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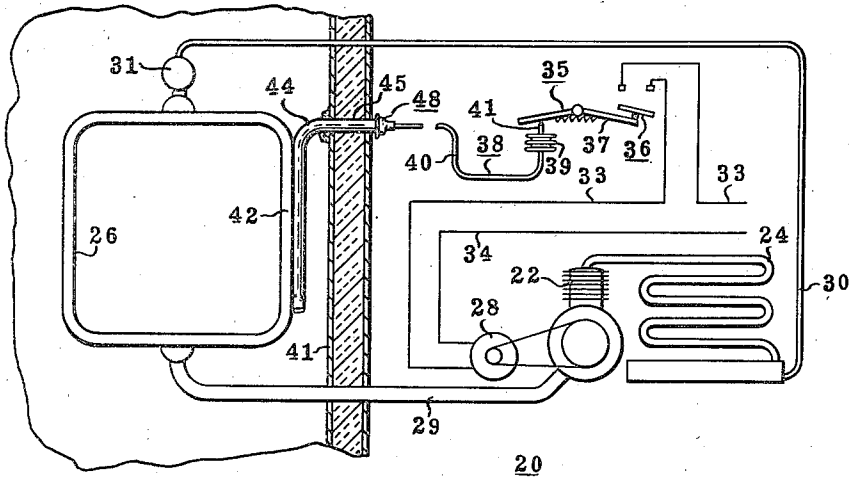


Fig 1



Fig 3

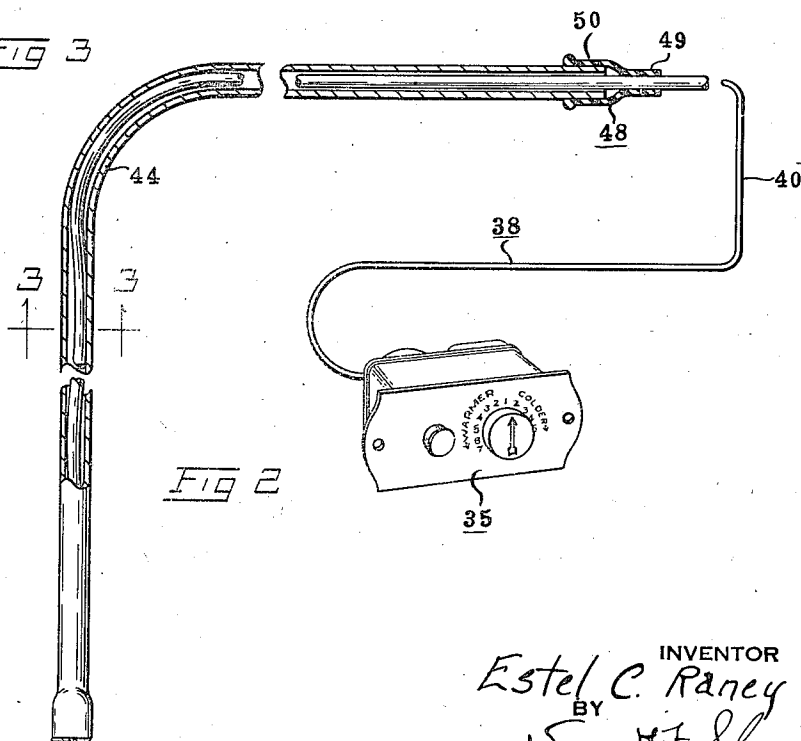


Fig 2

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CONNECTOR

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1 Claim. (Cl. 297—3)

The present invention relates to control apparatus and more particularly to a device for associating the tubular portion of a thermally responsive element of a control apparatus in heat exchange relation with a zone whose temperature is to be controlled.

An object of the present invention is to provide a tube-like heat conductor having a portion thereof fixed in heat exchange relation with a relatively inaccessible zone whose temperature is to be controlled and having an end portion of the conductor extending into a relatively accessible zone, so that a tubular portion of the thermally responsive element of a controller may be extended into the heat conductor from the accessible zone and in frictional engagement with the walls of the conductor for guiding the tubular section into heat exchange relation with the relatively inaccessible zone.

Another object of the invention is to provide a flexible seal between the conductor and thermal element for closing the conductor after the tubular portion of the thermal element has been inserted in the conductor.

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

In the drawing:

Fig. 1 is a diagrammatic view of a refrigerating system and a control therefor, the thermal element of the control being shown connected in heat exchange relation with the evaporator of the refrigerating system by my invention;

Fig. 2 is a perspective view of a control apparatus and a tubular heat conductor for receiving a portion of the thermal element of the control apparatus, the tubular heat conductor being shown partly in cross section and on a larger scale; and

Fig. 3 is a view in section taken on line 3—3 of Fig. 2, but on a larger scale.

Although the invention might be used in connection with different types of heat exchange systems, for the purpose of illustrating a preferred form of the invention I have shown a refrigerating system indicated generally at 20. The refrigerating system 20 is the well known compressor-condenser-expander type, comprising a refrigerant compressor 22, a condenser 24 and an evaporator 26 connected together in the usual manner by suitable pipes. The compressor 22 is driven by an electric motor 28 and operates to withdraw refrigerant from the evaporator 26

through a pipe 29 and directs compressed refrigerant to the condenser 24 and thence to the evaporator 26 through a pipe 30. A conventional expansion valve 31 is connected in the pipe 30 at the inlet of the evaporator for causing expansion of the refrigerant.

