May 24, 1938. L. W. ATCHISON 2,118,637

EVAPORATOR FOR REFRIGERATING MACHINES

Filed March 5, 1936

Fig. 2.

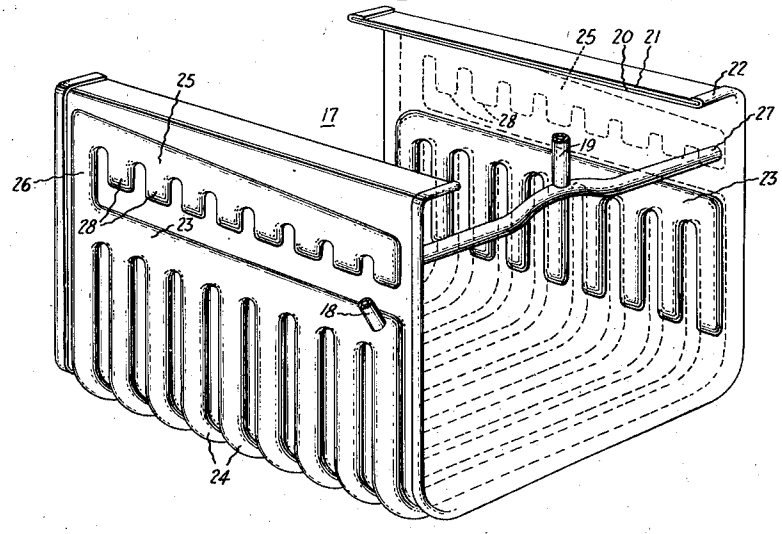


Fig. 3.

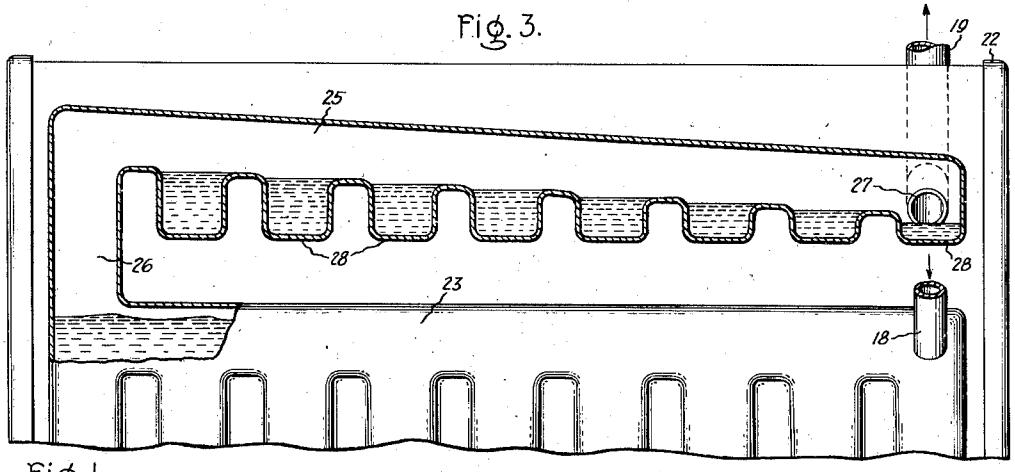
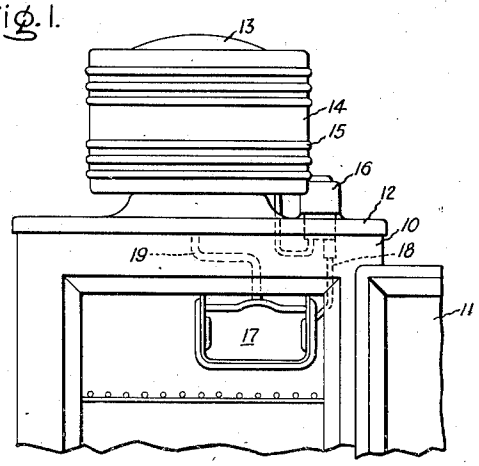


Fig. 1.



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Patented May 24, 1938

2,118,637

UNITED STATES PATENT OFFICE

2,118,637

EVAPORATOR FOR REFRIGERATING MACHINES

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Application March 5, 1936, Serial No. 67,269

4 Claims. (Cl. 62—126)

My invention relates to evaporators of the flooded type for refrigerating machines.

Evaporators of the flooded type for refrigerating machines are commonly provided with a header in which the liquid and gaseous refrigerant are separated and from which the gaseous refrigerant is withdrawn. Some of the lubricant which is utilized to lubricate the working parts of the refrigerant compressor is unavoidably carried with the refrigerant into the evaporator. It is necessary to provide some arrangement for returning the lubricant to the compressor in order to prevent a large accumulation of lubricant in the evaporator which would interfere with its operation by reducing vaporization of refrigerant and deplete the supply of lubricant available for lubricating the working parts. When the lubricant and liquid refrigerant form an intimate mixture not separable by gravity, it is necessary to withdraw small amounts of the mixture from the header of the evaporator and heat this portion of the mixture to evaporate the refrigerant and separate it from the lubricant. When the lubricant and liquid refrigerant are separable by gravity they may be separated within the evaporator by providing an undisturbed zone of liquid therein from the top of which the lubricant may be withdrawn with the gaseous refrigerant; this prevents slugs of liquid refrigerant from entering the compressor with possible damage to the parts thereof.

