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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Heat Operated Relays

We, WORMALD BROTHERS INDUSTRIES LIMITED, a Company incorporated in the State of New South Wales, Commonwealth of Australia, of 1 Phillip Street, Sydney, New South Wales, Commonwealth of Australia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to heat detector relays used to detect fires in buildings, etc.

The object of this invention is to provide a heat detector relay which will close its contacts quickly if there is a sudden rise of temperature at the detector, but not if there is but a slow rise of temperature, but nevertheless will close its contacts when an upper temperature limit is reached.

According to this invention a heat detector relay comprises a first temperature responsive element arranged to move a first moving contact as the temperature rises, a second temperature responsive element spaced from the first element and arranged so as to receive heat more rapidly than the first element for a rapid rise in temperature adjacent the detector, the second temperature responsive element moving a second moving contact in the same direction as the first moving contact as the temperature rises, whereby the second moving contact may catch up with and make contact with the first moving contact to complete an alarm circuit if the temperature adjacent the heat detector rises rapidly, a stop arranged to prevent further movement of the second moving contact after it has moved a predetermined distance, and a fixed contact in parallel with the second moving contact so arranged as to be contacted by the first moving contact when the said first temperature responsive element reaches a predetermined temperature.

Reference will now be made to the accompanying drawings in which:

Figure 1 is an exploded view of the components of a heat detector relay in accordance with this invention,

Figure 2 is a perspective view of the assembled heat detector relay with portion of an insulating base broken away, with the cover removed, and

Figure 3 is a side elevation of the relay of Figure 2.

The heat detector relay of Figures 1 to 3 includes an insulating base 1 from which the components are carried having metal lugs 2, 3 for connection to the leads of an alarm circuit. The component parts are enclosed by a thin metal cover 4, shown only in Figure 1, which is a push fit within the cylindrical cavity 5 in the base 1, and may be cemented in place.

The relay includes two temperature responsive elements each in the form of a bi-metallic spiral having one end fixed and the other movable. One element 6 may be called a fast responsive spiral or coil, and the other 7 may be called a slow response spiral. The two spirals are separated by an insulating disc 8 which also acts as a heat reflector.

The slow response spiral 7 is carried by a bracket 9 which is secured in place and electrically connected to the lug 2 by a screw 10. An arm 11 is secured to the inner end of the bracket by a bearing bush 12 so as to be difficultly rotatable about the bearing for initial adjustment purposes. One end, called the fixed end 13, of the spiral 7 is secured to a post 14, carried by the arm 11. The other or moving end 15, of the spiral is secured to the end of a first moving arm 16 which carries a first moving contact 17, the end 15 of the spring being soldered to an extension 18 of the contact 17. The moving arm 16 is pivoted on a pin 19 having enlarged heads and which passes through the bush 12. The lower enlarged head 20 seats inside the central hole 21 in the reflector 8 and helps to position it.

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The fast response spiral 6 is carried by a second bracket 22 in much the same way as the slow response spiral 7 is carried by the bracket 9, but is below the bracket 22 whereas the spiral 7 is above the bracket 9. A difficultly adjustable arm 23 is held to the bracket 22 by a bearing bush 24, and carries a post 25 to which the inner end 26 of the spiral 6 is secured. The moving end 27 of the spiral 6 is secured to a pin 28 attached to a further moving arm 29, the pin 28 being extended to form a second moving contact 30 having a bent arm 31 which forms the actual contact making point. A pivot pin 32 for the moving arm is provided which is secured in the bush 24 and has enlarged ends, the upper 33 of which also seats in the opening 21 in the reflector 8. Care is taken to see that the pins do not extend into the opening 21 far enough to make electrical contact. The base 34 of the bracket 22 is electrically connected to the lug 3 by a metal bridge 35, and is secured in position on the base 1 and to the bridge by a screw 36. A fixed contact 37 is secured at one end to the bracket 22 and its other end passes through a hole 38 near the circumference of the reflector and is positioned so that it may be contacted by contact 17. A stop is provided by the arm 39 of a third bracket 40, secured to the centre of the base 1 by a screw 41. The position of the stop in relation to the contacts can be adjusted by loosening the screw 41 and rotating the bracket about the screw.

