

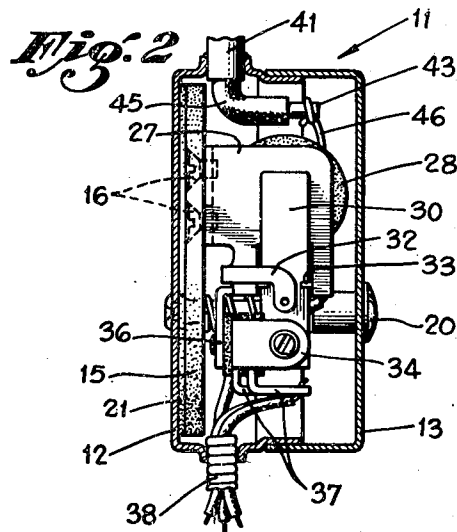
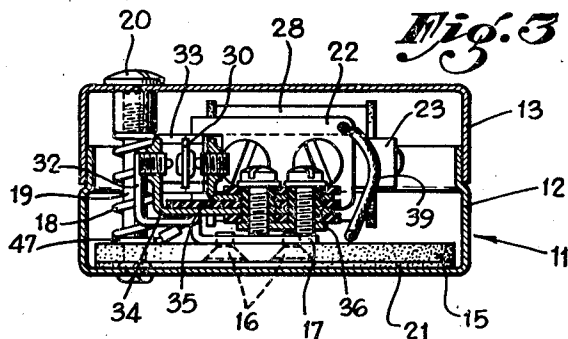
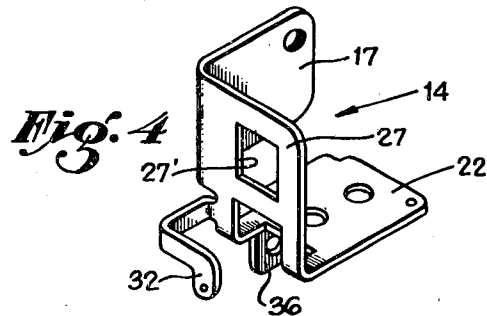
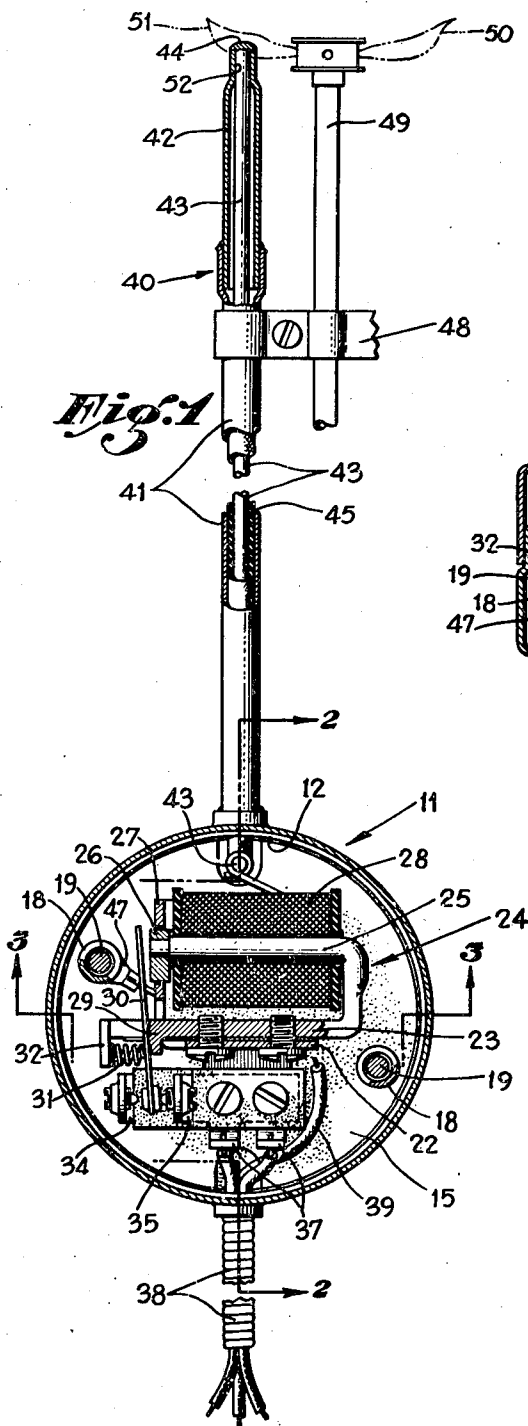
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2,470,864

