

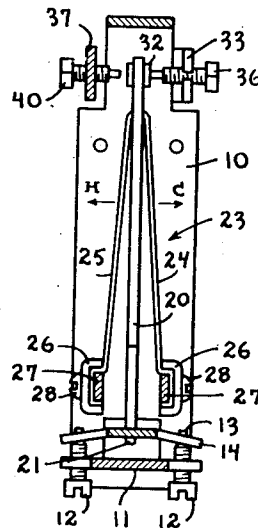
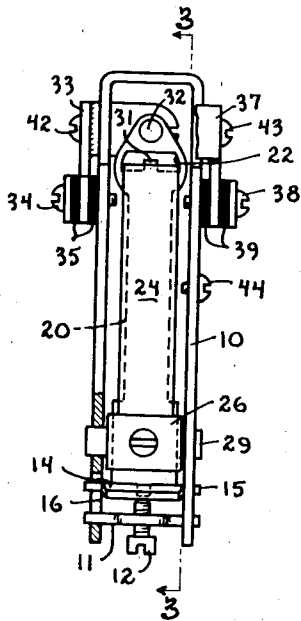
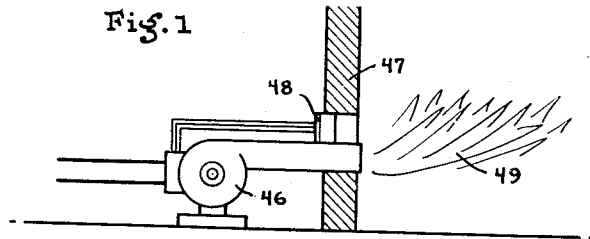
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TEMPERATURE RESPONSIVE DEVICE

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TEMPERATURE RESPONSIVE DEVICE

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11 Claims. (Cl. 200—137)

This invention relates generally to devices which are responsive to temperature changes, and more particularly to that type utilizing an expanding metal ribbon mounted under tension on a support.

The present invention is directed to the same type of device as that disclosed in the copending application of Willis H. Gille, Serial No. 401,205, filed July 5, 1941. My invention differs from that of Gille in that in Gille the two legs of the ribbon are bent inwardly by a means connecting the mid points of the two legs, so that when one leg expands relative to the other the said other tends to straighten out, whereby the connecting means moves in a direction away from the expanding leg, and actuates a switching mechanism. In the present invention the mid points of the two legs are unrestrained and hence assume straight line positions. The junction of the two legs are supported on a pivoted lever and as one leg expands relative to the other the lever is rotated to actuate a switching mechanism.

It is therefore an object of the present invention to provide a double ribbon temperature responsive device in which the support for one end of the double ribbon is movably mounted so that on a differential expansion between the two legs the mounting means will be moved to actuate a control device.

A further object is to make the movable mounting means in the form of a pivoted lever and to apply a force to this lever sufficient to maintain the two legs of the double ribbon under tension.

These and other objects will readily become apparent as the following specification is read in the light of the accompanying drawing, in which:

Figure 1 discloses an oil burner for producing combustion within a furnace and the device of the present invention mounted in the wall of the furnace for responding to combustion;

Figure 2 discloses a front elevation of the device, part of the supporting structure being shown in section for the sake of clarity, and

Figure 3 is a section taken along the line 3—3 of Figure 2 and looking in the direction of the arrows.

Referring now to Figure 2, the reference numeral 10 indicates a U-shaped supporting member having a plate 11 fixed to the open end of the U. The plate 11 adjustably carries a pair of screws 12, the stems of which are provided with reduced extensions 13. A resilient tensioning plate 14 is mounted between the legs of the U-shaped supporting member and is provided

with a pair of openings which receive the extensions 13 on the screws 12 for positioning the plate. The plate is provided with a pair of extensions 15 which are slidably received in slots 16 in each leg of the supporting member 10 for the purpose of guiding the plate 14.

A lever 20 is provided with a reduced extension 21 at its lower end which is received by a small hole located in the center of the tensioning plate 14. The shoulders formed by the extension 21 seat on the upper side of the tensioning plate 14 and support the lever 20 for pivotal movement. The lever 20 is provided with an opening 22 adjacent its upper end. A metallic ribbon indicated generally at 23 is bent into the form of a V, thereby forming two legs 24 and 25. The two ends of the ribbon are bent into channel shaped supporting members 26 and are clamped therein by means of the clamping plates 27 and screws 28. These channel members are provided with extensions 29 which extend through openings in the supporting member 10 and are fixedly supported thereby.

The metal ribbon 23 is passed through the opening 22 in the lever 20 in such a manner that the junction of the legs 24 and 25 is supported by this lever. The lever has a small projection 31 which extends through a hole in the ribbon 23 to prevent the ribbon from slipping with respect to the lever. The upper extremity of the lever 20 is provided with a movable contact 32.

