator in cooling the food storage compartment. It is accordingly necessary to remove this frost from time to time in order to prevent too serious a reduction in the operating efficiency of the refrigerating apparatus. In many cases, this defrosting is accomplished manually by stopping operation of the condensing unit and placing trays of warm water on the refrigerated surfaces of the evaporator. Defrosting in this manner is a somewhat time-consuming and disagreeable operation. By this invention a relatively uniform heating of the evaporator surface is accomplished and defrosting is achieved without the necessity of using trays of warm water and the like, and the time required for the completion of the operation is materially reduced.

Accordingly, it is an object of this invention to provide an improved arrangement for defrosting a refrigerator evaporator.

It is another object of this invention to provide an improved arrangement for defrosting a refrigerator evaporator which maintains a substantially uniform temperature throughout the entire evaporator during the defrosting operation.

It is a further object of this invention to provide an improved arrangement for defrosting a refrigerator evaporator including an improved arrangement for insuring circulation of refrigerant in the same direction through the evaporator under both heating and cooling conditions to prevent starving any portion of the evaporator of refrigerant.

It is still another object of this invention to provide an improved arrangement for discharging defrost water from the interior of an evaporator structure during each defrost period.

It is still a further object of this invention to provide an improved arrangement for insuring a complete defrosting of all surfaces of the evaporator.

It is another object of this invention to provide an improved arrangement for supplying

2

heat to an evaporator for defrosting the evaporator.

It is another object of this invention to provide an improved defrosting arrangement whereby a greater amount of defrosting capacity is supplied for surfaces on which the greater amount of frost collects during normal operation.

It is another object of this invention to provide an improved defrosting arrangement for minimizing the effect of the thermal mass of freezing trays and their contents in retarding defrosting of the evaporator.

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

In carrying out the objects of this invention, there is provided a wall structure including bottom, rear, top and end walls defining a frozen food storage compartment. Associated with this wall structure is a flooded evaporator having a header arranged near the top of the vertical wall and continuous serpentine tubing connected at both ends to the header. One portion of the continuous serpentine tubing is secured to the bottom wall of the evaporator and a second portion in series therewith is secured to the back wall, two end walls and top wall of the evaporator wall structure. The evaporator includes two closely spaced parallel sections spaced along the series circuit thereof, and a single heater is clamped in heat exchange engagement with both sections for vaporizing liquid refrigerant and effecting defrosting of the evaporator. Liquid refrigerant is supplied from the header to the first portion through a trap immediately preceding this first portion, and liquid refrigerant from the condensing unit is injected into the evaporator at the exit of the trap. The bottom wall of the evaporator wall structure is provided with depressions between adjacent widely spaced parallel passes of the serpentine tubing and holes are provided in the bottom of these troughs for draining defrost water from the interior of the evaporator or frozen food compartment. The passes of tubing are more closely spaced along the bottom wall of the evaporator, where the greater amount of frost collects, than along the other walls of the evaporator.

For a better understanding of this invention, reference may be had to the accompanying drawing in which Fig. 1 is a side elevation view of a portion of a refrigerator incorporating an

embodiment of this invention; Fig. 2 is an isometric view of the evaporator, the walls upon which the evaporator tubing is mounted being shown in dotted lines for clarity; and Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Referring to the drawing, there is shown a refrigerator cabinet 1 including an outer wall 2 and a spaced inner wall or liner 3, the inner wall 3 defining a food storage compartment 4. The access opening of the food storage compartment is closed by a door 5.

In order to cool the food storage compartment 4, an evaporator 6 is mounted in the upper portion of this compartment. The evaporator 6 includes a supporting wall structure including a bottom horizontal wall 7, a rear vertical wall 8, a top wall 9 and two end walls 10 and 11. The wall structure defines a compartment 12 for the storing of frozen foods and the like. A sloping baffle 13 is provided in spaced relationship below the evaporator 6, so that air from the food storage compartment 4 rises upwardly at the forward portion thereof, flows mainly between the bottom wall of the evaporator and the spaced baffle 13, and then downwardly between the rear end of the baffle and the rear wall of the food storage compartment 4.

