

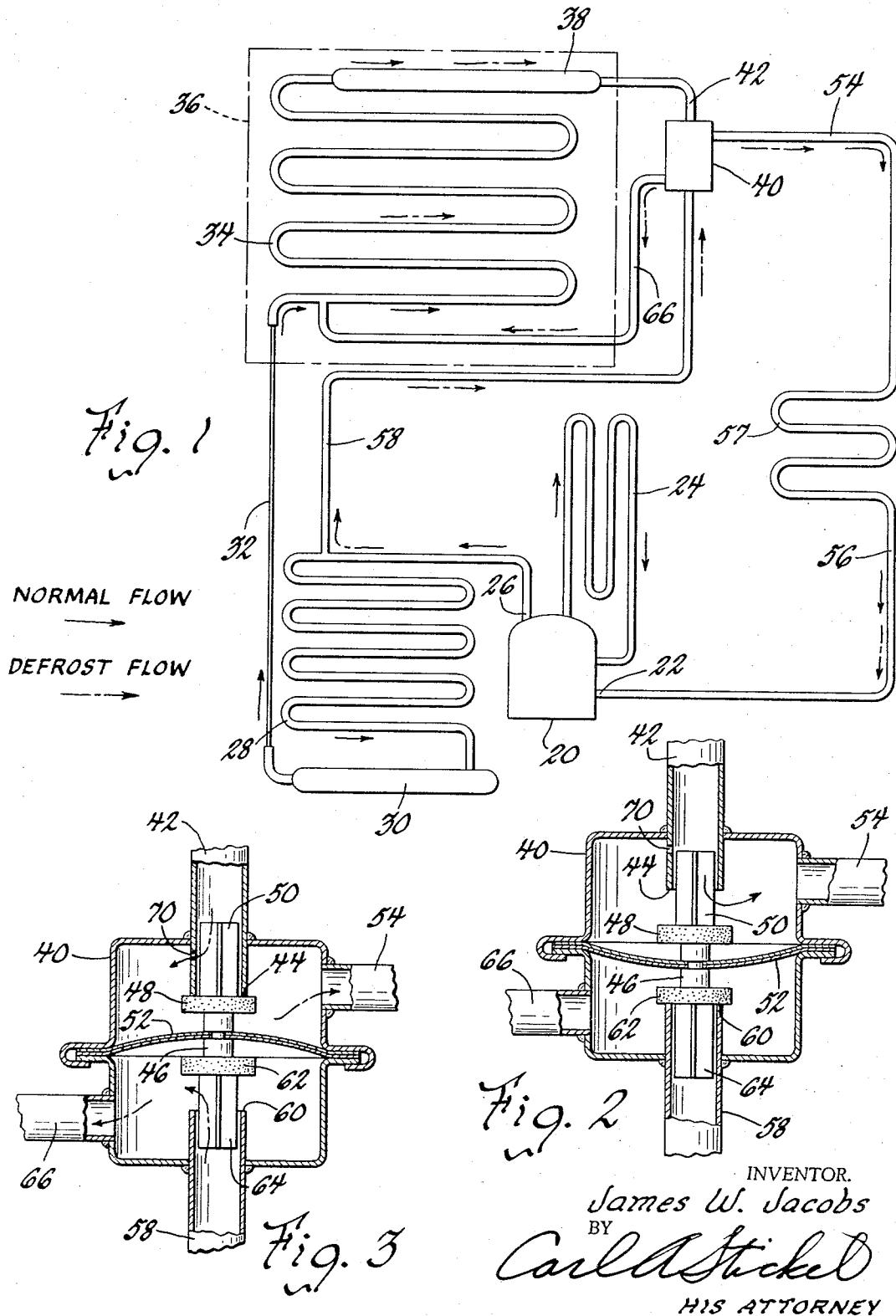
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HOT GAS DEFROSTING SYSTEM

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HOT GAS DEFROSTING SYSTEM

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ABSTRACT OF THE DISCLOSURE

A refrigeration system employing hot gas defrost means wherein the defrost means is responsive to temperature in the suction line to initiate and terminate the defrost cycle.

This invention pertains to a simple system for automatically defrosting refrigerating systems.

Many systems have been devised for automatically defrosting the evaporator of the refrigerating systems. At the present time substantially all of the systems used commercially have timing or counting devices which periodically defrost the evaporator regardless of the condition of the frost on the evaporator. Such systems may defrost more often or less often than needed according to varying conditions. This is usually wasteful.