The motor 28 is energized by a circuit comprising wires 33 and 34 which are connected with a suitable source of current. This circuit is controlled by a control apparatus 35 comprising a thermostatically operated switch 36 which is connected in the wire 33. The thermostatically operated switch may be of any of the well known types, comprising a snap acting switch mechanism 37 that is actuated by a thermostatic element 38, which element is responsive to temperatures produced by operation of the system.

The thermostatic element 38 comprises a Siphon bellows 39 and a tube 40 which is connected at one end of the bellows and having the other end sealed. The tube 40 is preferably formed of copper and is flexible. The bellows and tube are filled with a suitable thermal responsive fluid, such as sulphur dioxide vapor, which causes the pressure within the bellows to increase and decrease with an increase and decrease in temperature of the coolest portion of the tube 40. The bellows is connected with the snap acting mechanism 37 by a rod 41 for causing the switch 36 to be opened when the temperature of the coolest portion of the tube 40 decreases to a predetermined temperature and to cause the switch to close when the temperature of the tube increases to a predetermined temperature.

Control apparatus similar to the control apparatus 35 used commonly for controlling the operation of refrigerating systems similar to the system 20 by connecting a portion of the tube 40 in heat exchange relation with the refrigerated part of the system. Often times a portion of the tube 40 is connected in intimate heat exchange relation with a portion of the evaporator by a clamp. In many instances the evaporator is located in a compartment, such as a refrigerator cabinet, in such a position that the zone, or portion of the evaporator from which the temperature is to be controlled is not accessible for connecting and disconnecting the tube 40 with the evaporator. This is particularly true when the usual screw operated clamp is used. This situation is illustrated in the drawing wherein the evaporator 26 is shown adjacent a wall 41 of a compartment. Assuming, for the purpose of illustrating one form of the invention, that it is

desirable to control the operation of the refrigerating system 20 according to the temperatures produced at a zone 42 of the evaporator adjacent the wall 41, I have shown a device for readily connecting and disconnecting a portion of the tube 40 in heat exchange relation with the zone 42, which zone is relatively inaccessible for connecting the tube 40 to the evaporator by the usual clamping device. It is to be understood, however, that the device may be used for associating the tube 40 with any desired zone of the refrigerating system.

A tube 44, preferably formed of copper, or any suitable heat conductor, is suitably attached in heat exchange relation with the evaporator at the zone 42 before the evaporator is mounted in the compartment. Preferably the tube 44 is rigid relative to the tube 40. The upper end of the tube 44 is turned outwardly and extends into an opening 45 formed through the wall 41. The lower end of the tube is sealed by pinching and soldering. When the thermal element 33 of the switch 36 is attached to the refrigerating system, the end of the tube 40 is inserted in the open end of the tube 44 from the outside of the wall 41. Since the tube 40 is flexible relative to the tube 44, the end of the tube 40 is guided downwardly along the tube 44 and alongside the zone 42 of the evaporator from which the control of the refrigerating system is to be effected. The outside diameter of the tube 40 is slightly less than the inside diameter of the tube 44 and by reason of the thrust exerted on the tube 40 when it is inserted in the tube 44, the tube 40 will frictionally engage the walls of the tube 44 and will respond readily to the temperature changes of the tube 44. For example, if the outside diameter of the tube 40 is three thirty-seconds of an inch, the inside diameter of the tube 44 should be nine sixty-fourths of an inch.

It is desirable to seal the end of the tube 44 to prevent the collection of moisture inside the tube, and for this purpose a resilient flexible sleeve 48 is provided, which sleeve may be formed of rubber, or like material, having a portion 49 with an inside diameter normally less than the outside diameter of the tube 40 and a portion 50 having an inside diameter normally less than the outside

diameter of the tube 44. Thus the portion 49 frictionally engages the tube 40 and the portion 50 frictionally engages the tube 44. When the tube 40 is to be inserted in the tube 44, the sleeve 48 is slid over the portion of the tube 40 which is to be extended into the tube 44 and when this portion is inserted in the tube 44, the portion 50 of the cap is then slipped over the end of the tube 44. Since the sleeve is resilient, the portions 49 and 50 will frictionally engage the tubes 40 and 44 for forming seals therebetween.

Obviously the tube 44 may be formed so that the end which receives the tube 40 of the thermal element 38 will extend into any desired zone that is accessible for inserting the tube 40 into the tube 44.

By my invention the thermal element of the control apparatus for the heat exchange system may be easily connected in heat exchange relation with a portion of the heat exchange system which is normally inaccessible for making such connections. This permits a serviceman to change the control apparatus without removing parts of the heat exchange system to gain access to the zone at which the tube of the thermal element is to be responsive.

While the form of embodiment of the present 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 claim which follows:

I claim:

In combination, an elongated relatively rigid tube forming a heat conductor and adapted to have a portion thereof in heat exchange relation with a zone whose temperature is to be controlled and having another portion thereof extending outwardly from said first mentioned portion at substantially right angles, a pressure responsive element, and a relatively flexible tube containing a volatile fluid connected at one end with the pressure responsive element, said flexible tube having a portion thereof inserted into said first mentioned tube and caused to be flexed during insertion by the bend in the first-mentioned tube so that the tubes will be brought into frictional engagement.

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