The evaporator 6 is of the flooded recirculating type. The refrigerating portion of the evaporator includes a header 14 which is positioned near the top of the rear vertical wall 8. The evaporator includes continuous tubing 15 arranged in generally serpentine form and secured to the supporting wall structure. One end of the continuous tubing 15 is connected at 16 to the header 14 at a point below the normal level of the liquid refrigerant in the header. The other end 17 of the continuous tubing 15 is connected in communication with the interior of the header 14 above the normal level of the liquid refrigerant therein. By this arrangement, liquid refrigerant flows from the header to the tubing 15 through the connection at 16 and vaporized refrigerant is discharged into the header at 17.

The continuous serpentine tubing 15 includes a first portion 18 which is arranged in a generally horizontal plane and is secured to the lower surface of the bottom wall 7 of the wall structure in any suitable manner, as by brazing or welding. The tubing further includes a second portion 19 which is arranged in series with the first portion 18. This second portion, in the form illustrated, extends in heat exchange engagement with the rear wall 8, the end walls 10, 11, and the top wall 9 of the wall structure. The tubing of this second portion 19 is secured to the exterior surface of these walls in any suitable manner, as by brazing or welding.

Liquid refrigerant is supplied from the header to the first portion 18 of the continuous tubing 15 through a vertical section 20. The tubing is formed to provide a trap 21 at the bottom of the vertical section 20 and immediately preceding the beginning of the first portion 18 of the tubing. The refrigerating system includes a condensing unit (not shown) and liquid refrigerant is supplied from the condensing unit to the evaporator through a capillary tube 22. The end 23 of the capillary tube 22 extends into the tubing 15 at the exit of the trap 21, that is, at the point where the exit end of the trap 21 joins the first pass of the generally horizontal tubing portion 18 adjacent the bottom wall 7. The end 23 is formed as an injector to inject liquid refrigerant into the evaporator circuit in the direction of the normal circulation of liquid refrigerant in the evaporator.

The evaporator 6 and the tubing 15 thereof are exposed to the air within the food storage compartment 4 during operation of the refrigerator. In order to maintain a sufficiently low temperature in the food storage compartment 4 and in order to maintain a temperature within the compartment 12 sufficiently low for the preservation of frozen foods, evaporators of this type are normally operated at a temperature substantially below the freezing point of water. As a result, moisture in the air within the food storage compartment condenses on the evaporator and collects thereon as frost, eventually forming a blanket of such frost over the tubing and walls of the evaporator. This frost acts as an insulating medium, reducing the cooling effect of the evaporator and reducing the efficiency of the refrigerating system. It is desirable, therefore, to remove this blanket of frost from time to time to maintain the operation of the refrigerating system at a reasonably high efficiency. In accordance with this invention, and arrangement is provided whereby heat is supplied to the evaporator for vaporizing refrigerant within the tubing and for assisting in circulating refrigerant through the tubing so that the vaporized refrigerant, as it recondenses, gives up heat to the tubing for melting the frost therefrom. Specifically, we provide a defrosting arrangement in which heat is supplied by a single heater to the continuous tubing at two sections spaced along the length of the tubing. In the form of the invention illustrated, one of these sections is located at the beginning of the first portion 18 of the evaporator tubing and the other section is located at the end of this first portion 18, or stated otherwise, at the beginning of the second portion 19 of the tubing.

Thus a single heater 24 is positioned in heat exchange engagement with a first section 25 of the tubing 15 which is located at the beginning of the first, or horizontal, portion of the tubing, and with a second section 26 which is located at the end of the portion 18, or, in other words, at the beginning of the second portion 19 of the tubing. The sections 25 and 26 are located in closely spaced parallel relationship. The heater 24 may be any type of device suitable for supplying heat to the tubing and to the liquid refrigerant therein; for example, it may be the sheathed insulating type of heating element sold under the trade-mark Calrod. Such heating elements include an electrical conducting element 27, a metal sheath 28 and an intermediate tightly packed powdered insulating material 29.

The heater 24 is held in heat exchange relationship with the sections 25 and 26 of the tubing 15 by a clamp 30. This clamp is somewhat channel-shaped in cross section and may be secured to the bottom wall 7 of the wall structure in any suitable manner, for example by screws 31 threaded into openings in the clamp 30. To provide a larger heat transfer surface contact between the heater 24 and the sections 25 and 26, the wall of these tubing sections adjacent the heater is deformed to provide a concave portion or groove, as indicated at 32, conforming to the circumference of the cylindrical heater 24. In the form of the invention shown, one of the tubing sections, namely the section 26, is secured rigidly to the bottom wall 7 of the wall structure in any suitable manner, as by brazing or welding, as indicated at 33. The other tubing section 25

is free of direct physical attachment to the wall 7, but is held in heat exchange relationship with the wall 7 by the clamp 30, which not only presses the heater 24 into firm heat exchange contact with the sections 25 and 26 but also presses the section 25 into heat exchange contact with the wall 7.