Assume that the detector relay, with its cover on, is secured in the position shown to the ceiling of a room, and a fire breaks out beneath it. The fast response spiral 6 will heat rapidly, receiving heat from the flat surface of the cover, and the contact 31 will move toward the contact 17. The slow response spiral 7 will heat more slowly, both because it is farther from the source of heat, and because the reflector 8 reflects heat away from it. Finally the contacts 17 and 31 meet, and the alarm circuit is completed from lug 3, bridge 35, bracket 22, arm 23 and spiral 6 in parallel with arm 29, contact 31, contact 17, spiral 7 and arm 11, in parallel with arm 16, bracket 9 and lug 2.

However, if the rise in temperature is slow, both spirals 6 and 7 will move contacts 17 and 31 at about the same rate, and they will not meet to set off the alarm cicuit. If, nevertheless the temperature continues to rise slowly, when some predetermined "maximum temperature" is reached the contact 17 will make contact with the fixed contact 37 and the alarm will be given; the circuit is then lug 3, bridge 35, bracket 22, contact 37, contact 17, arm 16, in parallel with spiral 7 and arm 11, bracket 9 and lug 2.

Under certain weather conditions the rate of rise of ambient temperature may be sufficient for the two spirals to make contact, and so cause a false alarm, unless the travel of the fast response spiral is arrested before contact can be made. To prevent such false alarms the stop 39 is provided, which may be set to arrest the contact 31 at any desired position which is fixed relative to the contacts so as to permit operation of the alarm in the desired range of "rate of rise of temperature" and at the "maximum temperature".

WHAT WE CLAIM IS:—

1. A heat detector relay comprising a first temperature responsive element arranged to move a first moving contact as the temperature rises, a second temperature responsive element spaced from the first element and arranged so as to receive heat more rapidly than the first element for a rapid rise in temperature adjacent the detector, the second temperature responsive element moving a second moving contact in the same direction as the first moving contact as the temperature rises, whereby the second moving contact may catch up with and make contact with the first moving contact to complete an alarm circuit if the temperature adjacent the heat detector rises rapidly, a stop arranged to prevent further movement of the second moving contact after it has moved a predetermined distance, and a fixed contact so arranged as to be contacted by the first moving contact when the said first temperature responsive element reaches a predetermined temperature.

2. A heat detector relay as claimed in claim 1 wherein the two temperature responsive elements are each bi-metallic spirals.

3. A heat detector relay as claimed in either of claims 1 or 2 including a heat reflector between the two temperature responsive elements.

4. A heat detector relay comprising an electrically and heat insulating base, a first bracket supporting a first bi-metallic spiral adjacent to and in a plane parallel to the base, a first moving contact secured to the free end of the spiral, a second bracket supporting a second bi-metallic spiral in a plane parallel to the base but farther from the base than the first bi-metallic spiral, a second moving contact secured to the free end of the second spiral, a heat reflecting disc between the two spirals, an adjustable stop for limiting movement of said second contact, whereby for a selected range of rate of rise of temperature the second moving contact will catch up with the first moving contact to complete an alarm circuit, a fixed contact connected in parallel with the said second moving contact and so arranged as to complete the alarm circuit through the first moving contact when the first spiral reaches a predetermined temperature.

