Nov. 9, 1937. L. A. PHILIPP 2,098,731

REFRIGERATING APPARATUS

Filed Nov. 28, 1934

Fig. 1.

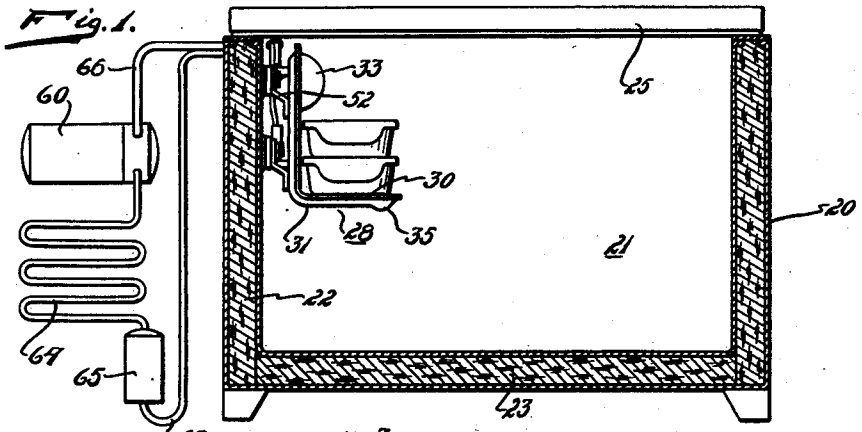


Fig. 2.

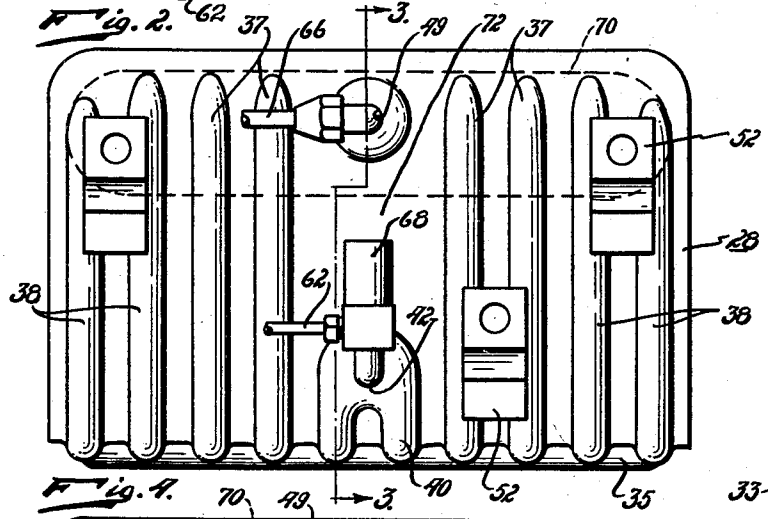


Fig. 4.

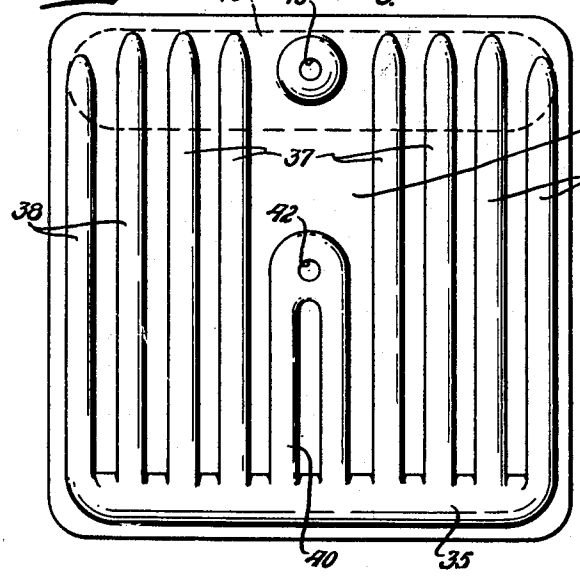
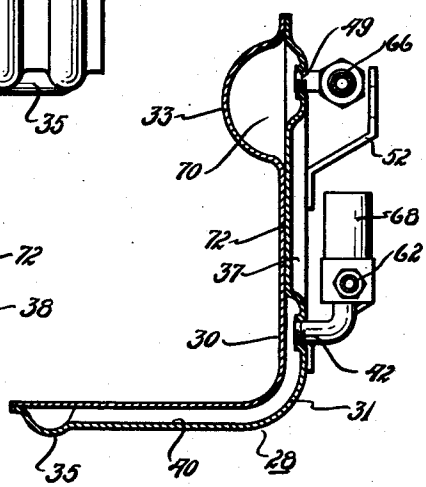


Fig. 3.



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REFRIGERATING APPARATUS

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Application November 28, 1934, Serial No. 755,082

14 Claims. (Cl. 62—126)

This invention relates to refrigerating apparatus, and particularly to refrigerant evaporators for use in such apparatus.