THERMOELECTRIC CONTROL DEVICE

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THERMOELECTRIC CONTROL DEVICE

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4 Claims. (Cl. 175—320)

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My present invention relates to means for controlling the energization of an electric circuit in accordance with temperature changes, and more particularly to such means wherein the thermostatic element is relatively remote from the switching device, as in a system employing a thermocouple and relay, or thermal bulb and pressure-operated switch. Heretofore it has been necessary in such a system to mount the thermocouple or thermal bulb in its designed location, as in a boiler or adjacent a flame in a furnace, and to extend a cable or capillary tube to the relay or pressure-switch which is separately mounted in another location; another cable being extended thence to the device to be operated, such as an electric motor or valve. It is an object of this invention to provide, in lieu of the aforementioned arrangements, a unitary control device which is supportable solely by its thermostatic element and includes a switching device and a cable for connection to the electric valve or other device to be operated.

For full understanding of the invention, and further appreciation of its features and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a view, with cover 13 cut away, of a control device embodying the invention;

Figures 2 and 3 are sections taken along the lines 2—2 and 3—3, respectively, of Fig. 1; and

Figure 4 is a view, in perspective, of a detail of the structure shown in the other figures.

In the drawing, the numeral 11 generally indicates an enclosed housing consisting of a cup-shaped base section 12 and a similar cover section 13 closely fitting the reduced mouth-portion of the base. Within the housing 11 is an electromagnetic switching-device or relay which is mounted by means of a bracket 14 (shown per se in Fig. 4) on a circular base-plate 15 of insulating material; the bracket being secured to the base-plate by screws 16 threaded in holes through the bracket-portion 17 (Fig. 4). The base-plate 15 is held in position against the bottom wall of the housing 11 by a pair of springs 18 which encircle posts 19 (riveted to the housing bottom-wall) and are compressed against the base-plate by caps 20 threaded on the posts and fitting in openings through the cover 13; these posts and caps also serving to hold the two sections of the housing together. Inserted below the base-plate 15 is a strip 21 of thin insulating material which ensures against electrical contact of the screws 16 with the housing.

Secured to another portion 22 (Fig. 4) of the bracket 14 is the flattened side-arm 23 of a U-shaped electromagnet core 24. The other side-arm 25 of the core is round and has a polar-

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enlargement 26 conforming in shape to that of the opening 27' (Fig. 4) in bracket-portion 27; an energizing coil 28 encircling the side-arm 25. Fulcrumed on the enlarged beveled extremity 29 of the side-arm 23 is a blade-like armature 30 which is attractable toward the polar-enlargement 26 when the coil 28 is energized, and is biased in an opposite direction by a spring 31 compressed between the armature and a finger 32 (see Fig. 4) bent-up from the bracket 14; longitudinal and transverse movement of the armature being prevented by a thin metallic strip (clamped between the core side-arm 23 and the bracket-portion 22) having bifurcated ends 33 (Fig. 2) fitting freely in notches formed in opposite edges of the armature. The contact-carrying end of the armature, beyond the electromagnet, cooperates with contact screws in the bent-up ends of a pair of metal strips 34 and 35 insulatingly mounted on a bent extension 36 (see Fig. 4) of the bracket-portion 22; these contact-strips having lugs 37 to which are soldered two of the wires of a three-wire armored cable 38 which extends through an opening in the housing base-section 12; the third wire of the cable being connected to the bracket-portion 22.