It is an object of my invention to provide a flooded evaporator for refrigerating machines having an improved arrangement for separating liquid refrigerant and lubricant, and for withdrawing the lubricant from the evaporator.

Another object of my invention is to provide a flooded evaporator for refrigerating machines which is constructed of sheets of metal secured together and having indentations formed therein to provide a header, refrigerant circulating passages communicating with the header and a lubricant separating device between the header and the suction line.

A further object of my invention is to provide a flooded evaporator for refrigerating machines including a header and refrigerant circulating passages and having an arrangement for separating liquid refrigerant and lubricant which is operable whether the liquid refrigerant and lubricant form an intimate mixture or are separable by gravity.

Further objects and advantages of my invention will become apparent as the following description proceeds, 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.

For a better understanding of my invention reference may be had to the accompanying drawing, in which Fig. 1 is a front elevation of a household refrigerating machine provided with an evaporator embodying my invention; Fig. 2 is an enlarged perspective rear view of the evaporator shown in Fig. 1; and Fig. 3 is an enlarged side elevation, partly in section, of a portion of the evaporator shown in Fig. 2.

Referring now to Fig. 1, I have shown a household refrigerating machine including a thermally insulated cabinet 10 having a door 11 and provided with a thermally insulated top 12 on which is mounted a refrigerating machine. The refrigerating machine includes a closed casing 13 in which is arranged a motor and a compressor, an air-cooled condenser 14 surrounding the casing 13 and having a condenser conduit 15 formed therein, a liquid receiver or float valve chamber 16 and a U-shaped flooded evaporator 17 supported from the top 12 within the cabinet 10. Gaseous refrigerant is compressed by the operation of the motor in the casing 13 and flows in the conduit 15 of the condenser 14 where it is cooled and liquefied and from whence it flows to the float valve chamber 16. When a predetermined amount of liquid refrigerant has collected in the float chamber 16 a float therein rises and permits the liquid refrigerant to flow through a connection 18 to the evaporator 17. The liquid refrigerant in the evaporator 17 is vaporized by the absorption of heat from the interior of the cabinet 10 and the vaporized refrigerant is withdrawn through a suction line 19 and returned to the compressor within the casing 13. Within the casing 13 is provided a body of a liquid lubricant, such as highly refined mineral oil, which is circulated about the working parts of the motor and the compressor to lubricate them. Some of this lubricant is unavoidably entrained in the refrigerant discharged in the compressor and finds its way through the condenser and float chamber to the evaporator 17. In order to prevent the accumulation of the lubricant within the evaporator 17, it is necessary to provide some arrangement for separating the lubricant and refrigerant and for returning the lubricant to the compressor casing. The evaporator 17, is, therefore, provided with a lubricant separating chamber in which the lubricant and refrigerant are permitted to separate either by gravity or by heating and which is so arranged that the lu-

bricant alone will flow toward the suction line and will be withdrawn from the evaporator with the gaseous refrigerant, the liquid refrigerant in the separating chamber being evaporated before it can reach the suction line.

The construction of the evaporator and lubricant separating chamber is clearly shown in Figs. 2 and 3. The evaporator 17 is constructed of inner and outer metal sheets 20 and 21, respectively, secured together about their edges by welding or in any other suitable manner, the edge of the sheet 20 being bent around the edge of the sheet 21, as indicated at 22. The sheets 20 and 21 are bent in U-shaped form to provide the side and bottom walls of a freezing chamber. The refrigerant passageways of the evaporator are formed by indentations in the sheets 20 and 21, and the sheets 20 and 21 are secured together by welding, brazing, or in any other suitable manner between the indentations in order to provide further strength. The two sides of the evaporator are of identical construction, each side being provided with a header 23 partially filled with liquid refrigerant wherein liquid and gaseous refrigerant are separated, and a plurality of refrigerant circulating conduits 24 are provided to connect the headers 23 and permit the circulation of liquid refrigerant about the walls of the evaporator. The conduits 24 extend below the level of liquid refrigerant in the headers 23, so that the conduits are flooded with liquid refrigerant. Above the headers 23 are provided passages or chambers 25 communicating at one end with the headers 23 through an upright connection 26 and at their other ends remote from the header connection with a cross connection 27 to which the suction line 19 is connected. The passages 25 are inclined from the connection 26 toward the cross connection 27 and are provided on their lower sides with a plurality of pockets 28, which are arranged to trap liquid refrigerant and lubricant at successively lower levels along the passage between the header and suction line, as clearly shown in Fig. 3.