One of the objects of the present invention is to provide a refrigerating system in which the refrigerant is supplied to the evaporator below the liquid level in such a manner that the incoming refrigerant is directed first to the lower part of the evaporator before passing to the upper part, and later is returned from the upper part to the lower part thereof so as to obtain uniform circulation throughout the area thereof to prevent the superheat of refrigerant in the evaporator.

Another object is to construct the aforesaid evaporator in such a manner that the incoming refrigerant is directed to two or more independent paths whereby independent circulatory movements of the refrigerant takes place throughout the area of said evaporator.

Another object of the present invention consists in an improved arrangement for returning oil from refrigerant evaporators to motor compressor units.

Other objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a vertical view in cross section of a refrigerating apparatus embodying features of my invention;

Fig. 2 is a side view in elevation of a refrigerant evaporator constructed in accordance with my invention;

Fig. 3 is a view taken along line 3—3 of Fig. 2; and

Fig. 4 is a view of the evaporator in the "flat" before being bent to assume the general shape of an L.

Referring to the drawing, 20 designates in general a refrigerator cabinet, which may be of the so-called chest type having a food storage compartment 21. The cabinet includes insulated vertical walls 22 and bottom wall 23. The cabinet 20 is closed on the top by a movable lid 25 which may be hingedly secured to the cabinet 20.

Within the compartment 21 is disposed my improved evaporator 28. The evaporator 28 is constructed chiefly of two sheets of metal; namely, an inner sheet 30 and an outer sheet 31. The inner sheet 30 is bent to form an upper header as at 33, and the outer sheet is bent to form a lower header as at 35. The outer sheet 31 is also corrugated so as to provide channels 37, 38, and 40. Channels 37 and 38 are in open communication with both upper and lower headers. Channel 40 is in the form of an inverted U, with its terminal ends opening into the lower header 35. An inlet 42 is provided in the curved portion of channel 40. Fig. 4 shows the evaporator while in the flat before bending, and Figs. 1, 2, and 3 show the completed evaporator after it has been bent to assume the general shape of an L. The two sheets of metal 30 and 31 may be secured together, such as by spot welding between the corrugations and seam welded about their outer edges. The outer sheet 31 is also provided with an outlet 49 directly opposite the header 33.

In order to secure the evaporator to the walls of the cabinet 20, I have provided a plurality of brackets 52 which are preferably welded to sheet metal member 31.

Liquid refrigerant is supplied to and gaseous refrigerant is withdrawn from the evaporator by a motor compressor unit 60. Any suitable pressure responsive or thermostatic control (not shown) may be provided to control the action of the motor compressor unit. The compressor withdraws the gaseous refrigerant from the evaporator through a vapor return conduit 66, which is associated with the outlet 49. The compressor compresses the gaseous refrigerant and delivers it to a condenser 64 wherein it is liquefied and from which it is delivered to a high side float 65. Liquid refrigerant is supplied to the evaporator through inlet 42 and conduit 66 under the control of the high side float 65. A pressure operated valve 68 is provided in the liquid line 66 at the evaporator to keep the pressure in line 66 sufficiently high enough so that frost and moisture will not accumulate on line 66.

Liquid refrigerant, after passing through inlet 42, passes out of the terminal ends of channel 40 into the lower header 35. In practice, it has been found that the liquid refrigerant entering the header 35 moves toward the front and rear of the evaporator. Owing to the resistance of the body of liquid in channels 38 and in the header 33, the incoming liquid moves upwardly through channels 37 into the header 33. This liquid entering header 33 moves toward the front and rear of the evaporator and then downwardly in channels 38 and into header 35 where some of it is picked up by the incoming refrigerant and moved upwardly through channels 37 into header 33 to be recirculated. Thus, it will be noted that I have provided in one evaporator two independent circulatory paths for independent circulation of refrigerant.

Preferably, the quantity of liquid in the system which is controlled by the high side float is calibrated so that the liquid level in the evaporator is somewhat below the outlet 49 but in the header 33 so that liquid refrigerant is free to circulate between the channels 37 and 38 and header 33.

In order to provide for the proper return of oil from the header 33 to the motor compressor unit, I have provided a quiescent zone 70 in the header 33. This is provided by arranging the sheets of metal 30 and 31 so that they are in contacting spot welded engagement as at 72, which is between channels 37 and immediately above and below the inlet 42 and outlet 49, respectively. By this arrangement, violent ebullition of refrigerant in channels 37 and 38 and in the header 33 adjacent these channels does not disturb the refrigerant and oil floating thereon immediately below the outlet 49. Thus, the possibility of slop-over of liquid refrigerant into the vapor line 62 is avoided. Also, the possibility of the pumping action withdrawing liquid through line 62 is avoided.