Extending from the side of housing 11, opposite the cable 38, is a thermoelectric generating device or thermocouple 40 comprising a relatively-rigid metallic tube 41 which is secured, as by solder, in an opening through the base-section 12. In the flared outer end of the tube 41, and welded thereto, is a short tube 42 which is reduced in diameter at its outer end to fit a rod or wire 43; the extremities of the wire and tube being fused together at 44. The wire 43 runs the full length (which is conveniently about ten inches) of the tube 41 (insulated therefrom by a sleeve 45) and terminates within the housing where it is soldered to one lead 46 of the electromagnet coil 28; the other lead of the coil being electrically connected to the housing and tube 41 through a lug 47 on one of the posts 19 below spring 18. The tube 42 may be of the well-known thermoelectric alloy "Chromel" or, preferably, of a steel alloy having a high chromium content which better withstands high temperatures and oxidation; the wire 43 conveniently being of the alloy "Copel" which is thermoelectrically highly different from "Chromel" or "high-chrome" steel. The approximate compositions of the alloys mentioned above are as follows: "Chromel," Ni 90% and Cr 10%; "high-chrome" steel, Fe 73% and Cr 27%; "Copel," Cu 55% and Ni 45%. The tube 41 is preferably of copper, which is thermoelectrically similar to the materials designated for tube 42, and has low electrical resistance.

The whole control device shown (to double scale of physical embodiment) in Fig. 1 is adapt-

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ed to be supported by its thermostatic element 40; as, for example, on a bracket 48 which, it is to be assumed, is attached to the main gas-burner of a furnace; a pilot-burner 49, providing a flame 50 for igniting the main burner, also being supported by the bracket. Another flame 51 of the pilot-burner is arranged to heat the "hot" junction 52 (between the tube 42 and wire 43) of the thermocouple. When this junction is heated, current is generated by the thermocouple in an amount sufficient to cause the electromagnet to attract the armature 30 and hold it in engagement with the contact strip 34; the closed circuit of cable 38 then being through this strip and the armature (by way of bracket-portion 22 and core-arm 23). If the pilot-burner flame is extinguished, the armature drops-back into engagement with contact strip 35, as shown, breaking the aforementioned circuit and closing another circuit through the cable.

From the foregoing description it is apparent that the thermostatic device of this invention is adapted to control, in accordance with its thermal condition, energization of any suitable electrical apparatus connected to the cable 38; and because of its unitary mounting and lack of disconnected parts, its installation is greatly simplified. The specific device herein shown and described may obviously be modified without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. A unitary thermostatic device for controlling an electric circuit and adapted to be mounted on a burner in thermally-responsive relation to the flame thereof, comprising: an enclosed housing; thermostatic means comprising an elongated tubular member of rigid construction extending from and rigidly secured to said housing, the outer end of said tubular member being adapted to be subjected to said flame; switching means within the housing; means within the housing operated by said thermostatic means for actuating said switching means; a cable, permanently connected to said switching means, extending

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from said housing so as to form, in part, an electric circuit controllable by the device; and means for supporting the device on said burner, said supporting means consisting entirely of a bracket attached to said tubular member adjacent its outer end.

2. A thermostatic device as defined in claim 1, and wherein said cable extends from said housing at a point opposite said tubular member.

3. A unitary thermostatic device for controlling an electric circuit and adapted to be mounted on a burner in thermally-responsive relation to the flame thereof, comprising: an enclosed housing; a thermoelectric generating device extending from said housing and comprising an elongated tubular member of rigid construction rigidly secured to the housing and forming at its outer extremity the hot-junction of the generating device; switching means within the housing; an electrical relay, for actuating said switching means, within said housing and connected to said generating device for operation by the energy produced thereby when said hot-junction is heated by said flame; a cable, permanently connected to said switching means, extending from said housing so as to form, in part, an electrical circuit controllable by the thermostatic device; and means for supporting the thermostatic device on said burner, said supporting means consisting entirely of a bracket attached to said tubular member adjacent its outer end.

4. A thermostatic device as defined in claim 3, and wherein said cable extends from said housing at a point opposite said tubular member.

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