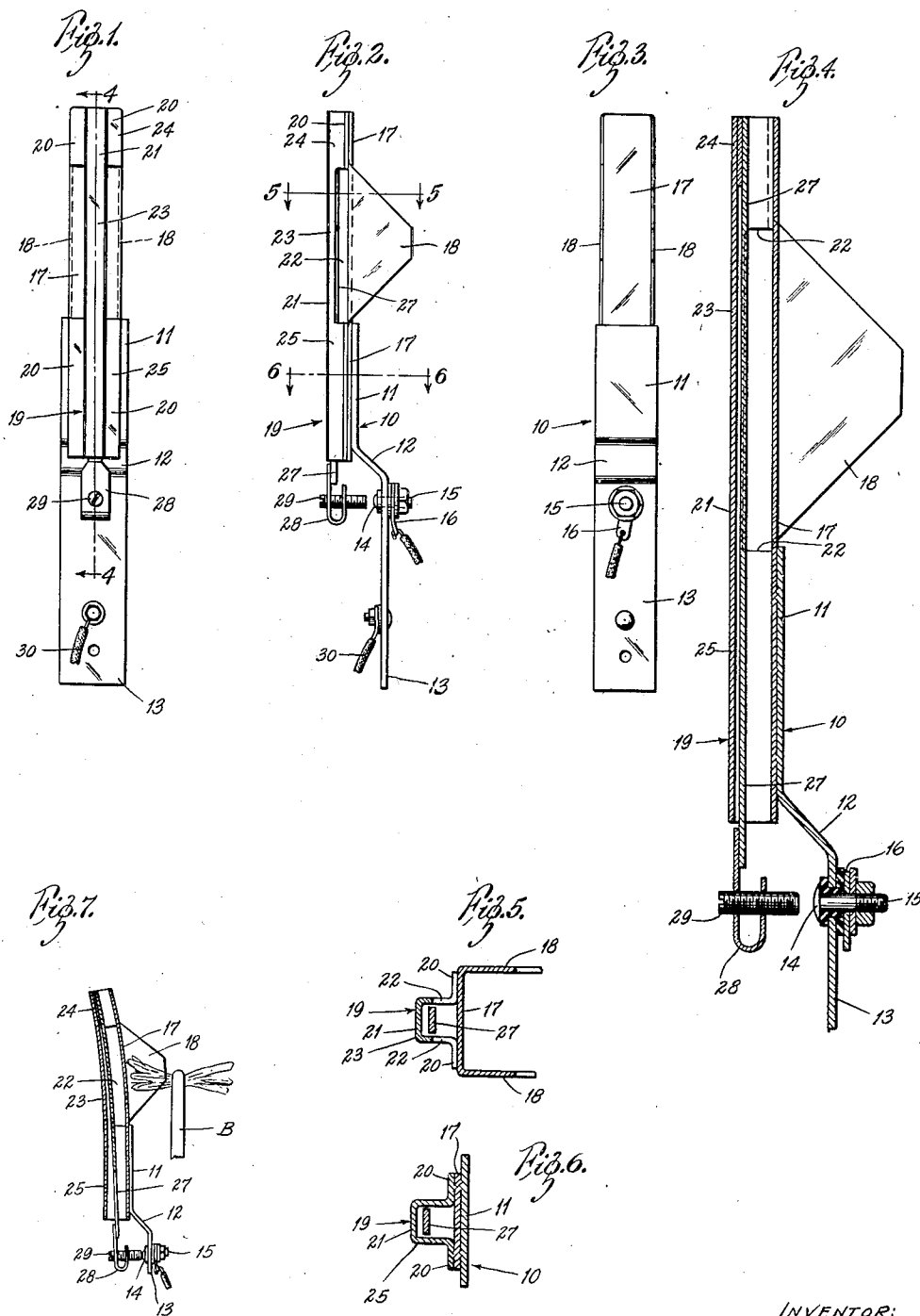


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THERMOSTATIC SWITCH
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THERMOSTATIC SWITCH

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This invention relates to improvements in thermostatic switches, and other like devices actuated by heat changes.

An object of the invention is to provide a safety device that is quick and positive in its action under the influence of direct heat, but which is unaffected by ambient temperature.

A further object is to provide a warping type mechanism that operates in response to particular heat application, regardless of the starting temperature of the device.

A further object of the invention is to provide an inexpensive thermostatic switch of the warp switch type, the thermostatic elements of which have substantially the same coefficient of expansion, and in which the operation of the switch results from the construction and association of such thermostatic elements, and their dispositions with respect to applied heat.