It is an object of this invention to provide a very simple, inexpensive, reliable system which will effect the defrosting of the evaporator efficiently, rapidly and only when needed and for only as long as needed to complete the defrosting.

It is another object of this invention to provide a simple, inexpensive, reliable defrosting system which will require only a compact dual thermally operating valve means to effect and terminate the defrosting within the evaporator.

These and other objects are attained in the form shown in the drawings in which a double throw dual alternately operating valve has one entrance connected to the outlet of the evaporating means and a second entrance connected to a hot gas bypass circuit. The valve is operated by a snap acting bimetal disc which separates the flow through the two valves. When the gas flowing out of the evaporating means is warm, the snap acting bimetal disc will move the valve to close the bypass circuit and keep open the valve at the outlet of the evaporating means so that the evaporated refrigerant will flow to the entrance of the motor compressor unit in the normal manner. When the evaporating means becomes frosted and the fluid flowing out of the evaporator consequently is much colder, the bimetal disc will snap to the opposite position to substantially close the outlet of the evaporating means and open the hot gas bypass circuit for flow by passing the condenser to discharge the hot gas into the evaporating means to heat and defrost it. The closed valve at the outlet of the evaporating means is bypassed by a restrictor in the form of a small hole which makes more efficient the defrosting. When defrosting is completed the fluid flowing through the valve will heat the opposite sides of the bimetal disc sufficiently to return it to the normal operating condition.

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 illustration of a refrigerating system embodying one form of my invention;

FIGURE 2 is a sectional view through the defrost valve showing the valve in normal operating condition;

FIGURE 3 is a sectional view through the defrost valve showing the valve in the defrost position.

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Referring now to the drawings and more particularly to FIGURE 1, there is illustrated a sealed motor compressor unit 20 which may be of the type illustrated in Patent 3,016,183 issued Jan. 9, 1962. This motor compressor unit 20 draws evaporated refrigerant through its inlet 22 and first discharges the compressed refrigerant through a superheat removing coil 24 and thereafter discharges the compressed refrigerant through its outlet 26 into a condenser 28 where the compressed refrigerant condenses and is collected in the receiver 30 below. From the receiver 30 the liquid refrigerant flows through a flow control device such as a capillary restrictor tube 32 to the evaporator 34 located within the enclosure 36 containing a medium such as air to be cooled by the evaporated 34. The evaporating means includes an accumulator 38 at the outlet of the evaporator.

When the enclosure 36 contains air and moisture vapor and the evaporator 34 is operated normally at below freezing temperatures, frost will accumulate on the evaporator 34 and acts as an insulator to reduce the transmission of heat from the fluid within the compartment 36 to the refrigerant within the evaporator 34. As the frost accumulates, the efficiency becomes lower so that eventually it is necessary to defrost the evaporating means. The rate of accumulation of frost depends upon the amount of moisture within the fluid in the enclosure 36. In a household refrigerator this varies according to the amount of moisture which enters the refrigerated compartment when the door is open. Thus, this moisture will vary not only according to the length of time the door is opened, but also to the humidity condition of the air in the room at the various times when the door is opened. These humidity conditions will be influenced by the weather as well as by the amount of vapor in the room caused by various forms of food preparation.

Since the frost acts as an insulator of the evaporating means and reduces the transmission of heat to the refrigerant flowing therein, the fluid flowing out of the evaporator means will become colder and have a higher proportion of liquid content as the frost accumulates. According to my invention, I take advantage of this condition by passing the flow of refrigerant out of the evaporating means through the valve casing 40 which includes a first entrance conduit 42 extending from the outlet of the accumulator 38 into the top of the valve casing 40. This entrance conduit 42 has a valve seat 44 within the casing 40 cooperating with a double throw valve 46 having an upper face 48 cooperating with the seat 44 and having a guide means 50 extending into the entrance conduit 42. The valve casing 40 is divided by a snap acting bimetal disc 52 having its central portion connected and sealed to the valve 46 and its rim held by and sealed to the casing 40 between the seats 44 and 60. This bimetal disc 52, when the casing 40 is at its normal warm temperature, is bowed downwardly as illustrated in FIGURES 2 to keep the valve face 48 separated from the valve seat 44 to provide for flow through the outlet conduit 54 connecting with the suction conduit 56 leading to the compressor inlet 22. When the fluid flowing out of the evaporating means and the accumulator 38 becomes cold, the bimetal disc 52 will snap upwardly to move the upper face 48 of the valve 46 into contact with the seat 44 to substantially stop the flow of refrigerant except for the restricted flow through the aperture 70.

