Nov. 22, 1938. C. STEENSTRUP 2,137,861

REFRIGERATOR EVAPORATOR AND METHOD OF MAKING SAME

Filed Aug. 28, 1929

Fig. 1.

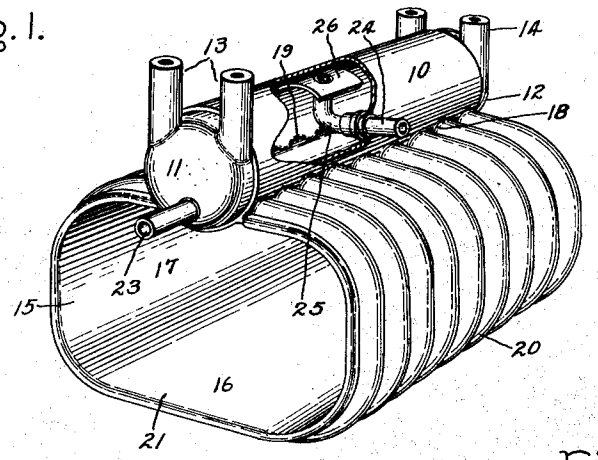


Fig. 2.

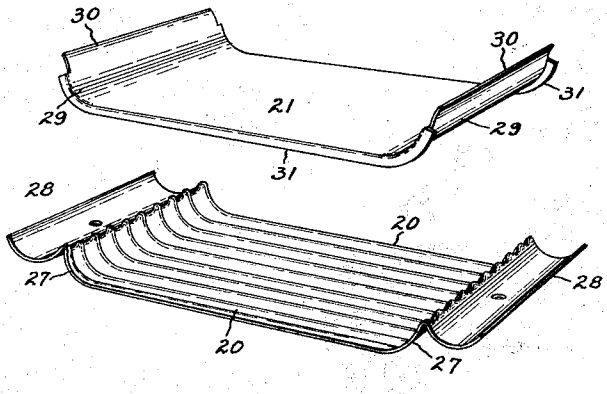


Fig. 3.

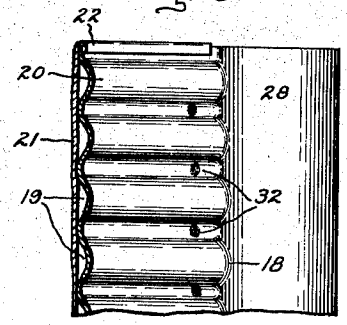


Fig. 4.

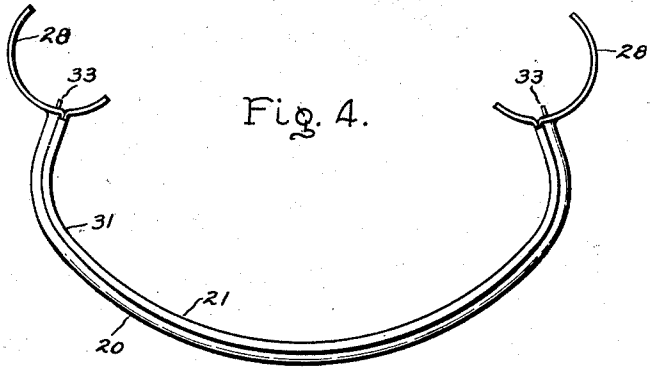


Fig. 5.

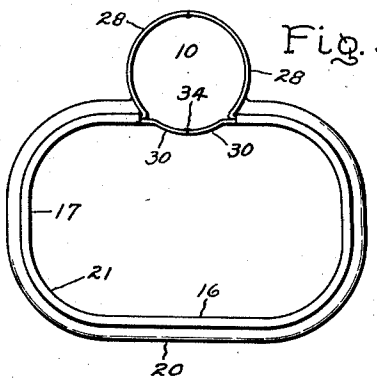
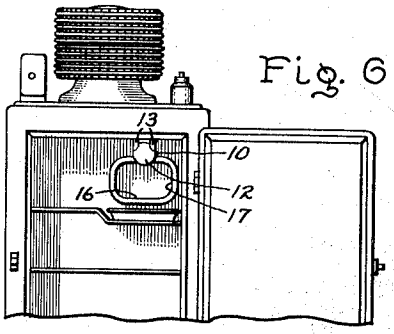


Fig. 6.



