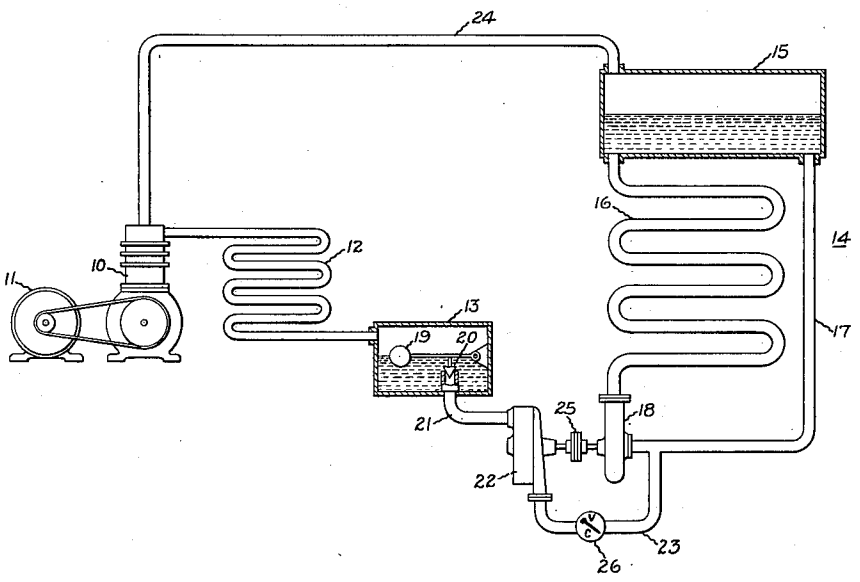
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REFRIGERATING MACHINE

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REFRIGERATING MACHINE

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6 Claims. (Cl. 62—115)

My invention relates to refrigerating machines and particularly to refrigerating machines utilizing evaporators of the flooded type.

In refrigerating machines utilizing evaporators of the flooded type, it is desirable to provide some means for inducing a rapid circulation of the liquid refrigerant in the evaporator Flooded evaporators commonly comprise a header and one or more depending refrigerant circulating conduits so arranged that liquid refrigerant may circulate from the header through the conduits and back to the header, any gaseous refrigerant formed by vaporization of the liquid being carried to the header where it collects and may be removed easily. If the circulation of refrigerant is not sufficiently rapid the liquid refrigerant may be superheated in parts of the circulating conduits and produce bumpy operation of the evaporator due to the sudden boiling or flashing of the superheated refrigerant. Such operation of the evaporator produces a violent agitation of the liquid refrigerant in the header which is undesirable as it may cause slugs of liquid refrigerant to be drawn into the suction line. Accordingly, it is an object of my invention to provide a refrigerating system including an evaporator of the flooded type and an improved arrangement for producing a rapid circulation of liquid refrigerant in the passages of the evaporator.

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, the single figure of which illustrates diagrammatically a refrigerating system embodying my invention.

Referring now to the drawing, I have shown a refrigerating system comprising a refrigerant compressor 10 driven by a motor 11, a condenser 12, a liquid receiver 13 and an evaporator 14. The evaporator 14 comprises a header 15 and a depending refrigerant circulating conduit including a main cooling portion 16 of sinuous form and a refrigerant return portion 17. The portions 16 and 17 communicate with each other at the bottom of the evaporator through a casing 18. During the operation of the refrigerating machine, refrigerant is compressed by the compressor 10 and discharged into the condenser 12 where it is cooled and liquefied, the liquid refrigerant collecting in the liquid receiver or float chamber 13. When a predetermined quantity of liquid refrigerant has collected in the chamber 13, a float 19 therein rises and lifts a valve 20 to permit liquid refrigerant to flow through a connection 21, a casing 22 and a connection 23 to the lower end of the evaporator conduit 17. Refrigerant circulating within the evaporator 14 is vaporized by the absorption of heat from the air or other medium surrounding the evaporator. The vaporized refrigerant collects within the header 15 and is withdrawn therefrom through a suction line or conduit 24 and returned to the compressor. Sufficient liquid refrigerant is supplied to the evaporator 14 to maintain the header 15 about half filled with liquid refrigerant as shown. Since the section 16 of the refrigerant circulating conduit has a considerably larger area than the section 17, more refrigerant is vaporized therein and there is a tendency for the refrigerant gas to produce a circulation of liquid refrigerant from the header downwardly through the section 17 and upwardly through the section 16. It is desirable, however, to obtain a more rapid circulation and I, therefore, provide a rotary liquid pump within the casing 18 arranged to pump refrigerant from the header through the conduit 17 and back to the header through the sinuous conduit 16. The refrigerant entering the evaporator through the connection 23 also passes through the pump with the liquid refrigerant from the evaporator section 17 and any gaseous refrigerant thereby admitted is utilized to assist the pump in lifting the column of liquid within the section 16. In order to drive the pump, I provide a fluid motor or engine within the casing 22. This motor is driven by the refrigerant flowing from the connection 21 through the casing 22, it being apparent that when the valve 20 is raised to admit liquid refrigerant to the connection 21, some of the refrigerant is immediately vaporized because of the reduction of pressure, the valve 20 separating the high and low pressure sides of the system. Further refrigerant is vaporized and expanded in driving the fluid motor. The fluid motor is connected to the pump through a coupling 25 and during the operation of the refrigerating machine, the motor within the casing 22 is driven whenever refrigerant is admitted to the evaporator and a rapid circulation of refrigerant in the conduits 16 and 17 depending from the header is produced. In order to prevent any reversal of flow of refrigerant through the connection 23 and back to the motor through

