

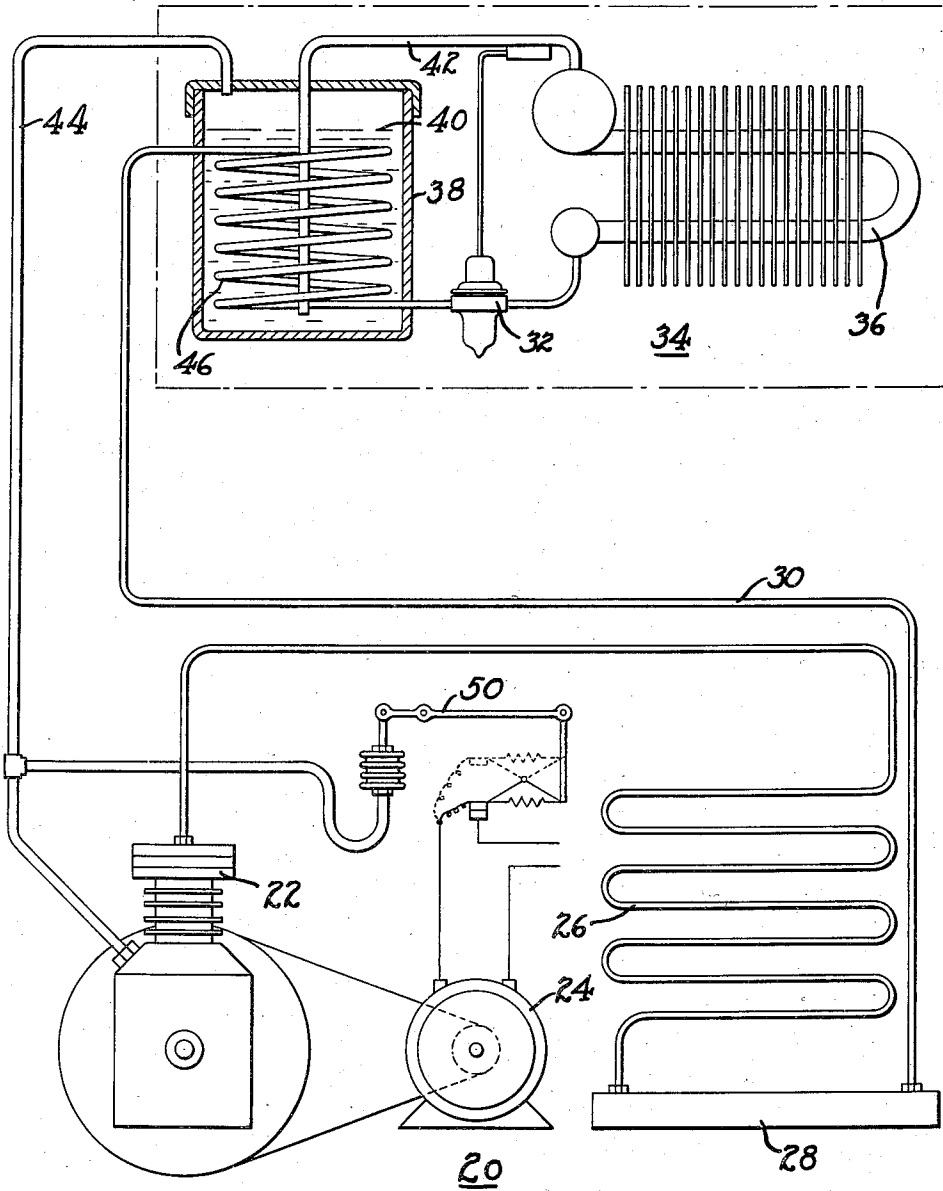
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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS

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2 Claims. (Cl. 62—115)

This invention relates to refrigerating apparatus and more particularly to heat interchangers therefor.

Recently more extensive use has been made of heat interchangers for refrigerating systems wherein the heat present in the liquid being supplied to the evaporating means is transferred to and absorbed by the cold vapor which is discharged from the evaporating means and is returned to the compressor or liquefying means. In these heat interchangers the liquid contacts one side of a metal wall while the cold gas contacts the other side. This on its face would seem to provide good heat transfer between the warm liquid refrigerant and the cold evaporated refrigerant but unless a very great amount of metal surface is extended into the path of the cold gas, the gas does not absorb a substantial amount of its capacity for absorbing heat from the liquid since there is not sufficient intimate contact of the gas with the metal wall.

It is an object of my invention to provide a refrigerating system with an improved heat exchange device in which substantially the entire heat absorbing capacity of the evaporated refrigerant is employed to absorb the heat of the warm liquid refrigerant.

It is another object of my invention to provide an improved heat exchange device for a refrigerating system wherein the cold evaporated refrigerant is brought into intimate contact with a heat conductor in heat exchange relation with the liquid refrigerant.

It is a further object of my invention to provide a heat interchanger for a refrigerating system wherein the cold evaporated refrigerant is bubbled through a liquid which transfers the heat from the liquid refrigerant to the cold evaporated refrigerant.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

The figure is a diagrammatic representation of a refrigerating system embodying my invention.

In the form of my invention disclosed herein, a refrigerant liquefying apparatus is provided which supplies liquid refrigerant to an evaporating means which evaporates the liquid refrigerant and forms a cold gas which is bubbled through a heat exchange liquid on its return to the liquefying means. This heat exchange liquid is in contact with the conduit through which the

liquid refrigerant extends in conducting the liquid refrigerant from the liquefying means to the evaporating means. The heat transfer liquid conducts the heat from the warm liquid refrigerant to the cold gaseous refrigerant which absorbs the heat when it is bubbled through the heat transfer liquid.