A contact bracket 33 is insulatingly carried by the supporting member 10 by means of the mounting screw 34 and suitable insulating means 35. This contact bracket adjustably carries a stationary contact 36. A second contact bracket 37 is insulatingly mounted on the supporting member 10 by means of the mounting screw 38 and insulation 39. The bracket 37 adjustably carries a stationary contact screw 40. Terminal screws 42 and 43 may be applied to the contact brackets 33 and 37, respectively, for electrically connecting them to an external circuit. In addition, the terminal screw 44 may be provided for connecting the common or movable contact 32 with the external circuit.

The screws 12 are adjusted to raise the tensioning plate 14 until it exerts a sufficient upward force to place the two legs 24 and 25 of the double ribbon 23 under tension. The device is so arranged that when the two legs are at the same temperature, they will be under substantially the same tension, at which time the movable contact 32 will be in engagement with stationary contact 36.

This device was originally designed to operate as a radiant heat responsive device and as such may be mounted as indicated in Figure 1 to respond to the radiant heat of combustion. The reference numeral 46 more or less diagrammatically illustrates an oil burner mounted in a position to produce combustion within a furnace, one wall of which is indicated at 47. The device disclosed in Figures 2 and 3 may be mounted in a casing indicated at 48 and so positioned therein that the leg 24 of the double ribbon 23 will face the flame 49 produced by the oil burner. With the device so mounted, it will be seen that the leg 24 will shield the leg 25 from direct heat radiations so that leg 25 will respond only to ambient temperature and to whatever heat is conducted to it from the leg 24. The heat dissipation from the device as a whole is such that when combustion is established and the temperature of the leg 24 is raised due to radiant heat, the temperature of the leg 25 can never attain that of leg 24, there being always a certain differential between the temperatures of these two legs.

As set forth above, when the device is cold and both legs are at the same temperature the movable contact 32 will engage contact 36. When combustion is established and radiant heat strikes the leg 24, this leg will expand and the tension therein will be relieved with the result that the tension in the leg 25 will rotate lever 20 in a counterclockwise direction and separate the movable contact 32 from the stationary contact 36 and cause it to engage stationary contact 40. As long as combustion is present, the device will remain in this position regardless of the actual temperatures attained by the two legs. This is due to the fact that there will always be a temperature differential present and therefore the leg 24 will expand to a greater extent than leg 25. Any differential expansion between the legs and the supporting member 10 and the supporting lever 20 will be absorbed by the tensioning plate 14 which will flex and maintain a substantially constant force on the lever 20.

As soon as the flame in the furnace is extinguished, the two legs 24 and 25 will rapidly assume the same temperature, at which time the lever 20 will be rotated clockwise and return to the position shown in Figure 3. It will be noted that this device is compensated for changes in ambient temperature and that its operation is unaffected by expansion of the various members supporting the double ribbon. The operation of the movable contact depends solely upon the differential expansion between the two legs 24 and 25, which in turn is dependent only upon whether or not the leg 24 is absorbing radiant heat which does not reach leg 25.

This device has been described particularly as a radiant heat responsive device but it will readily be appreciated that it is not necessarily limited thereto. It has application wherever an ambient temperature compensated thermostatic switch is desired, and it will be obvious that the leg 24 may be heated in any manner such as by actually wrapping a small electric heater about the leg.

Various other changes and modifications of this invention will doubtless occur to those who are skilled in the art, and I therefore wish it to be understood that I intend to be limited only by the scope of the appended claims and not by the particular embodiment disclosed.

I claim as my invention:

1. In a device of the character described, metal ribbon temperature responsive means including two heat expansible legs, a first mounting means for one end of said legs, a second movable mounting means for the other end of said legs, means associated with one of said mounting means for tensioning said legs whereby the differential expansion between said legs causes them to move said movable mounting means when heat is applied to one of said legs, a pair of stationary contacts, and a movable contact carried by said movable mounting member between said stationary contacts, said movable contact being in engagement with one of said stationary contacts when said two legs are at the same temperature, the differential expansion between said legs when heat is applied to one of them causing them to move said movable contact out of engagement with said one and into engagement with said other stationary contact.

2. In a device of the character described, metal ribbon temperature responsive means including two heat expansible legs, a supporting member, a first mounting means for one end of said legs, a second movable mounting means for the other end of said legs, one of said mounting means bearing directly on said supporting member, a resilient tensioning plate, the other of said mounting means being connected to said tensioning plate, whereby the tensioning plate maintains said legs under tension and absorbs all differential expansion between said legs and said supporting member without materially affecting the tension in said legs.