During normal operation, refrigerant circulates through the tubing 15 of the evaporator in the direction indicated by the arrows, liquid refrigerant being supplied from the header through the vertical section 20 and vaporized refrigerant returning to the header at the point 17. Vaporized refrigerant is returned from the header to the condensing unit through a suction line 34. Under such normal operation, the trap 21 assists in maintaining a proper direction of circulation of refrigerant, since it blocks flow of any vaporized refrigerant upwardly in the vertical section 20. The direction of circulation of refrigerant is further assisted, as mentioned above, by the injecting arrangement, at 23, for liquid refrigerant from the condensing unit.

When it is desired to defrost the evaporator, heat is simultaneously supplied by the single heater 24 to the tubing 15 at the sections 25 and 26 which are spaced along the series circuit of the tubing. In the form illustrated, an electric heating element is employed, and such a heating element may be energized by supplying power thereto in any suitable manner. It will be appreciated, however, that, within the scope of this invention, any other type of heating device for supplying heat to the evaporator in the arrangement described could be employed. Liquid refrigerant vaporized by the heater at the section 25 circulates in the direction indicated by the arrows through the first, or horizontal, portion 18 of the tubing, and the recondensation of the vaporized refrigerant as it passes through this portion of the tubing effects melting of the frost from this portion of the evaporator. Such recondensation is substantially complete by the time the refrigerant in its circuit reaches the section 26. Here heat is again supplied to the tubing from the heater 24, effecting a second vaporization of the liquid refrigerant. This vaporized refrigerant circulates through the second portion 19 of the tubing which is arranged in contact with the end walls, the rear wall, and the top wall and, in recondensing, effects melting of frost from these areas of the evaporator structure. To assist drainage of liquid refrigerant from the portion of tubing secured to the top wall 9 of the evaporator wall struture, this top wall 9 is sloped to the rear by a slight angle, for example in the order of three degrees. During defrosting, vaporized refrigerant condensing in the tubing of the top wall 9 of the evaporator wall structure flows by gravity rearwardly and downwardly into the header 14.

By this arrangement, a relatively uniform temperature is maintained throughout the length of the evaporator tubing during defrosting and a complete defrosting of the entire evaporator surface is effected, the vaporized refrigerant circulating in heat exchange relationship with all five walls of the compartment 12. The disposition of heater 24 in heat exchange relationship with two sections spaced along the series circuit of the continuous tubing 15 enables the use of a smaller size tubing and a smaller charge of refrigerant in the system. It will be noted that the trap 21, which insures maintenance of the proper direction of circulation of refrigerant during normal operation, as described above, also effects such maintenance of the proper direction of circulation of refrigerant during the defrosting operation, since it blocks flow up the vertical section 20 of refrigerant vaporized in section 25 by the heater 24.

The significance of the flooded recirculating evaporator in the defrosting operation should be noted. In cases where a series system is employed, that is where the capillary tube is connected at one end of the evaporator tubing and the header at the other, it is possible for the heater to blow the tubing dry. Under these circumstances, continued application of heat by the heater could burn out the heater or cause damage to the evaporator through local overheating. By our arrangement employing a flooded recirculating evaporator where both ends of the evaporator tubing are connected to the header, a supply of liquid refrigerant to the tubing in the region of the heater is assured, and the possibility of the evaporator being blown dry with resultant damage is minimized.