Additional objects of the invention will appear from the following detailed description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a rear elevation of the device;

Fig. 2 is a side elevation;

Fig. 3 is a front elevation;

Fig. 4 is a vertical section substantially on the line 4—4 of Fig. 1 in which the switch element is shown in open position;

Fig. 5 is a cross section on the line 5—5 of Fig. 2;

Fig. 6 is a cross section on the line 6—6 of Fig. 2; and,

Fig. 7 is a fragmentary view illustrating the switch in closed position.

In the embodiment of the invention illustrated in the drawing, the thermostatic switch is shown as a pilot operated safety switch for a gas burner. This is a valuable application, but is used as an illustration rather than as a limitation.

The switch comprises a bracket 10 which is in the form of a bent plate forming an upper section 11, a shoulder 12, and a lower section 13. The bracket carries an electrical terminal construction having a terminal point 14 formed at the head of a bolt 15, insulated from the bracket 10, and which passes through an eye 16 of a terminal lead.

The bracket is adapted to support the device adjacent to a pilot burner B, by an attachment through the lower section 13 thereof.

Attached to the back face of the upper section 11 of the bracket 10 is a member that comprises a plate 17 that is elongated beyond the upper edge of the bracket 10. The plate 17 is provided with wings or flanges 18 that extend forwardly

above the top edge of the bracket 10. In adjusting the device in association with the pilot burner B, the flame of the pilot burner is located so that it impinges against the upper part of the plate 17 and between the flanges 18. The bracket 10 and the plate 17 are rigidly united at their matching faces by spot welding, or by other suitable joining means.

A U-shaped channel member 19 has side flanges 20, connected by a channeled portion 21. Adjacent the wings 18, the side flanges 20 and the channel portion 21 are cut away, as at 22, leaving a bridge portion 23 connecting an upper portion 24 of the member 19 with a lower portion 25 thereof. The member 19 is attached to the plate 17 by spot welding, or other suitable joining means between the plate 17 and the flanges 20 on the upper section 24 and the lower section 25. That is to say, there is a united relationship between the plate 17 at its extreme portions with an intermediate free weakened section formed by the bridge 23.

A contact blade 27 is rigidly connected at its upper extremity with the base wall of the U-shaped member 19 by spot welding or by other suitable connecting means. The contact blade 27 is free to move within the channel member 19 throughout its length, except at its upper extremity. The contact blade carries a bracket 28 at its lower end, and an adjustable contact screw 29 is mounted in this bracket. The contact blade is electrically connected with a lead 30 through the metallic structure of the switch.

It will be understood that the plate 17 and the U-shaped member 19 are preferably of the same metal, or of metals having substantially the same coefficient of expansion. Preferably, too, the members 17 and 19 are relatively light, so as to respond rapidly to heat changes.

From the foregoing, it will be understood that the operation of the switch is as follows:

Operation

In starting position, the two members 17 and 19 have a starting shape and starting length. The switch is open. When heat is applied to the member 17 between the wings 18, this gives a relatively unlimited supply of heat to that portion of the member 17. It will, therefore, expand.

This restrictedly applied heat can flow to the member 19 only by conduction through the ends 24 and 25 of the member 19, and by convection and some radiation across the air gap of the channel portion 21. These paths provide only a restricted flow of heat, and coupled with the ex-

posure of the member 19 to ambient air, produces the result that the member 19 expands less than does the member 17.

The presence of the cut-away portion 23 has two functions. It limits the heat flow path, particularly reducing it adjacent the flame contact area of the member 17; and it provides a relatively weak area in the member 19. As a result of the latter, the greater expansion of the inner member 17 relatively to that of the outer member 19, will cause bowing backward of the two members; the bowing being particularly concentrated in the area of the bridge 23. The device will then assume the shape shown in Fig. 7.

In this position of Fig. 7, the lower portion 25 will remain substantially vertical, as it is secured to the portion 11 of the member 10. The middle portion of both members 17 and 19, in the area of the bridge, will bow backward. The upper portion 24 will remain almost straight, but by the bowing of the middle portion, will be moved backwardly and at an angle to the portion 25 and hence to the strip 10.

This displacement of the portion 24 will carry with it the upper end of the switch blade 27, and the lower end thereof will shift inwardly to make contact with the contact 14.

Continued application of heat to the inner member 17 will not cause the outer to catch up. The restricted heat flow path between the two, coupled with the fact that air is caused to circulate about the member 19 to carry off its heat, cause it to remain at a lower temperature than that of the member 17. The air flow is induced by a chimney effect of the channel, and the free flow of air is increased by the cut-out portion. The result is that the member 19 never becomes as hot as the member 17 during operation of the burner B.

