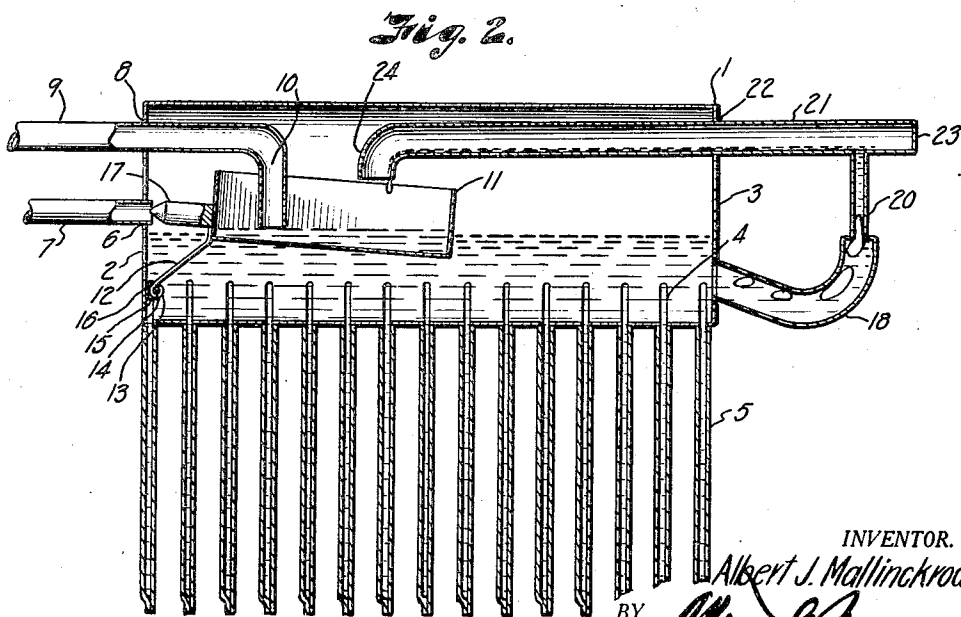
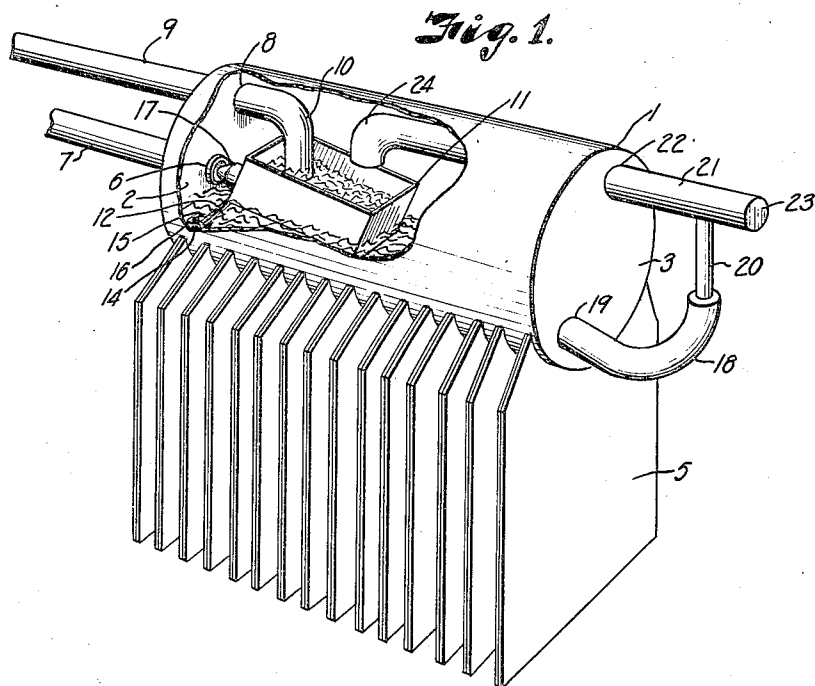


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METHOD OF AND APPARATUS FOR CIRCULATING OIL AND  
REFRIGERATING MEDIUM IN REFRIGERATING SYSTEMS  
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## METHOD OF AND APPARATUS FOR CIRCULATING OIL AND REFRIGERATING MEDIUM IN REFRIGERATING SYSTEMS

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6 Claims. (Cl. 62—126)

My invention relates to a method of and apparatus for circulating oil in refrigerating systems and more particularly in refrigerating systems of flooded type.