The tubing 15 is arranged on the wall structure with portions of the tubing in heat exchange relationship with each wall and in a manner to insure complete defrosting of the wall structure. Thus the tubing 18 includes sections 35 and 36 in contact with the end walls 10 and 11 respectively of the evaporator wall structure for effecting warming of these end walls and melting of any frost which may form thereon. The sections 35 and 36 are arranged in a particular manner on the end walls and the passes of tubing of the portion 18 on the bottom wall and of the section 37 on the top wall are arranged in a particular relationship with respect to the end wall tubing to insure supply of heat to the entire evaporator end wall structure for defrosting. Thus it will be noted that the section 35 is positioned on the end wall 10 near the bottom thereof, this section 35 being connected to the tubing portion 18 which in turn is arranged on the bottom wall 7 of the evaporator wall structure. During the defrosting operation, this section 35 supplies an ample amount of heat to the lower portion of the end wall 10. In order to insure the supply of sufficient heat to the upper portion of this end wall 10 for defrosting thereof, the section 37 of tubing on the top wall 9 includes a pass 38 which extends adjacent and generally parallel to the edge of the top wall 9 at the junction of the top wall 9 and the end wall 10. By this relationship of the position in the section 35 and the position of the pass 38, supply of heat of the entire surface of the end wall 10 is insured. Similarly, the section 36 is positioned at the upper portion of the end wall 11, the sections 35 and 36 being connected by an upwardly inclined length tubing 39 which is secured in heat exchange relationship with the rear wall 8 of the evaporator wall structure. During defrosting vaporized refrigerant condensing in the section 36 supplies heat for insuring removal of defrost at least from the upper portion of the end wall 8. In order to insure that the frost is also completely removed from the lower portion of this end wall 11, one pass 40 of the tubing portion 18 on the bottom wall 7 extends adjacent and generally parallel to the edge of this bottom wall 7 which joins with the end wall 11. The pass 40 insures supply of heat to the lower portion of the end wall 11 for effecting removal of frost therefrom.

For further insuring complete removal of

frost during the defrosting operation, a front pass 41 of the portion 18 of the tubing is arranged closely adjacent the front edge of the bottom wall 7. A flange 42 of this bottom wall 7 is rolled over the pass 41 to insure good heat exchange relationship between the front edge of the bottom wall of the evaporator wall structure and the tubing. It has been found that where the front pass of tubing is arranged a substantial distance from the front edge, frost does not completely melt from the area around this front edge during the defrosting operation. By the arrangement disclosed, such complete melting of frost in this area is insured. Similarly, the tubing portion 19 includes a front pass 42*a* positioned closely adjacent the front edge of the top wall 9 of the evaporator wall structure. The flange 43 of the edge of this top wall structure 9 is rolled over the pass 42*a* to insure good heat exchange contact therewith. In this manner defrosting of the area at the front edge of the top wall 9 is also insured. It can be seen that by the arrangement described, no section of the wall structure is thermally remote from the tubing and hence complete defrosting of the wall structure by the vaporized refrigerant circulating through the evaporator tubing is insured.

An additional feature of the defrosting arrangement disclosed is that the spacing of the tubing passes on the various walls of the evaporator structure is varied so as to provide a closer spacing and hence more passes of tubing in the area where the maximum frost collects. In a refrigerating arrangement of the type described, most of the air, as mentioned previously, rises upwardly at the front portion of the food storage compartment, circulates rearwardly between the bottom wall 7 of the evaporator and the spaced sloping baffle 13, and then passes downwardly between the rear end of this baffle 13 and the rear wall of the food storage compartment 4. Accordingly, the maximum amount of frost collects on the bottom wall of the evaporator, and much smaller amounts on the remaining surfaces of the evaporator which do not receive this large amount of moist circulating air. In our defrosting arrangement, the parallel passes of the tubing which form the tubing portion 18 are positioned much more closely than the passes of tubing which are arranged on the end walls, rear wall and top wall of the evaporator. Accordingly, a greater amount of heat is supplied to the bottom wall 7 and to the remaining walls of the evaporator and, moreover, because of the closer spacing of the passes of tubing adjacent this bottom wall, no portion of this bottom wall is as remote from the tubing as some portions of the other walls are from the tubing secured to these other walls. In this manner the maximum of defrosting capacity is supplied to the area on which the maximum of frost collects.

During normal operation of the evaporator, frost forms on the inner surface of the wall structure as well as on the exterior surface thereof. During the defrosting operation, this frost melts and collects on the bottom wall of the evaporator wall structure. In order to effect discharge of this water from the interior of the compartment 12, the bottom wall 7 is shaped to provide a plurality of troughs 44. These troughs are formed between successive relatively widely spaced parallel passes 41, 45, 46, 47, 48, and 25 of the first, or horizontal, portion 18 of the tubing. A plurality of spaced openings 49 are provided at the bottom of the troughs 44 for discharging water collecting therein to the exterior of the evaporator wall structure where it may flow onto the sloping baffle 13 and be directed thereby toward the rear of the food storage compartment for collection in any suitable receptacle (not shown) or for discharge through a drain opening in the bottom of the compartment 4 in a conventional manner.

