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REFRIGERATING APPARATUS WITH DEFROSTING MEANS

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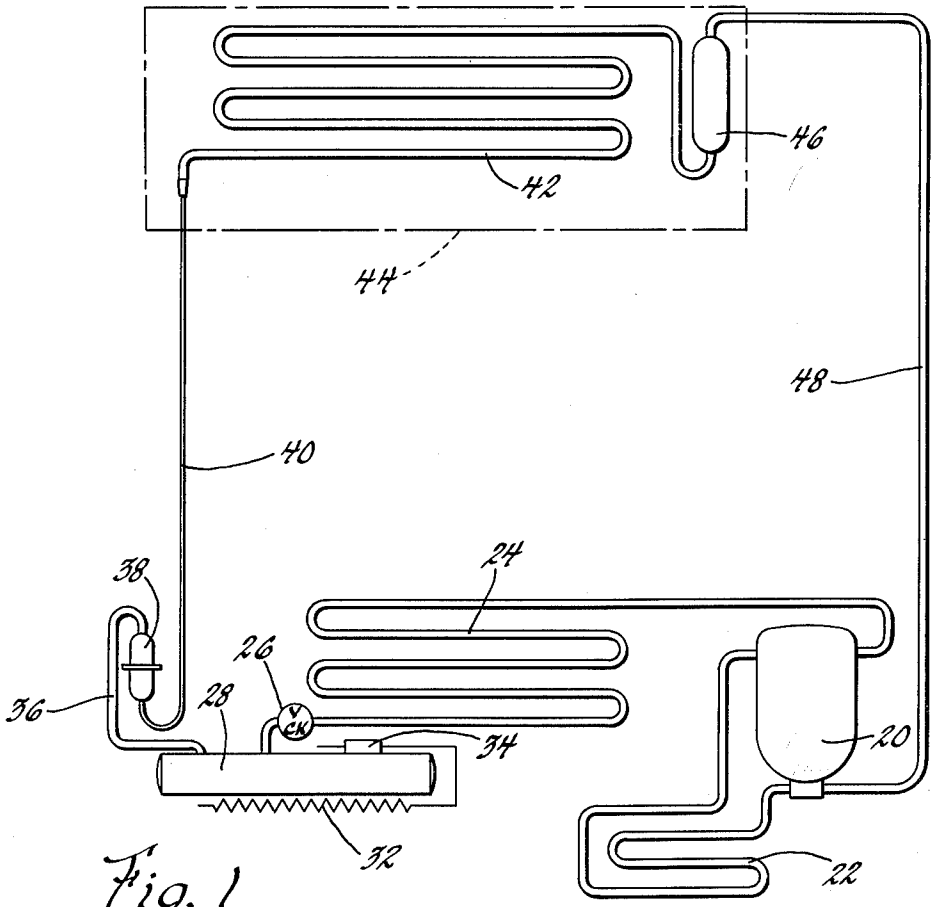


Fig. 1

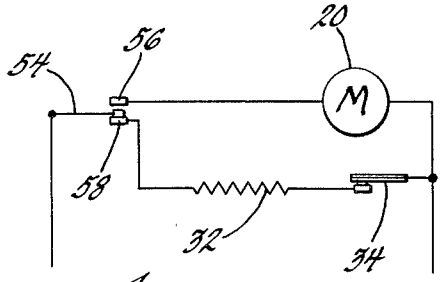


Fig. 3

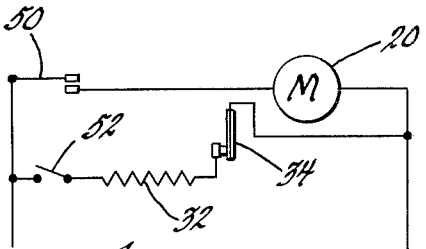


Fig. 2

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REFRIGERATING APPARATUS WITH DEFROSTING MEANS

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This invention pertains to refrigerating apparatus and more particularly to means for defrosting refrigerant evaporators.

Many ways of defrosting evaporators are known. In some, through the provision of suitable valves, hot gas is forced by the compressor through the evaporator. The use of such valves, however, is often objectionable.

In others, the cold refrigerant in or associated with the evaporator is heated to accomplish defrosting. In this latter type, much refrigeration and heat is wasted by heating the cold liquid.

It is an object of this invention to provide an arrangement wherein the relatively warm liquid at the outlet of the condenser can be used to defrost the evaporator.

It is another object of this invention to provide an arrangement wherein the heating of the relatively warm liquid at the outlet of the evaporator will force delivery to the evaporator of warm gas formed by the evaporation of the liquid to defrost the evaporator.

These and other objects are attained in the forms shown in the drawing in which a check valve is placed at the outlet of the condenser between the condenser and a receiver. An electric heater associated with the receiver is energized by suitable switch to further heat and evaporate the liquid in the receiver and to drive the evaporated liquid up through the capillary tube restrictor into the evaporator for defrosting the evaporator.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a diagrammatic view of refrigerating system embodying one form of my invention;

FIGURE 2 is one form of wiring diagram for controlling the system shown in FIGURE 1; and

FIGURE 3 is another form of wiring diagram for controlling the system shown in FIGURE 1.

