May 14, 1929. R. W. KRITZER 1,712,568

REFRIGERATING SYSTEM

Filed Dec. 10, 1926

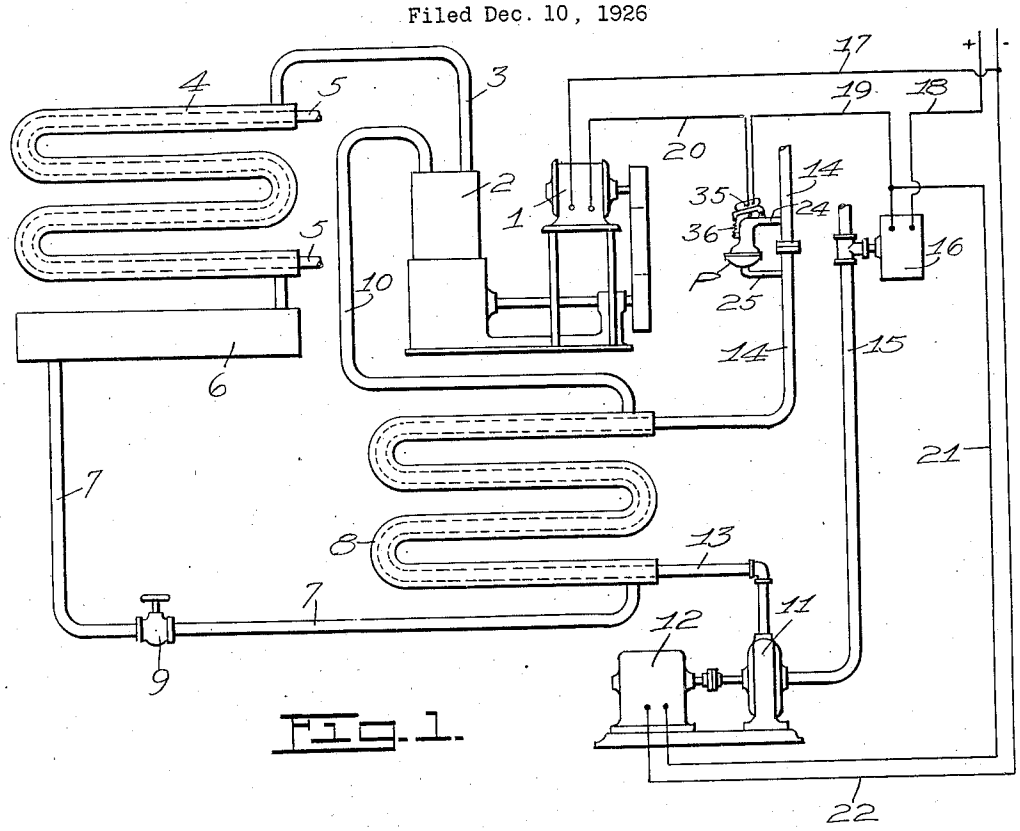


Fig. 1.

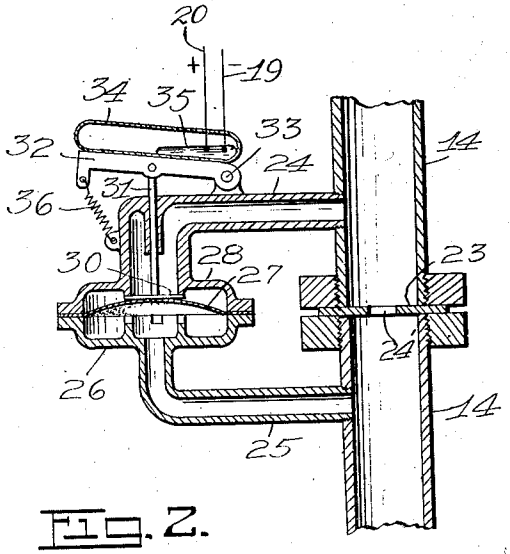


Fig. 2.

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REFRIGERATING SYSTEM.

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My invention relates to refrigerating systems, and more particularly to those systems in which the refrigerated medium is circulated, such as apartment house refrigerating systems, and it consists in the combinations, constructions, and arrangements herein described and claimed.

The operation of a refrigerating circulating system has heretofore been fraught with the danger of freezing up the coolers in which the circulated medium is refrigerated, if for any reason the rate of flow of the refrigerated medium falls below certain limits.

An object of the present invention is to provide a means whereby the refrigeration of the circulated medium is stopped whenever the rate of flow of the circulated medium decreases below normal.

A further object of the invention is to provide a system of the type described in which a decrease of temperature of the circulated medium will operate to stop the flow of the circulated medium and will also operate to stop the refrigeration or cooling of the circulated medium, thereby effecting an economy in the operation of the device and also obviating the freezing of the circulated medium inadvertently.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which

Figure 1 is a diagrammatic view of a system embodying my invention, and

Figure 2 is a sectional view through a flow rate controlled switch.

In the drawings, 1 represents a motor which drives a compressor 2. The latter is connected by a pipe 3 with a condenser 4 in which a cooling fluid, such as water, is circulated through an interior pipe 5. The condenser communicates with the receiver 6, which is connected by a pipe 7 with a cooler 8, an expansion valve 9 being interposed in the pipe line 7. A return pipe 10 completes the circuit of the compressor.