The corrugated formation of the bottom wall 7 also contributes to the effective removal of frost and further minimizes the melting of ice in freezing trays which are supported on this bottom wall. Thus, one or more freezing trays, one of which is shown at 50, are supported on the bottom wall 7 and specifically on the top portions 51 of the corrugated structure of this bottom wall. The successive passes of the tubing portion 18 are arranged in heat exchange relationship with the bottom wall 7 at these upwardly extending corrugations 51, and hence the tubing is disposed closely adjacent the bottom of the freezing trays for facilitating freezing of ice therein. Conversely, the portions of the bottom wall structure which are thermally more distant from the passes of the tubing portion 18, that is the portions providing the troughs 44, do not come in contact with the freezing trays. In this manner, the thermal mass of the freezing tray and its contents is ineffective for retarding flow of heat to the portions of the bottom wall 7, that is, the troughs 44, which are intermediate the successive passes of the tubing portion 18. Therefore, flow of heat to these portions of the bottom wall and defrosting thereof is facilitated by the particular corrugated structure disclosed.

The heater 24 is deenergized by any conventional control device which is actuated by means of a temperature responsive bulb 52. This bulb 52 is connected by a tube 53 to the control device for deenergizing the heater 24 when a predetermined maximum temperature, which insures completion of defrosting, has been reached. The bulb 52 is mounted on the end wall 10 near the bottom thereof by a clamp 54 which is riveted or otherwise secured to the end wall 10. This bulb 52 is specifically located in a position where presence of liquid refrigerant is assured and where heat from the heater 24 may reach this bulb by conduction through the wall structure. Under some conditions, for example where the refrigerator is located in an area where the ambient temperature may be as low as 40° F., the running time may be so short that liquid refrigerant does not reach the top of the evaporator. During defrosting the vaporized refrigerant may condense in the case of the refrigerating unit in preference too the tubing of the evaporator. Accordingly, if the bulb 52 were under such conditions positioned remote from the heater 24, and in a location where presence of liquid refrigerant were not assured, for example at the top of the evaporator, heat might not reach the bulb through the tubing in sufficient quantity to insure deenergization of the heater 24.

The broad idea of a defrosting arrangement in which heat is supplied to a continuous evaporator tubing at two points spaced along the series circuit thereof is not our invention but is described and claimed in the copending application of Charles S. Grimshaw, Serial No. 261,165, filed December 12, 1951, and assigned to the assignee of the present invention. The structural arrangement including the sloping baffle is not our invention but is described and claimed in the co-

pending application of Harold P. Harle, Serial No. 301,756, filed July 30, 1952 and assigned to the General Electric Company, the assignee of the present application.

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

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion and a second portion in series with said first portion, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, and a single heater disposed in heat exchange relationship with a section of said first portion of said tubing near the beginning thereof, said heater being further disposed in heat exchange relationship with a second section of said tubing near the beginning of said second portion of said tubing, whereby vaporization of liquid refrigerant and defrosting of said evaporator is effected.

2. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, and a single heater disposed in heat exchange relationship with a section of said first portion of said tubing near the beginning thereof, said heater being further disposed in heat exchange relationship with a second section of said tubing near the beginning of said second portion of said tubing, whereby vaporization of liquid refrigerant and defrosting of said evaporator is effected.

3. A flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion and a second portion in series with said first portion, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

4. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

5. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to the rear, top and both end walls, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

6. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, said tubing further including a portion forming a trap immediately preceding said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

7. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said

header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, said tubing including a vertical section connected to said header below the level of liquid refrigerant in said header for supplying liquid refrigerant to said first portion, said second portion being connected to said header above the level of liquid refrigerant in said header for conducting vaporized refrigerant from said second portion to said header, said tubing being formed to provide a trap between said vertical section and said first portion, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said horizontal portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

8. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, said tubing including a vertical section connected to said header below the level of liquid refrigerant in said header for supplying liquid refrigerant to said first portion, said second portion being connected to said header above the level of liquid refrigerant in said header for conducting vaporized refrigerant from said second portion to said header, said tubing being formed to provide a trap between said vertical section and said first portion, an injector connected to said tubing at the exit end of said trap at the point where said trap joins said first portion of said tubing for injecting liquid refrigerant into said evaporator in a direction facilitating circulation of refrigerant in said evaporator, said first portion of said tubing including two closely spaced parallel sections substantially at the beginnning and end respectively of said first portion, and a single header disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator.

9. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conduting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator, said first portion further including a plurality of spaced parallel passes, said bottom wall being depressed to provide a trough between successive ones of said spaced parallel passes, said bottom wall having openings therein in the bottom of said troughs for draining defrost water from said compartment.

10. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, and the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, and said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator, and a clamp secured to said bottom wall for pressing said heater into heat exchange relationship with both of said sections.

11. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, and the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, one of said sections being rigidly secured to said bottom wall, the other of said sections being free of said bottom wall, a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator, and a clamp secured to said bottom wall for pressing said heater into heat exchange relationship with both of said sections and for pressing said other of said sections into heat exchange relationship with said bottom wall.

12. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to the remaining walls of said wall structure, one end of said tubing being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, the other end of said tubing being connected to said header

above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said first portion including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said sections for vaporizing liquid refrigerant to defrost said evaporator, said wall structure including a first flange at the forward end of said bottom wall and a second flange at the forward end of said top wall, said first and second portions including sections disposed adjacent said first and second flanges respectively, said flanges being rolled into heat exchange engagement with said last-named sections to facilitate transfer of heat to the top and bottom forward edges of said wall structure for melting frost therefrom.

13. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion secured to said end walls and said top wall, said second portion including a section secured to one of said end walls at the lower portion thereof and a second section secured to the other of said end walls at the upper portion thereof, said second portion including tubing on said top wall extending adjacent and generally parallel to the junction of said top wall and said one of said end walls, said first portion including tubing on said bottom wall extending adjacent and generally parallel to the junction of said bottom wall and said other of said end walls, said first portion of said tubing including two closely spaced parallel sections substantially at the beginning and end respectively of said first portion, and a single heater disposed in heat exchange relationship with both of said last-named sections for vaporizing liquid refrigerant to defrost said evaporator.

14. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured to at least one of the remaining walls of said wall structure, and a heater disposed in heat exchange relationship with at least a section of said tubing for vaporizing liquid refrigerant to defrost said evaporator, said bottom wall being corrugated and being adapted to support a freezing tray on the upwardly extending corrugations thereof, said first portion including a plurality of spaced parallel passes of tubing, said passes being secured in heat exchange relationship with said bottom wall at said upwardly extending corrugations thereof whereby refrigeration is supplied through said passes for rapid freezing of liquid in the tray, the downwardly extending corrugations being spaced from the freezing tray for minimizing the effect of the thermal mass of the freezing tray and its contents in retarding melting of frost from the portions of said bottom wall intermediate said spaced parallel passes of tubing.

15. In combination with a wall structure including bottom, vertical rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said header being disposed near the top of said vertical rear wall, said tubing including a first portion secured to said bottom wall and a second portion in series with said first portion and secured at least to said top wall, said first portion being connected to said header below the level of liquid refrigerant therein for supplying liquid refrigerant to said first portion, said second portion extending from the front toward the rear of said top wall and being connected at its end to said header, and a single heater in heat exchange relationship with a section of said first portion of said tubing near the beginning thereof and in heat exchange relationship with a second section of said tubing near the beginning of said second portion of said tubing for vaporizing liquid refrigerant to defrost said evaporator, said top wall being sloped downwardly from front to rear whereby vaporized refrigerant condensing in said second portion of said tubing drains downwardly by gravity to said header.

16. In combination with a wall structure including bottom, rear, top and end walls defining a food storage compartment, a flooded recirculating evaporator comprising a header and continuous tubing connected at both ends to said header, said tubing including a first portion comprising a plurality of passes secured to said bottom wall and a second portion comprising a plurality of passes in series with said first portion and secured to said rear, top and end walls, one end of said tubing being connected to said header below the level of liquid refrigerant therein for conducting liquid refrigerant to said first portion, the other end of said tubing being connected to said header above the level of liquid refrigerant therein for conducting vaporized refrigerant from said second portion to said header, said bottom wall being normally subject to a greater amount of air circulation in heat exchange relationship therewith than said rear, top and end walls whereby a greater amount of frost forms on said bottom wall, and a single heater disposed in heat exchange relationship with a section of said tubing near the beginning of said first portion thereof and being further disposed in heat exchange relationship with a second section of said tubing near the beginning of said second portion thereof for vaporizing liquid refrigerant to defrost said evaporator, said passes of tubing on said bottom wall being of greater number and spaced more closely than said passes of tubing on said rear wall, said end walls, and said top wall whereby a greater amount of heat for defrosting is automatically supplied to the surface having the greater amount of frost thereon.

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