From the foregoing, it will be noted that I have provided a new refrigerating system wherein refrigerant is recirculated in the evaporator in a new and improved manner and superheat in the evaporator is avoided. Furthermore, it will be noted that I have provided a new and improved method of returning oil from the evaporator to the compressor.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What I claim is:

1. An evaporator for refrigerating systems comprising material formed to provide upper and lower headers and passages for the flow of refrigerant, so constructed and arranged as to direct the flow of refrigerant from a refrigerant inlet intermediate said headers first to said lower header at a plurality of locations in said lower header before entering said upper header and later returning said refrigerant from said upper header to said lower header for recirculation.

2. An evaporator for refrigerating systems comprising two sheets of metal formed to provide upper and lower headers and passages for the flow of refrigerant, so constructed and arranged as to direct the flow of refrigerant from a refrigerant inlet intermediate said headers first to said lower header at a plurality of locations in said lower header before entering said upper header and later returning said refrigerant from said upper header to said lower header for recirculation.

3. An evaporator for refrigerating systems comprising material formed to provide two headers, a curved inlet passage for refrigerant intermediate said headers and having its terminal ends opening in one of said headers and a passage for refrigerant interconnecting said headers, one of said headers being provided with an outlet for refrigerant.

4. An evaporator for refrigerating systems comprising material formed to provide upper and lower headers, a curved inlet passage for refrigerant having its terminal ends opening in spaced apart relation in said lower header and a passage for refrigerant interconnecting said headers, said upper header having an outlet for refrigerant.

5. An evaporator for refrigerating systems comprising sheet metal material formed to provide upper and lower headers and a U-shaped passage for refrigerant having its terminal ends opening in spaced apart relation in said lower header and an inlet for refrigerant associated with the curved portion of said passage, and a passage for refrigerant interconnecting said headers, one of said headers being provided with an outlet for refrigerant.

6. A sheet metal evaporator for refrigerating systems comprising sheet metal material formed to provide an L-shaped evaporator having a header adjacent the upper part of the vertical leg, a header adjacent the outer edge of the horizontal leg, and said sheet metal material being spaced apart between interior surfaces thereof to provide for the passage of refrigerant from one header to the other.

7. A sheet metal evaporator for refrigerating systems comprising sheet metal material formed to provide an L-shaped evaporator having a header adjacent the upper part of the vertical leg, a header adjacent the outer edge of the horizontal leg and being provided with channels interconnecting said headers, and additional channel means leading to the lower header for incoming refrigerant, and an outlet associated with the upper header.

8. A sheet metal evaporator for refrigerating systems comprising sheet metal material fashioned to form an L-shaped evaporator with a header for refrigerant formed on the interior side of the vertical leg, a header for refrigerant formed on the exterior side of the horizontal leg of said evaporator and a passage for refrigerant interconnecting said headers.

9. A sheet metal evaporator for refrigerating systems comprising sheet metal material fashioned to form an L-shaped evaporator with a header for refrigerant formed on the interior side of the vertical leg, and a header for refrigerant formed on the exterior side of the horizontal leg of said evaporator, said sheet metal material also being formed to provide channels in said legs, some of which interconnect said headers and at least one of said channels leading only to said lower header.

10. A sheet metal evaporator for refrigerating systems comprising sheet metal material fabricated to provide inner and outer sheets formed to provide a hollow wall for refrigerant, and a space where the two sheets are united to prevent passage of refrigerant, and an inlet for refrigerant directly below said space and an outlet directly above said space.

11. A sheet metal evaporator for refrigerating systems comprising two sheets of metal formed to provide upper and lower headers and spaced apart channels for the flow of refrigerant from one header to the other, said two sheets having a contacting area between said channels and below said upper header to provide an area where the refrigerant does not flow to maintain a quiescent zone in said headers, said sheets also being provided with a U-shaped passage for incoming refrigerant, and having its terminal ends opening into said lower header, and an outlet associated with said upper header in said quiescent zone.

12. A sheet metal evaporator for refrigerating systems comprising two sheets of metal formed to provide an L-shaped evaporator having an upper header in the vertical leg and a lower header

in the horizontal leg, and spaced apart channels for the flow of refrigerant from one header to the other, said two sheets having a contacting area between said channels and below said upper header to provide an area where the refrigerant does not flow to maintain a quiescent zone in said header, said sheets also being provided with a U-shaped passage for incoming refrigerant and having its terminal ends opening into said lower header, and an outlet associated with said upper header in said quiescent zone.

13. A sheet metal evaporator for refrigerating systems comprising sheet metal material formed to provide a hollow wall and a header for liquid and gaseous refrigerant associated with said hollow wall, said sheet metal material having portions united together adjacent said hollow wall and below said header to provide a quiescent zone in said header, and an outlet for gaseous refrigerant associated with said header in said quiescent zone.

14. A sheet metal evaporator for refrigerating systems comprising sheet metal material formed to provide a channelled wall and a header for liquid and gaseous refrigerant associated with said channelled wall, said sheet metal material having portions united together adjacent the channels in said wall and below said header to provide a quiescent zone in said header, and an outlet for gaseous refrigerant associated with said header in said quiescent zone.

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