Dec. 3, 1929. L. A. M. PHELAN 1,738,150

HEATING ELEMENT

Filed Dec. 22, 1926

Fig. 1

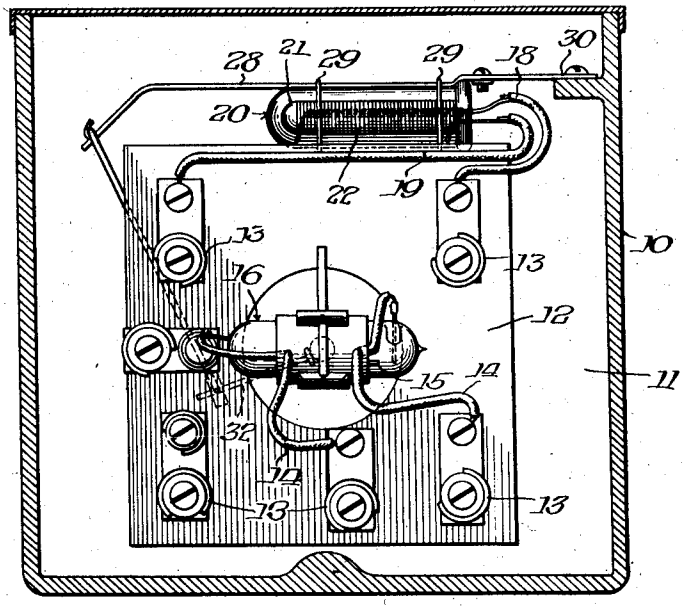


Fig. 2

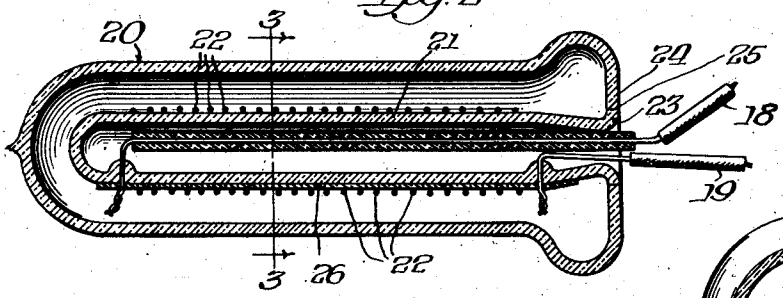


Fig. 3

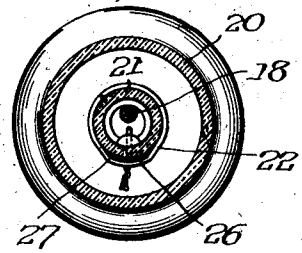
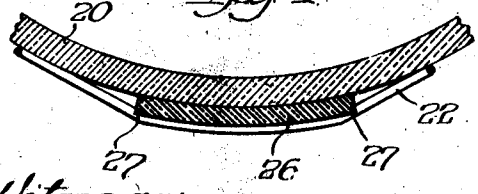


Fig. 4



Witness:

Inventor

Louis A. M. Phelan

By Jones, Addington, Cann & Aitken

Attys

Patented Dec. 3, 1929 1,738,150

UNITED STATES PATENT OFFICE

LOUIS A. M. PHELAN, OF ELKHART, INDIANA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO TIME-O-STAT CONTROLS COMPANY, OF ELKHART, INDIANA, A CORPORATION OF MARYLAND

HEATING ELEMENT

Application filed December 22, 1926. Serial No. 156,343.

This invention relates to heating elements and the method of forming the same, and has special reference to a heating element of a very fine construction which is operable with a minimum of energy and marked positiveness of control.

More particularly this invention relates to a method of forming a heating element for use in connection with a heat responsive element, said heating element comprising a heating coil which is secured within a glass tube and sealed apart from the atmosphere.

One particular application of this invention is in connection with tiltable switches, and for purposes of illustration, the application of this heating element to a switch of the tiltable type will be described hereinafter. It is to be understood, however, that the present heating element may find ready use in other electrical devices.

One of the objects of this invention is to provide a method for forming a heating element.

A further object of this invention is to provide a heating element of a very compact and desirable form.

A further object of this invention is to provide a heating element of a very fine construction which is operable with a minimum of energy and a marked positiveness of control.

Further objects and advantages will be apparent from the description and drawings forming a part of this specification to which reference may now be had for a more complete understanding of the characteristic features of this invention, in which drawings:

Figure 1 is a front elevational view of a switch employing this invention;

Fig. 2 is a central sectional view of the heating element of this invention;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2; and

Fig. 4 is an enlarged detail view of a portion of Fig. 3.