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2,137,861

REFRIGERATOR EVAPORATOR AND METHOD OF MAKING SAME

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Application August 28, 1929, Serial No. 389,050

20 Claims. (Cl. 62—126)

My invention relates to refrigerator evaporators or expansion chambers and the method of making them and has for its object the provision of an improved evaporator construction of simple form which can be readily fabricated from metal plates. This evaporator includes a header and a continuous curved wall having the edges thereof integral with the header and provided with a plurality of passages for the circulation of refrigerant therethrough from the header, a portion of the curved wall depending from the header constituting a shelf for receiving and supporting articles such as receptacles containing fluids to be frozen, and the entire evaporator being adapted to cool a refrigerator cabinet or the like. In accordance with my improved method of making this evaporator I join together two plates or sheet metal walls, one of which is corrugated, and form them to constitute a shelf with the edges of the plates extending upwardly, and utilize the edges of the plates to form a header from which refrigerant can circulate between the plates, so as to freeze articles placed on the shelf and provide the evaporator with the required heat absorbing surface.

My invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing, Fig. 1 is a perspective view of an evaporator embodying my invention, partly broken away; Figs. 2 to 5 inclusive show the evaporator in several stages of its manufacture when it is made in accordance with my improved method, and Fig. 6 is a front elevation of a refrigerator having my improved evaporator therein.

Referring to the drawing, the evaporator construction which I have shown as illustrative of one manner of carrying out my invention, includes a cylindrical header 10, the ends of which are closed by caps 11 and 12, the caps being provided with lugs 13 and 14 for supporting the evaporator in the refrigerator cabinet, as shown in Fig. 6. These lugs are made hollow and of small cross section to reduce the heat leakage from the box top to the evaporator. A continuous wall 15 is formed with a flattened portionu 16, and upwardly curved ends 17 which are integral with the header 10 as indicated at 18 and constitute laterally and downwardly depending side walls for supporting the shelf from the header. This wall is provided with a plurality of passages 19 extending throughout the continuous wall and opening at both ends thereof into the header 10 thereby providing a sharp freezing chamber completely surrounded by the wall. By this arrangement refrigerant from the header can freely circulate through the passages 19 which communicate therewith so as to freeze articles placed on the shelf 16 and absorb sufficient heat from the interior of the refrigerator cabinet, or the like, in which the evaporator is placed, to maintain the same at the desired low temperature. I prefer to form or fabricate the continuous wall 15 of a one-piece corrugated or embossed plate 20 and a one-piece flat plate 21 which is folded over the edge of the corrugated plate and secured thereto as indicated at 22. The wall portions of the two plates cooperate so that the corrugations of the plate 20 form a series of separate parallel passages 19 in the wall 15. These plates constitute inner and outer shells of the evaporator. Liquid refrigerant is supplied to the header of the evaporator by the supply pipe 23 and vaporized refrigerant is withdrawn therefrom through the pipe 24 which is turned upwardly at 25 in the header and is provided with a baffle plate 26 which prevents liquid refrigerant from being withdrawn from the header, it being understood that the level of the refrigerant in the header 10 is slightly below the baffle 26.

In accordance with my improved method of making the above described evaporator construction, I form the corrugated plate 20 with upturned portions 27 and embossed arcuate ends or header portions 28, and the flat plate 21 with upturned portions 29 adapted to conform to the upturned portions of the plate 20 and arcuate ends or header portions 30 embossed oppositely to the end portions 28 of the plate 20, the edges of the plate 21 being turned downwardly as indicated at 31. I then place or superpose the plate 21 on the plate 20 so that the complementary header portions register and fold the edges 31 thereof over the edges of the plate 20 and bend the plates thus joined together approximately into the form shown in Fig. 4.