The circulated medium, which may be brine or other suitable liquid, is forced by a pump 11, driven by a motor 12, through the pipe 13, which passes through the interior of the cooler 8, and which is connected to the service pipe 14. The latter leads to the refrigerators, not shown, and the return pipe 15 conveys the circulated medium back to the pump 11.

At 16 I have shown diagrammatically a thermostatic switch which may be of any suitable type, and which, when the temperature is below certain limits, will break the circuit to the motors 1 and 12. This thermostatic switch depends for its action on the temperature of the circulated medium in the pipe 15. It will be observed that the motor 1 is connected by the wire 17 to one of the lead wires and that the thermostatic switch is in series with the flow rate operated switch denoted in general by P, this flow rate operated switch being connected with the pipe line 14. One of the lead wires is connected to one side of the thermostatic switch by the conductor 18, the other side being connected by the conductor 19 with the flow rate operated switch, while a conductor 20 connects the flow rate operated switch with the motor 1. A branch wire 21 connects with the wire 19 and leads to the motor 12. The other terminal of the motor is connected with the opposite lead wire by the conductor 22.

An example of a flow rate operated switch which may be used successfully in connection with the system is shown in Figure 2, although it will be understood that any suitable switch responsive to the flow rate of the circulated medium might be used in lieu thereof. In Figure 2 a diaphragm 23, having a restricted orifice 24′, is interposed between the two sections of the pipe line 14. A pipe 25 leads from one of the sections of the pipe 14 to a casing 26. The latter is provided with a diaphragm 27 which is held by a cover 28. A pipe 24 leads to the upper section 14 and communicates with the interior of the casing above the diaphragm. A plunger 30 has a plunger rod 31 pivotally connected with an arm 32 which is pivotally mounted at 33 and which bears a tube 34 having mercury 35 disposed therein. The terminals of the wires 20 and 19 extend within the tube so that the ends thereof are normally covered by the mercury and the wires are therefore in electrical connection. A spring 36 tends to pull the arm downwardly against the pressure of the diaphragm 27.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The relation of the orifice 24′ to the rate of flow of the cir-

culated medium is such that the pressure on the underside of the orifice plate 23 and the interior of the pipe 25 is greater than the pressure on the upper side of the plate and the interior of the pipe 24, and this differential pressure is proportional to the rate of flow of the circulated medium. Whenever the pressure on the lower face of the diaphragm 27 exceeds that of the pressure on the upper face, then the diaphragm moves upwardly and through the medium of the plunger it tilts the arm 32 so as to close the circuit through the wires 17 and 19. When, however, the rate of flow has decreased to a given amount, then the spring 36 will pull the arm 32 downwardly and will tilt the tube 34 so as to cause the mercury to break the electrical connection.

It will be seen that the circuit of the motor 1 will be broken either by a low temperature which will cause the opening of the thermostatic controlled switch 16, or by a low rate of flow, which will cause the opening of the contacts of the flow rate controlled switch, and, in either event, the compressor will cease to function. In installations of the type described, the capacity of the compressor to cool the circulated medium is designedly greater than the heat absorption of the circulated medium. Therefore, the circulated medium keeps getting colder and colder. To run the compressor after the circulated medium has reached a low point would be uneconomical and the thermostatic switch 16 therefore operates to cause the compressor to cease its operation until such time as the circulated medium shall have absorbed sufficient heat to require its operation again.

Also, when the circulation is slow, if the compressor were permitted to operate, there would be danger of freezing the circulated medium and causing the bursting of the pipes. It will be observed that when the thermostatic switch acts to break the circuit, both the motors 1 and 12 are stopped. When the flow rate operated switch is actuated, the motor 12 is not stopped, but the circulation may proceed and, when it again reaches a definite point and the flow rate has risen to a degree to close the flow rate controlled switch, then the compressor will start up again. Thus the system is rendered automatic.

I claim:

1. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, means for starting and stopping the circulation of the cooled medium, responsive to its temperature, and means controlled by the rate of flow of the circulated medium for stopping the cooling thereof.

2. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, means for starting and stopping the circulation of the cooled medium, responsive to its temperature, and means controlled by the rate of flow of the circulated medium for starting and stopping the cooling thereof.

3. In a refrigerating system using a liquid medium, means for cooling the liquid medium, means for circulating the cooled medium, means for starting and stopping the circulation of the cooled medium, responsive to its temperature, means for stopping the cooling, responsive to the temperature of the cooled medium, and means controlled by the rate of flow of the circulated medium for starting and stopping the cooling thereof.

4. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, and means controlled by the rate of flow of the circulated medium for stopping the cooling thereof.

5. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, and means controlled by the rate of flow of the circulated medium for starting and stopping the cooling thereof.

6. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, means for starting and stopping the cooling, responsive to the temperature of the cooled medium, and means controlled by the rate of flow of the circulated medium for starting and stopping the cooling thereof.

7. In a refrigerating system using a liquid medium, means for cooling the medium, means for circulating the cooled medium, means for starting and stopping the cooling responsive to the temperature of the cooled medium, said second named means being provided with a restricted orifice, and a flow rate operated switch disposed in operative relation with respect to the restricted orifice, said flow rate operated switch being controlled by the rate of flow of the circulated medium for starting and stopping the cooling thereof.

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