During the operation of the evaporator 17 liquid refrigerant and lubricant are admitted thereto through the connection 18. The liquid refrigerant circulating in the conduits 24 will be vaporized by the absorption of heat from the air within the cabinet 10 and from articles placed within the evaporator, and the gaseous refrigerant will rise through the conduits 24 to the headers 23, where it will separate from and rise above the liquid refrigerant. This boiling of the refrigerant will produce agitation and splashing of the liquid in the headers 23 and some of the liquid will be carried up through the connection 26 with the vaporized refrigerant and will be trapped in the pockets 28 at the bottom of the passage 25. The pockets 28 at the end of the passage 25 near the connection 26 are deeper than those at the other end and the pockets are so arranged that each one will overflow into the adjacent pocket nearer the suction line and, consequently, the liquid will move toward the suction line as more liquid is added to the pockets 28 near the connection 26. If the mixture of liquid refrigerant and lubricant in the pockets 28 is separable by gravity the lubricant will settle out on top of the refrigerant in the pockets and, consequently, the lubricant tends to overflow from one pocket to the next while the refrigerant remains in the pockets at the bottom where it is vaporized by the absorption of heat from the walls of the evaporator and is then withdrawn through the suction line 19 with the gaseous refrigerant. Liquid refrigerant, therefore, will not reach the last pocket 28 and only lubricant will be withdrawn through the suction line. If the mixture of liquid refrigerant and lubricant is not separable by gravity there results, nevertheless, a separation of the refrigerant and lubricant in the pockets 28 since the pockets 28 hold the mixture so that it can absorb heat from the walls of the evaporator and, consequently, refrigerant is continuously vaporized from the mixture; the mixture in the succeeding pockets as it flows toward the suction line contains less and less liquid refrigerant. By providing a sufficient length of the passage 25 and a sufficient number of the pockets 28 the separation of liquid refrigerant and lubricant may be accomplished within the pockets so that lubricant alone reaches the last pocket and is withdrawn through the suction line.

It is readily apparent from the foregoing that I have provided a flooded evaporator for refrigerating machines having arranged therein a simple and effective device for separating liquid refrigerant and lubricant whether the mixture of liquid refrigerant and lubricant be separable by gravity or not.

While I have shown and described my invention in connection with a flooded evaporator for household refrigerating machines, other applications will readily be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications within 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. A flooded evaporator for refrigerating machines including sheets of metal secured together and having a header formed therebetween for separating liquid and gaseous refrigerant, a refrigerant circulating conduit formed between said sheets and communicating with said header, means for admitting liquid refrigerant and lubricant to said conduit, means including a suction line for withdrawing gaseous refrigerant from said evaporator, and means including a passage formed between said sheets above said header for providing communication between said header and said suction line, said last-mentioned means including a plurality of pockets communicating with said passage for facilitating the separation of liquid refrigerant and lubricant to prevent the withdrawal of slugs of liquid refrigerant through said suction line.

2. A flooded evaporator for refrigerating machines including sheets of metal secured together and having a header formed therebetween for separating liquid and gaseous refrigerant, a plurality of refrigerant circulating conduits formed between said sheets and communicating with said header, means for admitting to said conduits liquid refrigerant and lubricant, means including a suction line for withdrawing gaseous refrigerant from said evaporator, means including a passage formed between said sheets and communicating at one end with said header and at the other end with said suction line for removing gaseous refrigerant and lubricant from said header, and means including a plurality of pockets formed between said sheets in said passage for trapping liquid refrigerant and lubricant and for facilitating the separation of the liquid refrigerant and lubricant to prevent the withdrawal

of slugs of liquid refrigerant through said suction line.

3. A flooded evaporator for refrigerating machines including sheets of metal secured together and having a header formed therebetween for separating liquid and gaseous refrigerant, a plurality of refrigerant circulating conduits formed between said sheets and communicating with said header, means for admitting to said conduits liquid refrigerant and lubricant, means including a suction line for withdrawing refrigerant from said evaporator, means including a passage formed between said sheets and communicating at one end with said header and at the other end with said suction line for removing gaseous refrigerant and lubricant from said header, and means including a plurality of pockets formed between said sheets and arranged to trap liquid at successively lower levels in said passage between said header and said suction line and to cause the liquid in said pockets to overflow from one pocket to another toward said suction line for facilitating the separation of liquid refrigerant and lubricant.

4. An evaporator of the flooded type for refrigerating machines including complementary U-shaped sheet metal portions forming a plurality of walls of a freezing chamber, a header formed between said sheet metal portions in each leg of said evaporator, a plurality of refrigerant circulating conduits formed between said sheet metal portions and connecting said headers, means for admitting liquid refrigerant and lubricant to said conduits, means including a passage formed between said sheet metal portions in each of the legs of said evaporator and extending substantially parallel to and above said headers for removing gaseous refrigerant and lubricant from said headers, means including a suction line connecting said passages remote from said headers for removing gaseous refrigerant and lubricant from said evaporator, and means including a plurality of pockets arranged in said passages for trapping liquid refrigerant and lubricant and for facilitating the separation of the liquid refrigerant and lubricant to prevent the withdrawal of slugs of liquid refrigerant through said suction line.

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