5 In systems of the character named, particularly those employing methyl chloride, or other substances miscible with oil, as refrigerating medium, oil for lubricating the compressor parts is circulated with the refrigerating medium, passing with liquid refrigerant from the high pressure side of the compressor to an evaporator and returning with vapors of the refrigerant to the low pressure side of the compressor through a suction line. The oil, being less volatile than the refrigerant, tends to collect in the evaporator, thus interfering with proper lubrication of the compressor and necessitating interruption of operation of the system for removal of the oil from the evaporator.

20 It is the object of my invention to provide more effective lubrication of the compressor and avoid interruptions in operation of the system by providing continuous circulation of the oil between the compressor and the evaporator.

25 In accomplishing this object, I have provided an improved method and apparatus, the novel features of which are illustrated in the accompanying drawing, wherein:

30 Fig. 1 is a perspective view of an evaporator equipped for the practice of my improved method, a part of the evaporating vessel being broken away for illustration of contained parts and conventional compressor elements being indicated by high and low pressure lines.

35 Fig. 2 is a central longitudinal section of the evaporator illustrated in Fig. 1.

Referring more in detail to the drawing:

40 1 designates an evaporating vessel, which, except as hereinafter described, corresponds with those ordinarily employed in refrigerating systems of flooded type and specifically consisting of a cylinder including heads 2 and 3 and a body portion having slots 4 communicating with chambers in depending fins 5 for cooling circulation of the refrigerating medium.

45 An opening 6 is provided in the head 2 near its vertical center for receiving the high pressure line 7 leading from a liquid refrigerant receiver of ordinary type and therefore not illustrated. In the upper portion of the head 2 is an opening 8 for a suction line 9 leading to the low pressure side of the compressor and having a down-turned end 10 within the vessel 1.

55 Located within the vessel 1 is a float 11 con-

sisting of a pan having an arm 12 provided with an eye 13 pivotally mounted on a hinge pin 14 carried by ears 15 of a bracket 16 that is rigidly attached to the inner face of the head 2. Fixed to the end of the float 11 adjacent the head 2 is a valve 17 for controlling inlet to the vessel 1 from the high pressure line 7 to maintain a normal liquid level in the vessel and provide a vapor space within the vessel above the liquid level.

60 Leading from the head 3 of vessel 1 below the normal liquid level in said vessel is a line 18, preferably of circular cross section, trapped as shown and upturned and terminating at its outer end in a stand-pipe 20 of reduced cross section, the reduction occurring slightly below the extended line of the normal liquid level in the vessel 1. The stand-pipe section opens to a conduit 21 leading through an opening 22 in the head 3. The outer end of the conduit 21 is closed as at 23 and the inner end terminates in a down-turned elbow 24 above the float pan 11 and within the vapor space above the liquid in the vessel 1. The conduit 21 is of sufficiently greater diameter than the stand-pipe 20 to constitute an evaporating zone, as hereinafter described, and inclined to drain liquid oil delivered thereto from the stand-pipe to the float pan.

75 Assuming the evaporator, heretofore described, to be connected with a compressor of conventional type by the high and low pressure lines 7 and 9, and the compressor in operation for circulating refrigerating medium and oil, in accordance with common practice, the liquid refrigerating medium and oil delivered through the line 7 enters the evaporator chamber under control of the float actuated valve to maintain a normal liquid level in the evaporator vessel and provide a vapor space in the vessel above the liquid body. In practice of the present method 80 contemplating use of a refrigerant such as methyl chloride, miscible in oil, the oil and refrigerant pass from the compressor to the vessel 1 and remain in the vessel as a mixture until separated as hereinafter described. The liquid mixture of refrigerating medium and oil passes in limited flow from the vessel 1 into the conduit 18, where it tends to rise in the stand-pipe 20 to the same level as that of the liquid in vessel 1 because of the differential areas of the stand-pipe, the trapped section of the conduit and the interior of the vessel.

100 Relieved of pressure, the liquid refrigerant tends to expand and evaporate in the vessel 1 and conduit 18 and bubbles of the vapors passing 110

from the trapped section of the conduit into the stand-pipe, of less cross sectional area, act as pistons to lift the mixed liquid into the conduit 21 in heads.

6 The lighter component of the mixed liquid expands and evaporates within the conduit 21, thus separating from the oil, which later flows down the conduit into the float pan, the vapors leaving the conduit collecting with those emanating from the body of liquid in the vessel within the vapor space in the vessel.