In order to prevent the plates 20 and 21 of the evaporator being spread apart by the pressure of the refrigerant therein, I prefer to securely braze the plates together and in order to do this most effectively it is desirable to bring the plates into as close mechanical contact as possible. I do this by spot welding the plates 20 and 21 together between the corrugations where the corrugations terminate near the opposite edges of the sheet 20 as indicated at 32 in Fig. 3 when the plates are

in the form shown in Fig. 4, and while the plates are in this form I place copper wires 33 in each of the passages formed between the corrugations of the plate 20 and the plate 21 of such length as to extend entirely through the passages. After the plates are spot welded together in the form shown in Fig. 4 I bend them into the form shown in Fig. 5 and weld the arcuate portions 28 and 30 of the plates together where they come in contact at 34 to form the cylindrical header 10; each of the sheets or shells 20 and 21 thus has its ends welded together in a single seam extending along the vertical median plane of the assembled evaporator. It will be noted that when the shells 20 and 21 are welded together at points such as those indicated at 32 in Fig. 3, there is a substantial distance between the welded portions of the plates. When the plates are bent, there is a tendency for the inner plate to be compressed and the outer plate to be stretched, and it is evident, therefore, that the bending of the plates will stretch the outer plate over the inner plate and securely bind them together without the necessity of providing welded connections over their entire area. This binding action produced during bending thus provides the close mechanical contact desired for the brazing operation. I then press the caps 11 and 12 in the ends of the header 10, weld them thereto, and place the evaporator in a suitable brazing furnace so as to melt the copper wires 33 and securely braze the plates 20 and 21 together and the caps 11 and 12 in the cylindrical header thereby completely uniting the sheets and sealing all the edges thereof. By brazing the plates 20 and 21 together in this manner the portions of the corrugations formed in the plate 20 in contact with the plate 21 are brazed thereto throughout their length and closely adjacent the wall of the header 10 so that the evaporator will effectively withstand high pressure without any bulging of the walls. As the header 10 is cylindrical, the sheet metal used in constructing the evaporator can be made quite thin as this form of header provides for the most economical use of sheet metal to withstand the desired pressure and, as the portions of the corrugations in the plate 20 are brazed or united to the plate 21, the sheet metal is also utilized to the best advantage to withstand pressure so that high pressure in the evaporator will not cause any separation of the plates 20 and 21. By this arrangement the entire evaporator construction can be made of thinner metal than the constructions heretofore proposed so that a substantial economy in the manufacture of the evaporator is attained. The evaporator may then be finished in any manner desired, but I prefer to coat the same with a suitable vitreous enamel.

Modifications of the construction which I have disclosed and the particular method described will occur to those skilled in the art so that I desire my invention not to be limited to the particular construction shown, or the particular method set forth, and I desire in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

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

1. An evaporator for refrigerating machines including two curved plates secured together to form a passage for the flow of refrigerant between them, the opposite ends of both of said plates being formed and secured together to constitute a header.

2. An evaporator for refrigerating machines including a curved corrugated plate and another curved plate secured thereto to form passages for the flow of refrigerant between said plates, the opposite ends of both of said plates being formed and secured together at the ends of said corrugations to constitute a header.

3. The method of making an evaporator for refrigerating machines which includes forming semi-cylindrical portions at the opposite ends of smooth and corrugated plates, joining said plates together to form passages for the circulation of refrigerant between them, and joining the opposite ends of said semi-cylindrical portions together to form a header for the evaporator.

4. The method of making an evaporator for refrigerating machines which includes attaching the end of a corrugated plate and another plate together, and pressing said plates together by bending said plates to the form required in the completed evaporator.

5. The method of making an evaporator for refrigerating machines which includes forming the opposite ends of a corrugated plate and another plate so that they can be joined together to form a header, attaching said plates to each other adjacent the ends thereof to form passages between them, bending said plates to the form required in the completed evaporator, and joining the opposite ends of said plates together to form a header.

6. The method of making an evaporator for refrigerating machines which includes forming the ends of a corrugated plate and another plate so that they can be joined together to form a header, attaching said plates to each other adjacent the ends thereof to form passages between them, bending said plates to the approximate form required in the completed evaporator, joining the ends of said plates together to form a header, and uniting the ridges of said corrugations with said other plate.

7. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and laterally extending side walls bent to form a sharp freezing chamber or chambers, an inner one-piece shell having an oppositely formed arcuate portion, and laterally extending walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header, one of said laterally extending walls being embossed to provide passageways leading from said header.

8. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and side walls extending outwardly and downwardly, said side walls being bent to form a sharp freezing chamber or chambers, an inner one-piece shell having an oppositely formed arcuate depression, and outwardly and downwardly extending side walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header and said cooperating walls providing means for the passage of refrigerant from said header, said two shells being secured together by welding, each of said shells having a single welded seam extending longitudinally along the vertical median plane of the assembled evaporator.