If the burner stops, then the members will shortly assume equal lengths, opening the switch. This action will be enhanced by the fact that the pilot fuel then discharges as a cool stream onto the member 17, artificially cooling it.

Ambient temperature changes do not affect the device, since they act equally on the two members. Hence, the device may be installed as a pilot safety in a furnace where the main burner operates intermittently.

What is claimed is:

1. A safety device including two elongated members of substantially the same temperature coefficient of expansion, connected to lie alongside one another, means to support the device at one end, the device extending from said base end to a free end, one of said members being a channel-shaped member, means at spaced points on the open side of the channel-shaped member rigidly uniting it to the other member, said members having an insulating space between them, whereby when heat is applied to one in quantities greater than the capacity of the heat flow path, the difference in expansion will cause the device to bow and to displace the free end relative to the other and to the support means; and means adapted to be actuated by the displacement of said end.

2. In a mechanism of the kind described, a pair of elongated members having substantially the same temperature coefficient of expansion, the inner of said members having a flat portion with wings extending outwardly from the front face thereof to provide a flame restricting means, the outer member having a flanged channel section; said outer member being disposed against the

back of the inner member with the flanges engaging the same, said outer member having its flanges and walls of the channel cut away for the length of said flame restricting means, and providing an upper and a lower portion, said upper and lower portions being rigidly attached to the inner member, a switch blade having one end attached to said upper portion, and extending downwardly through the channel and below same, a contact thereon, a bracket secured to said mechanism to support the same, and a contact on said bracket engageable by said blade contact.

3. In a mechanism of the kind described, an inner and an outer elongated member having substantially the same temperature coefficient of expansion, the inner member having a front face with an area to receive direct application of heat, the outer member having the cross-sectional shape of a flanged channel, said outer member being disposed against the back of the inner member with the flanges engaging the same, said outer member having its flanges and walls of the channel cut away throughout the heat receiving area of said member, the portions of said outer member above and below said central portion being attached to the inner member, whereby the inner member will expand to a greater extent than the outer upon application of heat to the heat receiving area.

4. In a mechanism of the kind described, a pair of elongated members having substantially the same temperature coefficient of expansion, said members having body portions, means fixedly uniting said members at spaced points, and holding the body portions of said members spaced from each other between said points, a switch blade having one end attached to the upper portions of said members adjacent one point of union, and extending downwardly between said members and below the same, and a device adapted to be operated by the lower end of said blade.

5. In a mechanism of the kind described, means forming an integral tubular shaped device of material expansible and contractible in accordance with heat changes, and comprising two integrally formed sides, one of which is adapted to receive direct application of heat changes, said tubular member being formed of material of substantially the same coefficient of expansion throughout, means limiting the heat changes applied to one side of the tubular shaped member against direct application in equal quantity to the other side, whereby it receives more heat change than corresponding parts on the side opposite thereto, means supporting the tubular member by one side adjacent one end, whereby the other end will warp upon application of heat thereto, and actuated means connected to the other end, to be operated by the warpage thereof.

6. In a heat responsive device, a pair of elongated members of substantially the same coefficient of expansion, said members being disposed alongside of each other and rigidly united at spaced points, stiffening means on at least one of said members between the points of union, and a weakened portion on at least one of said members between the points of union, whereby when heat is applied to one side of the device adjacent the spaced points and not directly applied to the other, the members will expand to different degrees, and the stiffened member will remain substantially of its original shape in the stiffened area, the weakened portion will bend,

and one end of the device will warp relative to the other end, an actuating element engaged with said movable end, and moved for actuation thereby.

7. In a heat responsive device, a pair of elongated members of substantially the same coefficient of expansion, said members being disposed alongside of each other and rigidly united at spaced points, stiffening means on one of said members between the points of union, said other member having a portion weakened against bending, also between the points of union, whereby when heat is applied directly to the stiffened one of said members and not to the other, the one will expand more than the other, and the weakened one will flex principally in the weakened portion and one united point will warp relative to the other, an actuating element attached to the flexing end and rocked thereby to produce an actuating movement.

8. In a device of the kind described for use in detecting flame conditions at a given point,

comprising an inner member adapted to be disposed adjacent the flame and having a front face against which the flame can impinge, a pair of wing members on opposite sides of the front face extending therefrom toward the flame to concentrate the flame upon the front face, an outer member of substantially the same coefficient of expansion as the inner member, and spaced from the flame and insulated from the inner member, means rigidly attaching said members together at spaced points, said attaching means constituting restricted heat-conducting paths from one member to the other, means to support the device, an actuating element attached to the device adjacent one end opposite the supporting means, said inner member, when flame is impinged upon the front face, expanding more rapidly than the outer member, and the device warping about the supporting means to displace the actuating element.

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