10 The oil collecting in the float pan is drawn into the suction line 9 along with the refrigerant vapors and returned therewith to the compressor. Continuous operation of the system maintains a level of oil in the pan and insures a constant supply of lubricant to the compressor due to the necessity for reducing the level of oil in the pan to provide access of vapors to the suction line and prevent liquid sealing of the line.

15 It is apparent that in practice of my method, with the apparatus described, circulation of oil is not dependent on saturation of vapors with oil during evaporation in the vessel proper, but oil, which would ordinarily separate from the mixed liquid and accumulate in the evaporator, is recovered and returned to the vapors for recirculation through the compressor.

20 What I claim and desire to secure by Letters Patent is:

30 1. Apparatus of the character described including a vessel having an inlet for mixed refrigerating medium and oil, float controlled means for controlling the inlet to restrict liquid level and maintain a vapor space within the vessel, means exterior of the vessel providing an evaporating zone in communication with said vapor space, means in communication with said vapor space for collecting oil separated from the refrigerating medium in said exterior evaporating zone, a line leading from below the normal liquid level in said vessel having a restricted section communicating with said evaporating zone, and a suction line leading from said oil collecting means.

45 2. Apparatus of the character described including a vessel having an inlet for mixed refrigerating medium and oil, a float in said vessel having an upwardly opening chamber, a valve on said float controlling said inlet to maintain a normal liquid level and providing a vapor space within the vessel, a conduit opening to the float chamber above a normal liquid level therein, a line leading from below the normal liquid level in said vessel and having a restricted portion leading to said conduit, and a suction line leading from the float chamber.

60 3. In an apparatus for circulating oil with a refrigerating medium in a flooded type system of refrigeration including an evaporating vessel, means for delivering the oil and refrigerating medium to the vessel, means in the vessel for controlling the admission of the mixed liquids into the vessel for maintaining a substantially uniform level of the mixed liquids therein and a vapor space above the liquids, a by-pass communicating with the vessel below the surface of the mixed liquids and at a point in said vapor space to form a passageway for a portion of the mixed liquids to effect evaporation of the liquid refrigerating

medium passing through the by-pass for elevating the oil in the by-pass to the vapor space, means in the vapor space for collecting the separated oil discharged from the by-pass, and means for removing the collected oil and vapors from the vessel.

80 4. The method of circulating oil with a refrigerating medium in a flooded type system of refrigeration including delivering the oil and refrigerating medium to a primary evaporating zone in liquid form from a point of liquefaction of the refrigerating medium, maintaining a substantially uniform level of the mixed liquids in the primary evaporating zone to maintain a vapor space above the mixed liquids, by-passing a portion of the mixed liquids from the primary evaporating zone through a secondary zone for return to the primary zone and wherein the refrigerant is subjected to a faster rate of vaporization than in the primary zone, restricting passage of the vapors in their return to the primary zone to effect elevation of the oil into the vapor space, gravitating the oil through the vapor space to divide the separated oil from the vapors, collecting the oil, and returning the collected oil and vapors to the point of liquefaction to complete the cycle of circulation.

90 5. The method of circulating oil with a refrigerating medium in a flooded type system of refrigeration including delivering the oil and refrigerating medium to a primary evaporating zone in liquid form from a point of liquefaction of the refrigerating medium, maintaining a substantially uniform level of mixed liquids in the primary evaporating zone to maintain a vapor space above the mixed liquids, by-passing a portion of the mixed liquids from the primary evaporating zone through a secondary zone for return to the primary zone, restricting passage of the vapors returned to the primary zone for effecting elevation of the oil into the vapor space of the primary zone, gravitating the oil through the vapor space to divide the separated oil from the vapors, collecting the oil, and returning the collected oil and vapors to the point of liquefaction to complete the cycle of circulation.

105 6. The method of circulating oil with a refrigerating medium in a flooded type system of refrigeration including delivering the oil and refrigerating medium to a primary evaporating zone in liquid form from a point of liquefaction of the refrigerating medium, maintaining a substantially uniform level of the mixed liquids in the primary evaporating zone to maintain a vapor space above the mixed liquids, by-passing a portion of the mixed liquids from the primary evaporating zone through a secondary evaporating zone for return to the primary zone to effect separation of the oil from the refrigerating medium by vaporizing the refrigerant in the secondary zone, elevating the oil to the vapor space in the primary zone by the action of the vapors moving from the secondary to the primary zone, gravitating the oil through the vapor space in the primary zone to divide the separated oil from the vapors, collecting the oil, and returning the collected oil and vapors to the point of liquefaction to complete the cycle of circulation.

ALBERT J. MALLINCKRODT.