Referring now to the drawing, there is shown a refrigerant liquefying apparatus generally designated by the reference character 20 which includes a compressor 22 driven by an electric motor 24 for compressing the refrigerant and for forwarding the compressed refrigerant to a condenser 26 where the compressed refrigerant is liquefied and collected in a receiver 28. From the receiver 28 the warm liquid refrigerant is conducted through a supply conduit 30 to a thermostatic expansion valve 32 located within an insulated compartment 34. The thermostatic expansion valve 32 controls the flow of liquid refrigerant to a refrigerant evaporating means 36 also located within the compartment 34. The liquid refrigerant evaporates within the evaporating means 36 under reduced pressure and absorbs heat from the compartment 34.

The evaporated refrigerant is approximately the evaporator temperature when it leaves the evaporator. In its return to the compressor it normally becomes heated by the surrounding air and by the compressor itself so that its capacity for absorbing heat is thereby wasted to a considerable extent. However, if this capacity for absorbing heat is used in cooling the warm liquid refrigerant which is supplied to the evaporating means, the efficiency of the system would be increased since less refrigerant would be required to be evaporated in order to reduce the temperature of the liquid refrigerant to the temperature of the evaporating means 36. Heretofore it has been customary when desired to secure greater efficiency to provide a heat exchange member having a common wall which is contacted on one side by the liquid refrigerant and by the cold gaseous refrigerant on the other side. This would cause the temperature of the liquid refrigerant to be reduced by the amount of heat which was withdrawn through the metal dividing wall by the cold evaporated refrigerant. Such heat exchangers recovered some of the capacity for absorbing heat of the cold evaporated refrigerant but inasmuch as the cold evaporated refrigerant did not come into intimate contact with the liquid refrigerant or in intimate contact with the metal wall separating the liquid and gaseous refrigerant, a considerable portion of the heat absorbing ca-

capacity of the cold evaporated refrigerant was not used.

I, by my invention have improved this heat transfer and use substantially the entire heat absorbing capacity of the cold evaporated refrigerant. In order to do this, I provide a metal container 38 within the insulated compartment 34 which contains a heat transfer liquid 40 preferably having a high capacity for transferring heat such as mercury which is immiscible with the refrigerant in the system. Instead of mercury, other liquids such as the same oil which is used to lubricate the compressor may be used as the heat transfer liquid. The cold evaporated refrigerant is conducted by the conduit 42 to the lower portion of the container 38. The cold evaporated refrigerant bubbles through this heat transfer liquid and collects in the top of the container 38 above the liquid level. A second return conduit 44 connects to the top of the container 38 for returning the evaporated refrigerant which collects in the top of the container to the compressor 22. The supply conduit 36 extends through the container 38 and has a coiled portion 46 submerged within the heat transfer liquid.

The heat from the liquid refrigerant thus passes through the walls of the coiled portion of the supply conduit and then transfers the heat to the heat transfer liquid 40 which in turn transfers the heat to the cold evaporated refrigerant which bubbles through the heat transfer liquid 40. The size of the bubbles may be controlled by the size of the outlet of the conduit 42 within the container 38 and preferably a plurality of small outlets may be provided for the conduit 42 in the lower portion of the container 38 in order to provide very intimate contact between the gas and the liquid. Should any lubricant collect upon the surface of the heat transfer liquid, it will be returned to the compressor by the evaporated refrigerant which will bubble through the layer of lubricant and pick up some of the oil.

The operation of the system may be controlled by any suitable means such as by the temperature of the evaporating means 36, by the temperature of the compartment 34, or as shown by the pressure within the return conduit 44. In the control as shown there is provided a pressure operated snap acting means 50 which is connected and operated by the pressure in the return conduit 44 for controlling the supply of electric energy to the electric motor 24.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating apparatus comprising, a

cooling element, a circulating unit and a plurality of conduits connecting same together to form a closed system, a working fluid within said closed system and adapted to be circulated there-through by said circulating unit through one of said conduits to said cooling element and from said cooling element to said circulating unit through the other of said conduits, said closed system including a heat exchanger comprising a receptacle containing a heat transfer fluid, a portion of said conduit which conveys working fluid from said circulating unit to said cooling element extending in heat exchange relation with said heat transfer fluid in said heat exchanger, and said conduit which conveys working fluid from said cooling element to said circulating unit being arranged to cause the working fluid to bubble directly through the heat transfer fluid within the receptacle during its return flow to said circulating means, said heat transfer fluid being inert with respect to said working fluid whereby the heat transfer fluid is retained in the receptacle while said circulating unit is circulating the working fluid therethrough.

2. A refrigerating apparatus comprising, a cooling element, a refrigerant compressing and circulating unit, a condenser and a plurality of conduits connecting same together to form a closed system, a refrigerant medium within said closed system adapted to be circulated there-through by said compressing and circulating unit through one of said conduits to said cooling element and from said cooling element to said compressing and circulating unit through another of said conduits, means interposed in said one of said conduits between said condenser and said cooling element for controlling the flow of the circulated refrigerating medium to the cooling element, said closed system also including a heat exchanger separate from said cooling element and comprising a receptacle containing a heat transfer fluid, the receptacle of said heat exchanger being in intimate heat transfer relation with that portion of said another of said conduits extending between said condenser and said refrigerant flow control means, and said one of said conduits which conveys the refrigerant medium from said cooling element to said compressing and circulating unit being arranged to cause the refrigerating medium to bubble directly through the heat transfer fluid within the receptacle during its return flow to said compressing and circulating unit, said heat transfer fluid being inert with respect to said refrigerating medium whereby the heat transfer fluid is retained in the receptacle while said compressing and circulating unit is circulating refrigerant therethrough.

VICTOR W. SMITH.