Referring more particularly to the drawing, the switch in which the present invention has been incorporated, comprises a casing 10 having a back wall 11 to which wall is fixed a plate 12 in spaced relation thereto. A plurality of binding posts 13 are positioned on said plate 12 and to these latter may be connected the lead wires used in connection with the aforesaid switch, it being noted that lead wires 14—14 are connected to electrodes 15—15 of a mercury tube contactor switch 16, which latter is rotatably mounted in any suitable manner to the back wall 11.

Other lead wires, 18 and 19, are connected to the upper binding posts on the plate and supply current to the heating element 20. The heating element 20 comprises an elongated tube having a re-entrant portion 21 about which a heating coil 22 is wound, this latter being connected at one end to the wire 19 and at the other end to the wire 18, from whence energy is derived for the operation of said coil. It will be noted from the construction of the tube 20, that the heating coil is disposed on an integrally formed portion of the tube, thereby eventuating a heating element of a compact and highly satisfactory form.

In forming this heating element, the re-entrant portion first has the coil wound thereabout, the lead-in wires being sealed through this portion and led out through the open end of the same. The outside portion 22 is then placed in an enveloping relation to the re-entrant portion 21, said outside portion having a lip 23 which is then in close contact with the lip 24 at the open end of the re-entrant portion. The two portions are then sealed where they meet, as at 25, wherefrom the heating coil is contained within said tube and is wound on the re-entrant portion as shown.

A strip of mica 26 is positioned along the re-entrant portion 21 and under coil 22. From the enlarged detail, as shown in Fig. 4, it will be noted that the coil 22, in being wound around the re-entrant portion and over the strip of mica, will embed itself into the corners on each side of the strip of mica, as at 27, because of the small diameter of the wire and the brittleness of the mica. This provides a means for keeping the turns of the coil 21 apart and for insulating them one from another, said mica at the same time also acting in an advantageous manner when

the turns of the coil 21 become hot and tend to expand.

In the application of this heating element to a specific use, said heating element is secured to a bimetallic member 28 by strips 29 or other suitable means. The bimetallic element 28 is fixed at one end 30 to a suitable extension from the switch casing 10. It is apparent, therefore, that when said coil is supplied with current, the heat generated therefrom rises and serves to bend or flex the bimetallic element 28 wherefrom an actuating force for the switch is derived.

As has been hereinbefore stated, the mercury tube contactor switch 16 is rotatably mounted in any suitable manner to the back wall 11. Briefly, the operation of the heating element to actuate the switch consists in the following: The heating of the bimetallic strip 28 by the passage of current through the coil 22, results in the flexing of said strip, whereupon a thrust is imparted to connecting rod 31 secured to the free end of said bimetallic element, which connecting rod in turn moves the crank 32 extending from and rotatable with the tube 16, and this movement of the crank 32 will tilt said tube 16 and change the electrical circuits controlled by said switch.

This invention provides, therefore, a very compact and exceedingly desirable heating element which is of a fine construction and operable with a minimum of energy and, moreover, has a marked positiveness of control. This invention further provides a new and novel method for forming a heating element whereby the heating coil will be sealed within a container and apart from the atmosphere.

While but a single embodiment of this invention is herein shown and described, it is to be understood that the device is not to be limited to that particular structure since various modifications may be apparent to those skilled in the art without departing from the spirit and scope of this invention, and, therefore, the same is to be limited only by the scope of the appended claims and the prior art.

I claim:

1. Heating means comprising a sealed tube having an elongated re-entrant portion, a current-carrying coil supported interiorly of said tube, and insulating means for holding the turns of said coil in a spaced and insulated relation.

2. Heating means comprising a sealed tube having an elongated re-entrant portion, a current-carrying coil supported interiorly of said tube, and an insulating member disposed between said coil and said re-entrant portion for holding the turns of said coil in a spaced and insulated relation.

3. Heating means comprising a sealed tube having an elongated re-entrant portion, a current-carrying coil supported interiorly of said tube, and a strip of mica disposed between said coil and said re-entrant portion, said coil being adapted to imbed itself in the edges of said mica by its own action in being wound on said re-entrant portion whereby the turns of said coil are held in a spaced and insulated relation.

In witness whereof, I have hereunto subscribed my name.

LOUIS A. M. PHELAN.