Referring to FIGURE 1, there is shown a sealed motor-compressor unit **20** which first delivers compressed refrigerant to a superheat-removing coil **22** which returns the cooled refrigerant back to the sealed unit **20**. From the sealed unit **20** the refrigerant then is forced into the condenser **24**. At the outlet of the condenser **24**, there is provided a check valve **26** which drains into the receiver **28**. The receiver **28** is arranged to be heated by an electric heater **32** which is located in heat transfer relation with it. This electric heater, if desired, may extend inside the receiver **28** in contact with the liquid or it may be mounted upon and bonded to the outside of the receiver **28** in any suitable way so as to effectuate good heat transfer therewith. The electric heater **32** may be connected directly in series with a thermostat switch **34** which at times may open to prevent overheating of the receiver **28**.

The top of the receiver **28** is connected to a supply conduit **36** extending to a filter drier member **38**, in turn connecting through a capillary restrictor supply tube **40**, with the evaporator **42** located within the compartment **44** to be cooled. The outlet of the evaporator **42** connects with a liquid trap **46**, the top of which connects to the suction line **48** extending to the inlet of the sealed motor-compressor unit **20**.

According to my invention, whenever it is desired to defrost the evaporator **42**, the sealed motor-compressor unit is stopped and the electric heater **32** is energized. This heats and evaporates the warm liquid refrigerant within the receiver **28** which is relatively warm at all times. This heating of the refrigerant causes gas to form under pressure in the top of the receiver which is forced through the capillary restrictor to the evaporator. The gas is prevented from going to the condenser by the closing of the check valve **26**. The rise in pressure in the receiver forces the warm gas which has been raised in temperature by the heater **32** up through the supply conduit **36**, the filter drier unit **38** and the capillary tube **40** into the evaporator **42**, thereby warming the evaporator **42** and melting the frost therefrom. An excess liquid passing into the evaporator **42** or forced out of the evaporator **42** will be collected and held in the liquid trap **46**.

The defrosting may be controlled by either of the systems shown in FIGURE 2 or FIGURE 3. In FIGURE 2, a switch, such as a thermostatic control switch **50**, is connected directly in series with the electric compressor motor **20**. To defrost the system, the switch **50** is opened and a switch **52** in series with the heater **32** is closed so that the heater **32** is energized. The energization of the heater **32** by the closing of the switch **52** effects the defrosting of the evaporator **42** as previously mentioned. At the termination of the defrosing of the evaporator **42**, the switch **52** is opened and the switch **50** is closed to re-energize the sealed motor-compressor unit to draw evaporated refrigerant from the liquid trap **46** at the outlet of the evaporator **42** to begin the evaporation within the room to be cooled, designated by reference character **44**. After the refrigerant is drawn from the liquid trap **46**, additional refrigerant will be evaporated from the evaporator **42** at lower temperatures so as to resume cooling of the space **44**.

In FIGURE 3, a double throw switch **54** is provided which normally engages the contact **56** to operate the sealed motor-compressor unit **20** to provide normal refrigeration. To accomplish defrosting, the double throw switch **54** is moved into contact with the contact **58** which connects to the defrost heater **32**. The energization of the defrost heater **32** accomplishes defrosting of the evaporator **42** as previously explained. Should the receiver **28** rise too high in temperature, the thermostatic switch **34** which is in heat transfer relation with the top of the receiver will open for a sufficient period of time to prevent overheating of the receiver after which it will automatically reclose.

Since the liquid which comes out of the condenser **24** is cooled by environmental air, the temperature of this environmental air will vary from about 70° to 110° F. normally. Therefore, the temperature of the refrigerant within the receiver **28** also exposed to the environmental air will not be any lower than this. Therefore, this is warm enough to help accomplish the defrosting and the heater **32** is required to provide enough heat to force the refrigerant up into the evaporator **42** to accomplish defrosting. This defrosting will be accomplished rapidly and effectively and, since the motor-compressor unit is not operating, no cooling will take place during this time except as provided by the frost upon the evaporator **42**.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Refrigerating apparatus including a compressor and a condenser and a check valve and a receiver and a continuously open expansion device and an evaporating means connected in a closed refrigerant circuit arranged in series in the order named adapted to circulate a refrigerant, means for heating said receiver for forcing

warm refrigerant through said expansion device into said evaporator to heat and defrost said evaporator, and means coinciding with the heating of said receiver for preventing operation of said compressor.

2. Refrigerating apparatus including a compressor and a condenser and a check valve and a receiver and a continuously open expansion device and an evaporating means connected in a closed refrigerant circuit arranged in series in the order named adapted to circulate a refrigerant, an electric heater associated in heat transfer relation with said receiver, switch means for energizing said electric heater to heat said receiver for forcing warm refrigerant through said expansion device into said evaporator to heat and defrost said evaporator, and means coincidental to the energizing of said electric heater for preventing the operation of said compressor.

3. Refrigerating apparatus including a compressor and a condenser and a check valve and a receiver and a continuously open expansion device and an evaporating means connected in a closed refrigerant circuit in the order named adapted to circulate a refrigerant, an electric heater associated in heat transfer relation with said receiver, and switch means for energizing said electric

heater to heat said receiver for forcing warm refrigerant through said expansion device into said evaporator to heat and defrost said evaporator and thermostatic switch means in series with said heater and responsive to the temperature of said receiver for limiting the heating thereof.

4. Refrigerating apparatus including a compressor and a condenser and a check valve and a receiver and a continuously open expansion device and an evaporating means connected in a closed refrigerant circuit arranged in series in the order named adapted to circulate a refrigerant, means for heating said receiver for forcing warm refrigerant through said expansion device into said evaporator to heat and defrost said evaporator, temperature responsive means responsive to the temperature of said receiver for limiting the heating of said receiver, and means coinciding with the heating of said receiver for preventing operation of said compressor.

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