9. A sheet metal evaporator comprising outer and inner shells fabricated to each form a portion of a cylindrical header and laterally and down-

wardly depending side walls, one of said side walls being corrugated, said shells being welded together in the spaces between the corrugations before bending, said welded side walls being bent to form the sides and bottom of a sharp freezing chamber.

10. A process of making an evaporator for a refrigerator from two sheets of metal, which comprises forming complementary header depressions in a portion of each sheet and laterally extending parallel corrugations in one sheet opening at one end into said header portion, superposing said sheets so that the header portions register, welding the sheets together between the corrugations, and then bending the sheets thus secured together in the form of an evaporator, the sheets being sealed by uniting the edges thereof.

11. A process of making an evaporator for a refrigerator from two sheets of metal, which consists in forming complementary header depressions in a portion of each sheet and laterally extending parallel corrugations in one sheet, said corrugations opening at one end into said header portion and terminating near the opposite edge of said sheet, superimposing said sheets so that the header portions register, welding the sheets together between the corrugations, and then bending the sheets thus secured together into the form of an evaporator, the sheets being sealed by uniting the edges thereof.

12. A process of making an evaporator for a refrigerator from two sheets of metal, which consists in forming complementary header depressions in each sheet and laterally extending parallel corrugations in one sheet, said corrugations opening at one end into said header portion and terminating near the opposite edge of said sheet, superimposing said sheets so that the header portions register, welding the sheets together between the corrugations and then bending the sheets thus secured together into the form of an evaporator.

13. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and side walls extending outwardly and downwardly, said side walls being bent to form a sharp freezing chamber or chambers, an inner one-piece shell having an oppositely formed arcuate depression, and outwardly and downwardly extending side walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header and said cooperating walls providing means for the passage of refrigerant from said header, said two shells being secured together.

14. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and side walls extending outwardly and downwardly, said side walls being bent to form a sharp freezing chamber or chambers, an inner one-piece shell having an oppositely formed arcuate depression, and outwardly and downwardly extending side walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header and said cooperating walls providing means for the passage of refrigerant from said header, said two shells being secured together by welding.

15. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and side walls extending outwardly and downwardly, said side walls being bent to form a sharp freezing chamber, an inner one-piece shell having an oppositely formed arcuate portion, outwardly and downwardly extending side walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header, one of said laterally extending side walls being embossed to provide passageways extending from one side to the other of said header, the embossed portions of one of said walls in contact with the other wall being united therewith closely adjacent the wall of said header.

16. The method of manufacturing an expansion chamber for a mechanical refrigerating machine, comprising, first corrugating one of two walls, then welding the two walls together between the corrugations and at or near their peripheries, and then bending the integral construction to form a plurality of walls of a sharp freezing chamber adapted to receive a receptacle.

17. The method of manufacturing an expansion chamber for a refrigerating machine, comprising, first corrugating one of two walls, then welding the two walls together between the corrugations, and then bending the integral construction to form a plurality of walls of a sharp freezing chamber adapted to receive a receptacle.

18. The method of manufacturing an expansion chamber for a refrigerating machine comprising, first embossing at least one of two walls to provide portions of a header and a plurality of passages communicating therewith, then welding the two walls together between the embossed portions thereof, then bending the integral construction until portions thereof come into contact to form walls completely surrounding a freezing chamber, and securing together the walls of said freezing chamber along their line of contact.

19. The method of manufacturing an expansion chamber for a refrigerating machine which comprises providing two sheet metal walls, embossing at least one of the walls to provide a header portion, corrugating at least one of the walls to provide passages adapted to communicate with said header portion, then welding the walls together between the corrugations, and then bending the integral construction to form a plurality of walls of a sharp freezing chamber.

20. A sheet metal evaporator comprising an outer one-piece shell having an arcuate portion and side walls extending outwardly and downwardly, said side walls being bent to form a sharp freezing chamber, an inner one-piece shell having an oppositely formed arcuate portion, outwardly and downwardly extending side walls cooperating with the side walls of the outer shell, said two arcuate portions registering complementally to form a substantially cylindrical header, one of said side walls being embossed to provide passageways extending from said header, the embossed portions of one of said walls in contact with the other wall being united therewith closely adjacent the wall of said header.

CHRISTIAN STEENSTRUP.