the discharge side thereof, I provide a check valve 26.

During the operation of the refrigerating system illustrated, the compressor 10 is operated whenever there is a demand for cooling, any of the well-known types of controls being suitable for this purpose, it being common practice to start and stop the compressor motor in response to the temperature of the evaporator or of the medium to be cooled thereby. Whenever the compressor is started, liquid refrigerant is supplied to the float valve chamber 13 and when a predetermined amount has collected, liquid refrigerant flows into the connection 21 and enters the casing 22 where it drives the fluid motor and is further expanded, the remaining portion of liquid and gaseous refrigerant flowing through the connection 23 to the evaporator. Operation of the motor within the casing 22 drives the pump within the casing 18 and produces a rapid circulation of liquid refrigerant from the header through the conduit 17 and thence back to the header through the motor casing and the conduit 16. Any vaporized refrigerant admitted to the evaporator through the connection 23 will flow into the pump inlet and thence to the conduit 16 where it assists the upward flow of refrigerant. The liquid refrigerant in the evaporator is vaporized by the absorption of heat from the surrounding medium and the vaporized refrigerant collects in the header 15 from which it is withdrawn through the suction line and returned to the compressor.

It is readily apparent from the foregoing that I have provided a simple and effective arrangement for increasing the circulation and recirculation of liquid refrigerant within an evaporator of the flooded type and that this arrangement is simple and effective in operation.

While I have described a particular embodiment of my invention, 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 accompanying 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 refrigerating system including means for supplying compressed refrigerant, an evaporator of the flooded type having a header and a depending refrigerant circulating conduit communicating with said header, means including a pump for circulating liquid refrigerant through said conduit, means including a fluid motor for expanding said compressed refrigerant and for driving said pump, means for supplying to said evaporator refrigerant expanded in said motor, and means for withdrawing gaseous refrigerant from said header.

2. A refrigerating system including means for supplying compressed refrigerant, an evaporator of the flooded type having a header and a depending refrigerant circulating conduit communicating with said header, a pump, means for supplying to said pump liquid refrigerant from said header, means including a fluid motor for expanding said compressed refrigerant and for driving said pump, said pump being arranged to discharge liquid refrigerant into said depending conduit to produce a circulation of refrigerant therein, means for supplying to said evaporator refrigerant discharged from said motor, and means for withdrawing gaseous refrigerant from said header.

3. A refrigerating system including means for supplying compressed refrigerant, an evaporator of the flooded type including a header and a refrigerant circulating conduit communicating at both ends with said header, a fluid pump arranged to circulate refrigerant in said conduit, means for expanding said compressed refrigerant and for discharging the expanded refrigerant into said evaporator, means utilizing the expansion of said refrigerant for driving said pump, and means for withdrawing gaseous refrigerant from said header.

4. A refrigerating system including a flooded evaporator having a header and a depending refrigerant circulating conduit, means including a pump and another conduit communicating with said header for removing liquid refrigerant from said header and for circulating refrigerant through said circulating conduit into said header, means for supplying liquid refrigerant under pressure, means including a motor driven by the expansion of liquid refrigerant supplied by said last mentioned means for driving said pump, and means for conveying refrigerant from said motor to the inlet side of said pump.

5. A refrigerating system including means for supplying compressed refrigerant, an evaporator of the flooded type having a header and a depending refrigerant circulating conduit communicating at both ends with said header, means including a pump for circulating liquid, means for conveying refrigerant from said supplying means to said evaporator, means arranged in said conveying means and utilizing the expansion of refrigerant therein for driving said pump, means for preventing a reversal of the flow of refrigerant through said conveying means, and means for withdrawing gaseous refrigerant from said header.

6. A refrigerating system including means for supplying liquefied refrigerant, a chamber for collecting liquid refrigerant, an evaporator of the flooded type having a header and a depending refrigerant circulating conduit communicating with said header, means including a pump for circulating liquid refrigerant through said conduit, means for conveying refrigerant from said collecting means to said evaporator, means for controlling the discharge of refrigerant from said collecting means to said conveying means, means arranged in said conveying means and utilizing the expansion of refrigerant therein for driving said pump, and means for withdrawing gaseous refrigerant from said header.

MANUEL G. ROBINSON.