3. In a device of the character described, metal ribbon temperature responsive means including two heat expansible legs, a supporting member, one end of said legs being connected to said supporting member, a resilient tensioning plate mounted on said supporting member, a lever pivoted on said tensioning plate and supporting the other end of said legs, said tensioning plate acting through said lever to maintain said legs under tension, and a control device actuated by said lever upon a differential expansion of said legs due to the application of heat to one of said legs.

4. In a device of the character described, metal ribbon temperature responsive means including two heat expansible legs, a supporting member, one end of said legs being connected to said supporting member, a resilient tensioning plate mounted on said supporting member, a lever pivoted on said tensioning plate and supporting the other end of said legs, said tensioning plate acting through said lever to maintain said legs under tension, a movable contact carried by the free end of said lever, stationary contact means cooperable with said movable contact, and means for adjusting said tensioning plate for varying the tension in said legs.

5. A temperature responsive device comprising in combination, a support, a resilient plate connected at each end to said support, a lever pivotally mounted at one end on an intermediate portion of said plate, said lever having an opening adjacent its other end, an expansible metal ribbon having its two ends fixed to said support and its mid portion extending through said opening to form two legs, said resilient plate exerting sufficient force on said lever to maintain the two legs of said ribbon under tension, the differential expansion between said two legs as heat is ap-

plied to one of them causing rotation of said lever, and control means actuated by said lever.

6. A temperature responsive device comprising in combination, a support, a resilient plate connected at each end to said support, a lever pivotally mounted at one end on an intermediate portion of said plate, said lever having an opening adjacent its other end, an expansible metal ribbon having its two ends fixed to said support and its mid portion extending through said opening to form two legs, said resilient plate exerting sufficient force on said lever to maintain the two legs of said ribbon under tension, the differential expansion between said two legs as heat is applied to one of them causing rotation of said lever, control means actuated by said lever, means preventing slippage between said ribbon and said lever, and means for adjusting the tensioning force exerted by said plate.

7. A temperature responsive device comprising in combination, a support, a resilient plate connected at each end to said support, a lever pivotally mounted at one end on an intermediate portion of said plate, said lever having an opening adjacent its other end, an expansible metal ribbon having its two ends fixed to said support and its mid portion extending through said opening to form two legs, said resilient plate exerting sufficient force on said lever to maintain the two legs of said ribbon under tension, the differential expansion between said two legs as heat is applied to one of them causing rotation of said lever, a movable contact carried by the free end of said lever, a first stationary contact engaged by said movable contact when both legs are at the same temperature, and a second stationary contact engaged by said movable contact when one of said legs is at a higher temperature than the other.

8. In a device of the character described, a lever, means resiliently and pivotally supporting said lever at one end, an elongated flexible member of thermally expansible metal, said member being supported at a mid point upon an intermediate portion of said lever, fixed supporting means, the two ends of said member extending generally in the same direction to form a pair of expansible legs, said ends being connected to said fixed supporting means, whereby said lever maintains said member under tension, unequal expansion of said legs causing pivotal movement of said

support, and control means actuated by the other end of said lever.

9. In a device of the character described, a lever, means resiliently and pivotally supporting said lever at one end, an elongated flexible member of thermally expansible metal, said lever having an opening therethrough at an intermediate portion, said member extending through said opening and having a mid point thereof supported by said lever at said opening, fixed supporting means, the two ends of said member extending generally in the same direction to form a pair of expansible legs, said ends being connected to said fixed supporting means, whereby said lever maintains said member under tension, unequal expansion of said legs causing pivotal movement of said support, and control means actuated by the other end of said lever.

10. In a device of the character described, a lever, means resiliently and pivotally supporting said lever at one end, an elongated flexible member of thermally expansible metal, said lever having an opening therethrough at an intermediate portion and a projection extending into said opening, said member having a slot at a mid portion, said member extending through said opening in such a manner that said slot receives said extension, said lever supporting said member, fixed supporting means, the two ends of said member extending generally in the same direction to form a pair of expansible legs, said ends being connected to said fixed supporting means, whereby said lever maintains said member under tension, unequal expansion of said legs causing pivotal movement of said support, and control means actuated by the other end of said lever.

11. In a device of the character described, a lever, means resiliently and pivotally supporting said lever at one end, thermal means including two heat expansible legs joined at one end, said thermal means being supported at the junction of said two legs upon an intermediate portion of said lever, fixed supporting means, said two legs extending generally in the same direction and having their other ends connected to said fixed supporting means, whereby said lever maintains said legs under tension, unequal expansion of said legs causing pivotal movement of said support, and control means actuated by the other end of said lever.

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