5. A heat detector relay substantially as described and as shown in the accompanying drawings.

The fast response spiral 6 is carried by a second bracket 22 in much the same way as the slow response spiral 7 is carried by the bracket 9, but is below the bracket 22 whereas the spiral 7 is above the bracket 9. A difficultly adjustable arm 23 is held to the bracket 22 by a bearing bush 24, and carries a post 25 to which the inner end 26 of the spiral 6 is secured. The moving end 27 of the spiral 6 is secured to a pin 28 attached to a further moving arm 29, the pin 28 being extended to form a second moving contact 30 having a bent arm 31 which forms the actual contact making point. A pivot pin 32 for the moving arm is provided which is secured in the bush 24 and has enlarged ends, the upper 33 of which also seats in the opening 21 in the reflector 8. Care is taken to see that the pins do not extend into the opening 21 far enough to make electrical contact. The base 34 of the bracket 22 is electrically connected to the lug 3 by a metal bridge 35, and is secured in position on the base 1 and to the bridge by a screw 36. A fixed contact 37 is secured at one end to the bracket 22 and its other end passes through a hole 38 near the circumference of the reflector and is positioned so that it may be contacted by contact 17. A stop is provided by the arm 39 of a third bracket 40, secured to the centre of the base 1 by a screw 41. The position of the stop in relation to the contacts can be adjusted by loosening the screw 41 and rotating the bracket about the screw.

Assume that the detector relay, with its cover on, is secured in the position shown to the ceiling of a room, and a fire breaks out beneath it. The fast response spiral 6 will heat rapidly, receiving heat from the flat surface of the cover, and the contact 31 will move toward the contact 17. The slow response spiral 7 will heat more slowly, both because it is farther from the source of heat, and because the reflector 8 reflects heat away from it. Finally the contacts 17 and 31 meet, and the alarm circuit is completed from lug 3, bridge 35, bracket 22, arm 23 and spiral 6 in parallel with arm 29, contact 31, contact 17, spiral 7 and arm 11, in parallel with arm 16, bracket 9 and lug 2.

However, if the rise in temperature is slow, both spirals 6 and 7 will move contacts 17 and 31 at about the same rate, and they will not meet to set off the alarm cicuit. If, nevertheless the temperature continues to rise slowly, when some predetermined "maximum temperature" is reached the contact 17 will make contact with the fixed contact 37 and the alarm will be given; the circuit is then lug 3, bridge 35, bracket 22, contact 37, contact 17, arm 16, in parallel with spiral 7 and arm 11, bracket 9 and lug 2.

Under certain weather conditions the rate of rise of ambient temperature may be sufficient for the two spirals to make contact, and so cause a false alarm, unless the travel of the fast response spiral is arrested before contact can be made. To prevent such false alarms the stop 39 is provided, which may be set to arrest the contact 31 at any desired position which is fixed relative to the contacts so as to permit operation of the alarm in the desired range of "rate of rise of temperature" and at the "maximum temperature".

WHAT WE CLAIM IS:—

1. A heat detector relay comprising a first temperature responsive element arranged to move a first moving contact as the temperature rises, a second temperature responsive element spaced from the first element and arranged so as to receive heat more rapidly than the first element for a rapid rise in temperature adjacent the detector, the second temperature responsive element moving a second moving contact in the same direction as the first moving contact as the temperature rises, whereby the second moving contact may catch up with and make contact with the first moving contact to complete an alarm circuit if the temperature adjacent the heat detector rises rapidly, a stop arranged to prevent further movement of the second moving contact after it has moved a predetermined distance, and a fixed contact so arranged as to be contacted by the first moving contact when the said first temperature responsive element reaches a predetermined temperature.

2. A heat detector relay as claimed in claim 1 wherein the two temperature responsive elements are each bi-metallic spirals.

3. A heat detector relay as claimed in either of claims 1 or 2 including a heat reflector between the two temperature responsive elements.

4. A heat detector relay comprising an electrically and heat insulating base, a first bracket supporting a first bi-metallic spiral adjacent to and in a plane parallel to the base, a first moving contact secured to the free end of the spiral, a second bracket supporting a second bi-metallic spiral in a plane parallel to the base but farther from the base than the first bi-metallic spiral, a second moving contact secured to the free end of the second spiral, a heat reflecting disc between the two spirals, an adjustable stop for limiting movement of said second contact, whereby for a selected range of rate of rise of temperature the second moving contact will catch up with the first moving contact to complete an alarm circuit, a fixed contact connected in parallel with the said second moving contact and so arranged as to complete the alarm circuit through the first moving contact when the first spiral reaches a predetermined temperature.

5. A heat detector relay substantially as described and as shown in the accompanying drawings.

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