Oct. 23, 1934. R. H. MONEY 1,978,028

DELIVERY OF REFRIGERANT TO EVAPORATORS

Filed March 15, 1934

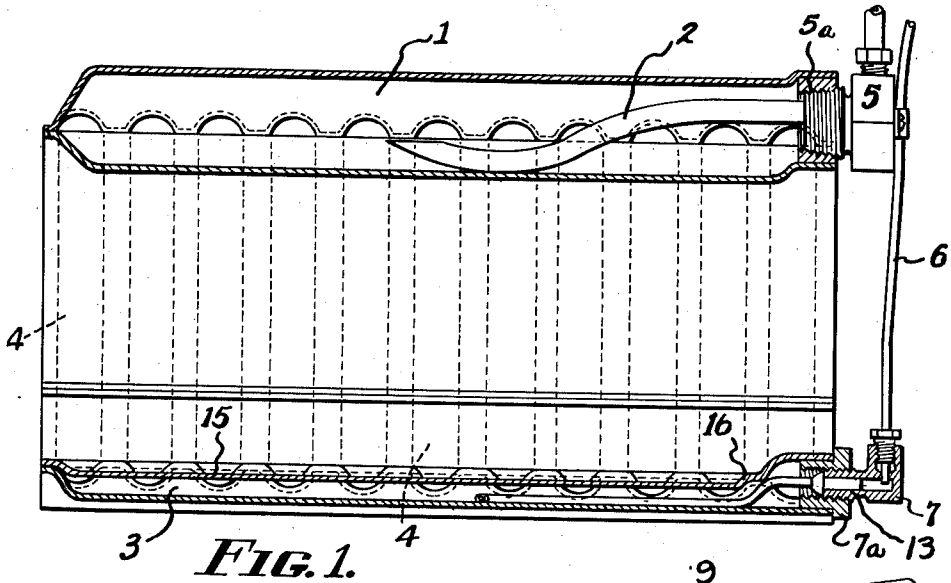


FIG. 1.

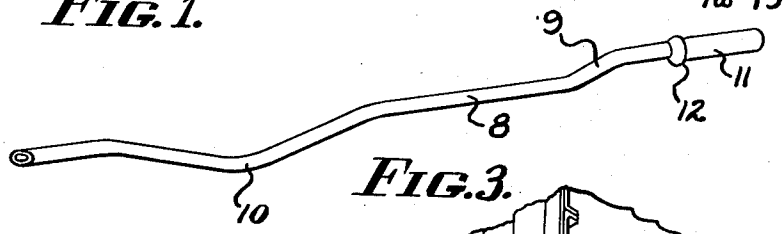


FIG. 3.

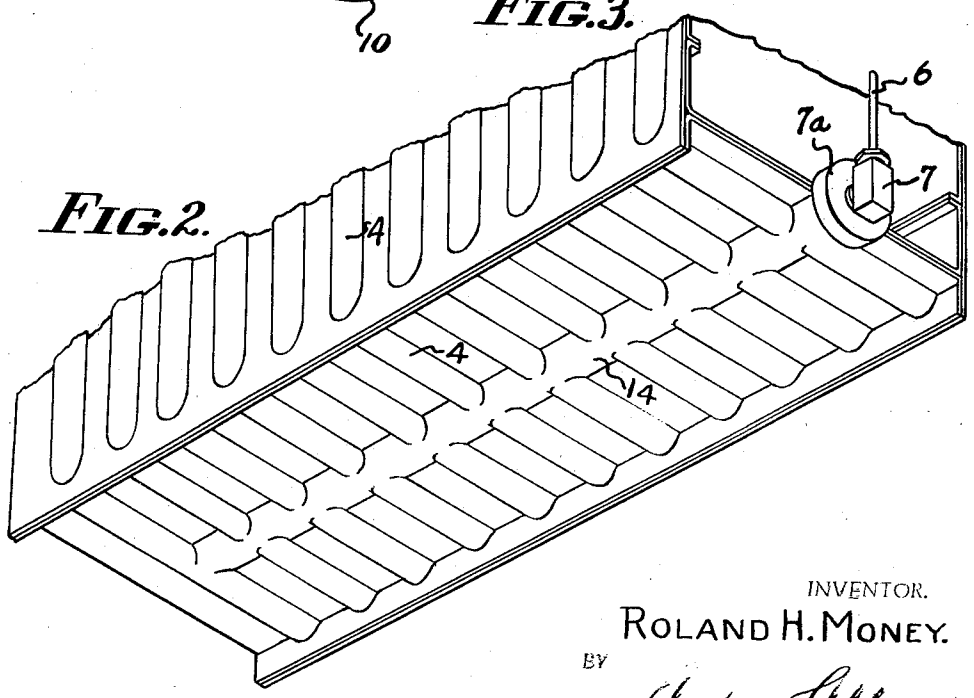


FIG. 2.

