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OIL RETURN MECHANISM FOR REFRIGERATION SYSTEMS

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FIG. 1

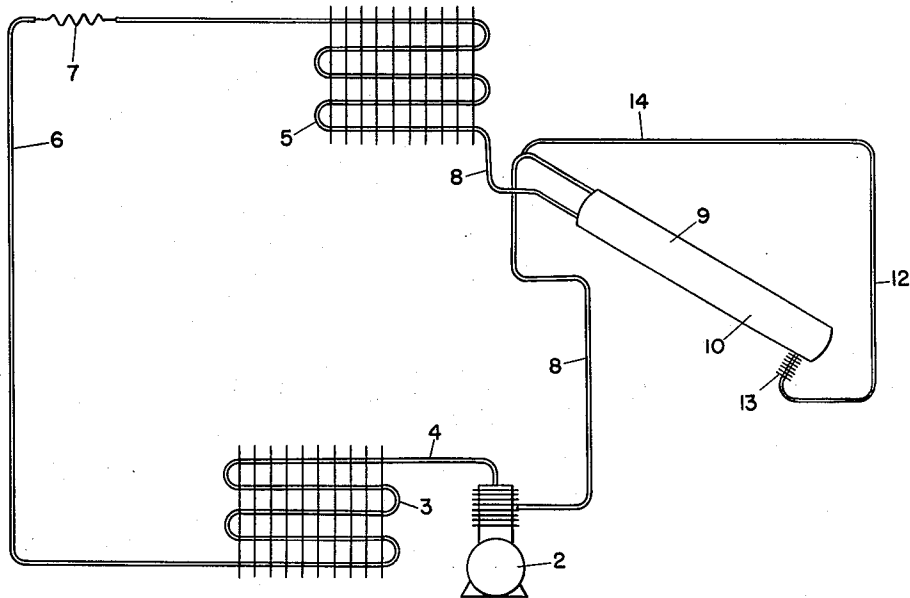
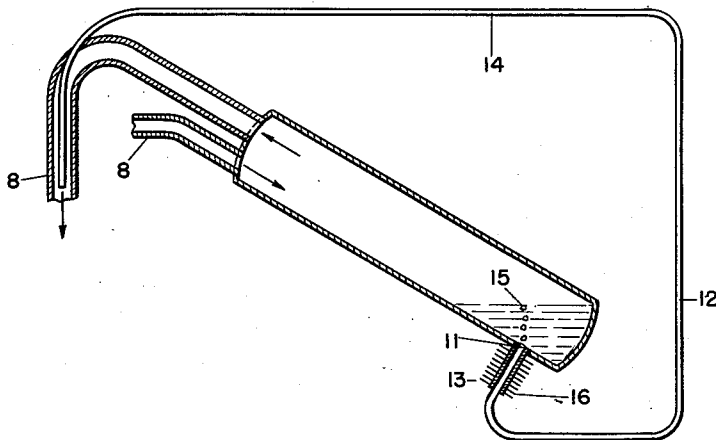


FIG. 2



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OIL RETURN MECHANISM FOR
REFRIGERATION SYSTEMS

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This invention relates to refrigeration systems and more particularly to a refrigeration system including economical and efficient means for returning oil dissolved in the refrigerant to the compressor while restricting or blocking free flow of liquid refrigerant from the evaporator to the compressor.

In the operation of the usual type refrigeration system, the compressor lubricant tends to mix with the refrigerant thru oil pumping by the compressor pistons or by direct transfer of oil foam from the compressor crankcase thru the intake ports of the compressor and from thence into the refrigerant circuit. Such lubricant in solution with the refrigerant liquid reduces the efficiency of the heat transfer surfaces and also decreases the quantity of oil lubricant in the compressor crankcase. It is necessary that some means be provided to return this lubricant to the compressor crankcase. In refrigerant systems having continuous evaporator tubing without any traps or accumulators, the lubricant is returned to the compressor with the refrigerant vapor which moves at high velocities. In a large majority of refrigerating systems, it is necessary to include a trap or accumulator as part or all of the system. In this type of system, the lubricant being non-volatile, tends to remain in the trap especially in systems where under some conditions of operation the trap is not supplied with liquid refrigerant. If no means are provided to return the contents of the trap to the crankcase of the compressor, lubrication failure of the compressor may ensue. Heretofore, means proposed to return this lubricant to the compressor were liable to return unevaporated liquid refrigerant to the crankcase of the compressor which caused damage to working parts of the compressor or impaired the lubricating qualities of the lubricant.

The chief object of the present invention is to provide means in a refrigeration system for separating oil from liquid refrigerant, returning the oil to the compressor while preventing return of liquid refrigerant.

An object of the present invention is to provide a refrigeration system including an accumulator which will serve as a reservoir for liquid refrigerant but which will not accumulate oil. A further object is to provide a refrigeration system in which an accumulator is connected to the suction line of the system whereby passage of gaseous fluid in the suction line reduces oil collected in the accumulator to return to the compressor, the connection being so designed that

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free flow of liquid refrigerant therein is restricted by vaporization thereof, the bubbles serving to block the outlet of the accumulator preventing or retarding free flow of refrigerant therethrough. Other objects of my invention will be readily perceived from the following description.