To effect defrosting of the evaporating means 34, 38, there is connected to the top of the condenser 28 a bypass conduit 58 which extends through the bottom of the casing 40 to provide a lower seat 60. The bottom face 62 of the valve 46 normally contacts the seat 60 to keep closed the bypass conduit 58. The valve 46 is provided with a downwardly extending guide 64 extending into the conduit 58. When the bimetal 52 is cooled sufficiently to

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snap to the upper position shown in FIGURE 3 the warm gas from the compressor 20 will flow through the bypass conduit 58 through the valve casing 40 to the second conduit portion 66 of the bypass circuit which connects to the bottom of the evaporator 34. This warm gas flowing through the casing 40 will heat the bimetal disc 52 to prepare it for return to the normal position. The hot gas flows through the tubing of the evaporator 34 providing internal heat which efficiently and rapidly melts the frost from the evaporator 34 and the accumulator 38. This heating is made more efficient by providing in the first entrance conduit 42 a restrictor bypass aperture 70 which bypasses the closed valve 48 by providing a restricted flow through it from the outlet of the accumulator 38 through the valve casing 40 to the outlet conduit 54 and the suction conduit 56. This provides a restricted flow which maintains a sufficiently high pressure within the evaporating means 34, 38 to quickly effect the frosting thereof. The suction conduit 56 may have a serpentine heat absorbing portion 57 to evaporate any condensed refrigerant.

After the frost has melted from the evaporating means, the gas flowing through the aperture 70 and above the bimetal disc 52 in the casing 40 will become warmer, thereby supplementing the heating of the bimetal disc 52 sufficiently to cause it to snap downwardly from its position in FIGURE 2 to the position shown in FIGURE 3 to restore the system to normal condition. If desired, the system may be cycled to control the normal temperature in the enclosure 36 by a thermostatically controlled switch such as is illustrated and applied to a refrigerating system in Patent 2,351,038 issued Jan. 13, 1944.

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

What is claimed is as follows:

1. A refrigerating system including a refrigerant circuit comprising a condenser and a flow control device and evaporating means and a motor compressor unit for circulating a refrigerant through said circuit, a bypass circuit bypassing said flow control device, closing means for normally closing said bypass circuit, said evaporating means having an outlet, and temperature means positioned within the outlet and bypass circuit and responsive to a predetermined low temperature of the refrigerant flowing out of said outlet for opening said closing means and said bypass circuit.

2. A refrigerating system as defined in claim 1 in which a normally open closing means is provided for the outlet of the evaporating means, a second bypass circuit containing a second flow control device for bypassing said normally open closing means, said temperature responsive means also having means for closing said normally open closing means.

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3. A refrigerating system as defined in claim 1 in which a normally open closing means is provided for the outlet of the evaporating means, a second bypass circuit containing a second flow control device for bypassing said normally open closing means, both of said closing means being in the form of a dual alternately opening and closing valve, said temperature responsive means being operatively connected to said valve.

4. A refrigerating system as defined in claim 1 in which said closing means comprises a valve casing containing a dual alternately opening and closing valve, said casing having a first entrance connected to the outlet of said evaporating means and a second entrance connected to said bypass circuit, said valve cooperating with said entrances to alternately open and close said entrances, said motor compressor unit having an inlet, said casing having an outlet connected to said inlet, said temperature responsive means being operatively connected to said valve.

5. A refrigerating system as defined in claim 1 in which said closing means comprises a valve casing containing a dual alternately opening and closing valve, said casing having a first entrance connected to the outlet of said evaporating means and a second entrance connected to said bypass circuit, said valve cooperating with said entrances to alternately open and close said entrances, said motor compressor unit having an inlet, said casing having an outlet connected to said inlet, said temperature responsive means being operatively connected to said valve and comprising a snap acting arrangement for controlling the operation of said valve.

6. A refrigerating system as defined in claim 1 in which said closing means comprises a valve casing containing a dual alternately opening and closing valve, said casing having a first entrance connected to the outlet of said evaporating means and a second entrance connected to said bypass circuit, said valve cooperating with said entrances to alternately open and close said entrances, said motor compressor unit having an inlet, said casing having an outlet connected to said inlet, said temperature responsive means being in the form of a snap acting bimetal means located in said casing.

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