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1,978,028

UNITED STATES PATENT OFFICE

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DELIVERY OF REFRIGERANT TO EVAPORATORS

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Application March 15, 1934, Serial No. 715,667

3 Claims. (Cl. 62—126)

My invention has to do with the delivery of refrigerant to evaporators such as are used in modern electrical refrigerators, and while not so limited, it is of especial importance in connection with the constant or substantially constant delivery of refrigerant as through a capillary tube or other constant flow device. As distinguished from the use of float valves which deliver the refrigerant periodically as needed, the use of the capillary tube for example, brings with it special problems in connection with the control of the refrigerating apparatus. In the co-pending application of applicant and Lewis M. Crosley, Serial No. 716,456 filed March 20, 1934 we have taken up these special problems and a general solution for them in detail. It is not necessary here to review the general construction of a refrigerator mechanism or of the evaporator as such; but it is sufficient to point out that while my invention is not restricted thereto, it is also of especial importance in connection with the delivery of refrigerant to the bottom of an evaporator of a type comprising a shell, which is open completely around an interior space in which ice cubes are to be frozen. With the understanding that my invention is not so restricted, I shall describe it for the purpose of making an exemplary disclosure in connection with a capillary tube feed system, feeding refrigerant into the bottom of an evaporator of the type hereinabove referred to. The type of evaporator to which I shall refer in this connection is an evaporator such as is shown in my copending application, Serial No. 675,571 filed June 13, 1933.

The general objects of my present invention are to improve the conditions of the delivery of refrigerant to an evaporator, in such a way particularly as to promote evaporation, secure a more even distribution, keep the refrigerant in a condition of constant agitation uniformly throughout the body of the evaporator, and to prevent the formation of so-called dead spots in the evaporator. These and other objects of my invention which will be set forth hereinafter, or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain procedure and in that certain construction and arrangement of parts of which I shall now describe the aforesaid exemplary embodiment. Reference is made to the drawing wherein:

Figure 1 is a sectional view through the center of an evaporator embodying my invention.

Figure 2 is a perspective view looking up at the evaporator from beneath.

Figure 3 shows a delivery device which I prefer to use in the type of evaporator disclosed herein as exemplary.

The form of the evaporator in this exemplary embodiment of my invention is essentially tubular, and is formed of four metal plates welded together at their edges. One of the plates forms the outer top and outer side portions of the evaporator, a second plate forms the outer bottom, a third plate forms the inner top and portions of the inner sides, while a fourth plate forms the inner bottom and the remaining portion of the inner sides as set forth in my copending application above referred to. Essentially there is provided in this construction, an upper chamber or manifold indicated at 1, and containing a skimming device 2. At the bottom of the evaporator there is a second but much smaller longitudinal manifold or chamber 3, and between the chambers 1 and 3 there are a series of inter-connecting passage-ways 4, formed by ridges in the metal. Essentially therefore, this particular type of evaporator is a tubular chamber, there being manifolds or passage-ways at the top and bottom longitudinally, and interconnecting passage-ways around the sides of the tubular chamber laterally. Within the evaporator is open so as to provide a space for the disposal of trays in which ice cubes are to be frozen. The refrigerant is withdrawn from this device at the top through the skimmer 2, which is attached to a suitable fitting 5, threaded into a member 5*a*, welded in the casing. The refrigerant from a capillary tube 6 is introduced into the bottom of the evaporator through a fitting 7*a*, welded into the end of the lower manifold.

Instead of permitting the refrigerant to enter the evaporator merely through the fitting 7, whereby it will be delivered essentially at but one end of the evaporator, I use in following my invention a device like that shown in Figure 3, and which comprises essentially a delivery tube 8 bent to form two shoulders 9 and 10. Upon one end of the tube I place a sleeve 11, which may be brazed or soldered in place, and which bears a shoulder 12. The fitting 7 is drilled as at 13 to admit this sleeve. It will be noted in Figures 1 and 2 that the lower manifold referred to hereinabove, is formed by an indentation 14 in the metal of the bottom, and that the fitting 7 is displaced from a central position with respect to this manifold. The central portion of the inner bottom plate is as shown in Figure 1, recessed as at 15, which provides a shoulder 16 opposite the mouth of the fitting 7. The bend 9 in the tube lies adjacent this shoulder 16 on the inside of the manifold, and has for its purpose the prevention of a dislodgement of the tube from the fitting. As a consequence the sleeve does not have to be welded, soldered or otherwise attached to the fitting. It will be noted that the fitting essentially comprises two parts, the part denominated 7*a* welded into the evaporator, and a part denominated 7 threaded into the portion 7*a*. The bend 10 in the tube

assists in getting the tube past the shoulders formed by the raised portions of the metal in the outer bottom of the evaporator forming passage-ways taking off from the lower manifold 3. In assembling the structure, it is necessary merely to insert the structure of Figure 3 into the fitting portion 7 and turn this portion into place. The ends of the tube may advantageously be cut off at an angle so as to prevent the tube from being stopped by butting up against some other part.