This invention relates to a refrigeration system including a compressor, a condenser, an expansion device and an evaporator connected by the suction line to the compressor. An accumulator is disposed in the suction line but serves as a reservoir for liquid refrigerant. Oil also collects to some extent in the accumulator. The bottom of the accumulator is connected to the suction line by a conduit of small diameter. The outlet in the accumulator is also of small diameter. At least a portion of the conduit extends downward below the accumulator and such downward extension portion is exposed to ambient atmosphere whereby its temperature is higher than the temperature in the accumulator. Passage of gaseous refrigerant in the suction line induces oil collected in the accumulator through the conduit and returns the oil to the compressor. However, if no oil is present in the accumulator, liquid refrigerant may attempt to return to the compressor which would be undesirable. Since the downward portion of the conduit is at a higher temperature than the accumulator, some portion of the refrigerant entering the conduit is vaporized, the bubbles of gaseous refrigerant rising in the conduit to restrict free flow of liquid refrigerant therein and serves to block free flow of liquid refrigerant into the conduit.

The attached drawing illustrates a preferred embodiment of my invention, in which

Figure 1 is a diagrammatic view of a refrigeration system including the present invention; and

Figure 2 is an exaggerated sectional view disclosing the construction of the accumulator and connecting conduit.

Referring to the drawing, there is shown a refrigeration system including a compressor 2 connected to condenser 3 by discharge line 4. Condenser 3 is connected to an evaporator 5 by liquid line 6. A suitable expansion device 7 such as a capillary tube or a thermal expansion valve is disposed in line 6 to regulate the refrigerant flowing to the evaporator 5. A suction line 8 connects the evaporator 5 and compressor 2. An accumulator 9 is disposed in the suction line 8 and acts as a reservoir for liquid refrigerant preventing such refrigerant flooding into the

compressor and also serves to collect oil passing through the refrigeration system. The accumulator 9 is inclined downward to some extent to assure that liquid therein collects in a pool at one end 10; the suction line connections are made to the raised end of the accumulator.

At end 10 of accumulator 9, an outlet 11 of small diameter is provided connected to a conduit 12. Conduit 12 includes a downward extending portion 13 and a second portion 14 which connects, as shown in Figure 2, with suction line 8. The passage of gaseous refrigerant through the suction line serves to induce oil collected in the accumulator to enter the suction line and to return such oil together with gaseous refrigerant to the compressor.

When all oil collected in the accumulator 9 has been withdrawn it will be appreciated any liquid refrigerant collected therein will attempt to pass through the conduit 12, induced by the passage of gaseous refrigerant in suction line 8. Conduit 12 is exposed to ambient atmosphere so that the temperature thereof is higher than the temperature in accumulator 9. The outlet 11 being of small diameter it will be appreciated any liquid refrigerant passing therethrough flashes to some extent. The heat transferred to the conduit portion 13 from the ambient atmosphere and outlet 11 cooperate to vaporize or produce a small series of bubbles 15 which serve to restrict free flow of liquid refrigerant in the conduit. Such bubbles 15 rise upward in the conduit portion 13 and aid in blocking outlet 11 to prevent to some extent passage of liquid refrigerant therethrough. Any refrigerant able to seep through the barriers so provided is in gaseous form when it is drawn into the suction line 8 since portion 14 of conduit 12 is also exposed to the ambient atmosphere.

If it be desired to increase the formation of bubbles 15 at the accumulator outlet 11, fins 16 or similar heat concentrating means may be disposed about conduit portion 13. Any suitable means of increasing the temperature of such conduit portion may be utilized.

It will be understood the invention so disclosed is also applicable to a refrigeration system employing a flooded type evaporator in which the accumulator is integral with the evaporator.

My invention provides a simple and economical means of assuring that oil carried through the refrigeration system is returned to the compressor. In addition, such means prevents liquid refrigerant being drawn into the compressor from the accumulator which may result in seri-

ous damage to the compressor. The invention is particularly adapted for small refrigeration systems such as those employed in small self-contained air conditioning units, domestic refrigerators, freezers, etc.

While I have described a preferred embodiment of my invention it will be understood the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In a refrigeration system, the combination of a compressor, a condenser, an expansion device and an evaporator, a suction line connecting the evaporator and the compressor, an accumulator adapted to receive oil and refrigerant from the evaporator, and means for returning oil collected in the accumulator, said means including an outlet in the accumulator of relatively small diameter, and a conduit of relatively small diameter connecting the outlet to the suction line, said conduit having a portion extending downward from the accumulator and exposed to ambient atmosphere to cause liquid refrigerant to vaporize therein, the vaporized refrigerant flowing upward to restrict the accumulator outlet, oil returning from the accumulator through the conduit to the suction line, the outlet and the conduit being so constructed and arranged that liquid refrigerant in the downward extending portion of the conduit is vaporized producing a series of bubbles which flow upward into the accumulator to restrict the outlet thereby blocking free flow of liquid refrigerant through the outlet, and means to increase the temperature of the downward portion of the conduit.

2. A refrigeration system according to claim 1 in which the temperature increasing means comprise metal fins disposed about the exterior of the downward extending conduit portion.

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