It will be observed that the tube is preferably of such a length as to extend substantially to the middle portion of the bottom manifold 3. The force of the refrigerant being delivered through the tube, while gentle, will be sufficient to set up agitation from the middle toward the opposite end (left hand end, in Figure 1), of the manifold 3. The tube itself is surrounded by cool refrigerant; but the refrigerant delivered through it is relatively warm, since it is delivered through the capillary tube directly from the condenser of the refrigerating device. Consequently, it produces a boiling of the surrounding refrigerant where it contacts the tube, and this boiling is sufficient to set up agitation in the remaining half (right hand end, in Figure 1), of the evaporator.

Thus by the construction which I employ, I achieve uniform agitation all along the bottom of my evaporator. The evaporation of the refrigerant proceeds uniformly, and no dead spots are formed. By dead spots I mean, of course, portions of the evaporator construction in which there is no ebullition or in which no evaporation is taking place. These spots become spots of relatively higher temperature and the efficiency of the evaporator is diminished. Dead spots may, under some circumstances, be caused by oil collecting in certain of the passage-ways of the evaporator; but in my invention where agitation is uniform throughout the interior of the evaporator, this agitation prevents the clogging of the passage-ways with oil. By the use of this device I have noted not only a marked increase in general cooling efficiency, but I have also been able to save several ounces of refrigerant in the ordinary small sized refrigerator, which, multiplied by the number of such structures produced, represents a considerable saving in material.

I have not illustrated herein the general features of a refrigerating system, since these are well known in the art. It will be understood that the evaporated refrigerant in gaseous form, together with the oil collecting on the surface of the liquid in the evaporator, is withdrawn through the skimming device 2, and the fitting 5, and is transferred by means of a suitable tube of the motor driven compressor. The compressor delivers it to a condenser where it is cooled and liquefied, and the condenser in turn delivers it through a suitable filter to the capillary tube 6.

It will be understood that modifications may be made in my invention without departing from the spirit thereof.

Having thus described my invention, what I claim as new and useful, and desire to secure by Letters Patent, is:—

1. In a refrigerating system having an evaporator of the shell type with an upper header for the withdrawal of gaseous refrigerant and a lower header for the introduction of liquid refrigerant, means for conducting liquid refrigerant in a substantially continuous stream directly from a condenser to one end of said lower header, and means for introducing said refrigerant into said header, said means comprising a thin walled heat conductive tubing extending into said header from said end and terminating in said header in the general region of the mid portion thereof, said tubing delivering refrigerant at its said termination toward opposite end of said header whereby to set up mechanical agitation of the refrigerant in a substantial portion of said header, and said tubing, due to the passage of heated refrigerant therethrough, setting up agitation by boiling in the remaining portion of said header, thereby producing conditions of even activity throughout said evaporator.

2. In a refrigerating system having an evaporator of the shell type with an upper header for the withdrawal of gaseous refrigerant and a lower header for the introduction of liquid refrigerant, means for conducting liquid refrigerant in a substantially continuous stream directly from a condenser to one end of said lower header, and means for introducing said refrigerant into said header, said means comprising a thin walled heat conductive tubing extending into said header from said end and terminating in said header in the general region of the mid portion thereof, said tubing delivering refrigerant at its said termination toward opposite end of said header whereby to set up mechanical agitation of the refrigerant in a substantial portion of said header, said tubing, due to the passage of heated refrigerant therethrough, setting up agitation by boiling in the remaining portion of said header, thereby producing conditions of even activity throughout said evaporator, and a fitting in the delivery end of said header, said tubing being loosely inserted therein.

3. In a refrigerating system having an evaporator of the shell type with an upper header for the withdrawal of gaseous refrigerant and a lower header for the introduction of liquid refrigerant, means for conducting liquid refrigerant in a substantially continuous stream directly from a condenser to one end of said lower header, and means for introducing said refrigerant into said header, said means comprising a thin walled heat conductive tubing extending into said header from said end and terminating in said header in the general region of the mid portion thereof, said tubing delivering refrigerant at its said termination toward opposite end of said header whereby to set up mechanical agitation of the refrigerant in a substantial portion of said header, said tubing, due to the passage of heated refrigerant therethrough, setting up agitation by boiling in the remaining portion of said header, thereby producing conditions of even activity throughout said evaporator, and withdrawal means for gaseous refrigerant having an orifice located intermediate the ends of said upper header, the end of said thin walled tubing being vertically offset from said orifice.

ROLAND H. MONEY.