Feb. 16, 1943. W. H. BULPITT 2,311,206

ELECTRIC THERMAL SWITCH

Filed Nov. 3, 1941

FIG. 1.

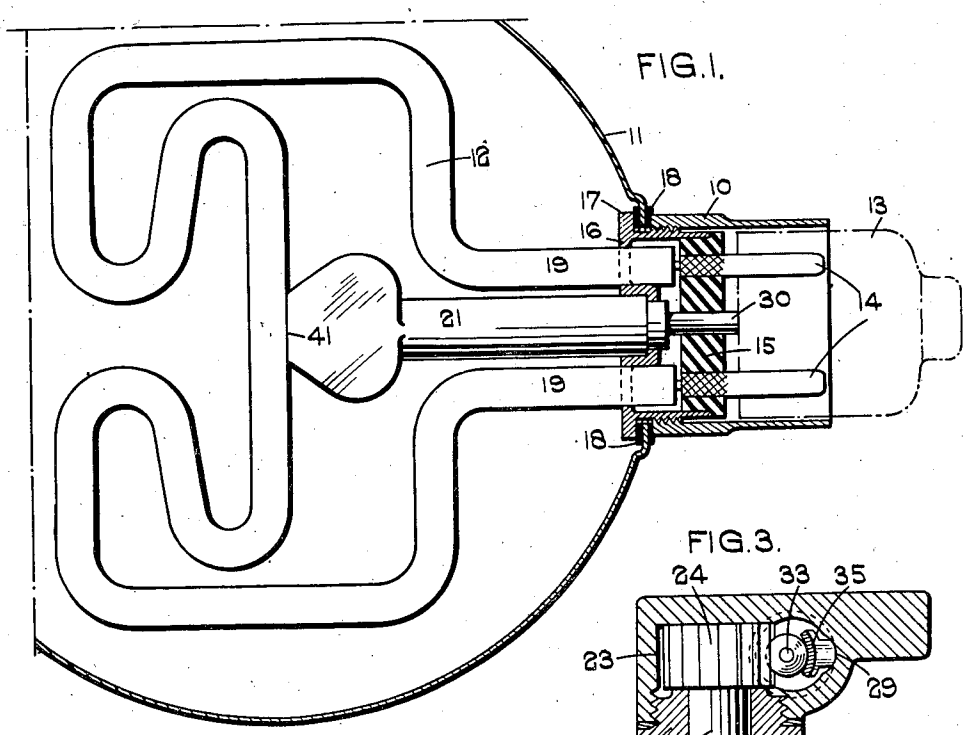


FIG. 3.

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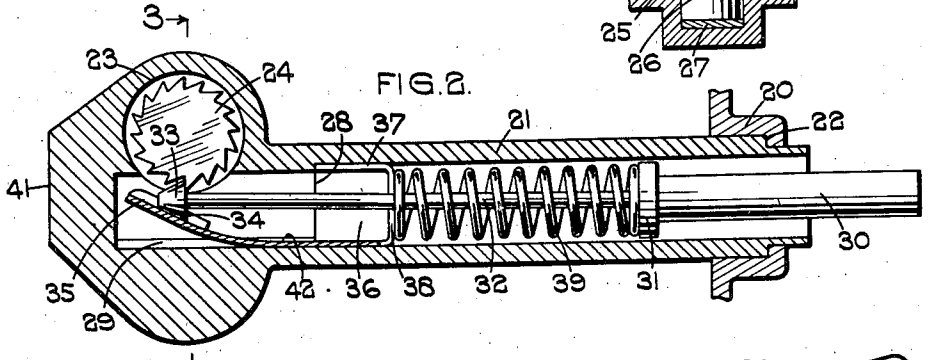
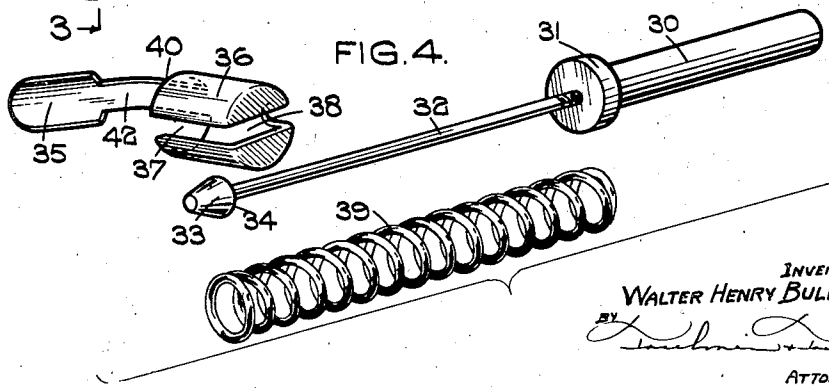


FIG. 2.

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FIG. 4.



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ELECTRIC THERMAL SWITCH

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Application November 3, 1941, Serial No. 417,660
In Great Britain August 20, 1941

8 Claims. (Cl. 74—2)

This invention relates to electric thermal switches having associated therewith a safety device which upon attainment of a predetermined temperature operates to open the switch, the safety device comprising a ratchet wheel normally held against rotation by means of fusible metal, a spring loaded plunger operating in a tube or other support and having a tooth which co-operates with the ratchet wheel when the switch is closed to hold the plunger against movement under the action of the spring.

The switch may take the form of a plug and socket electric coupling and the action of moving these coupling members into engagement may operate the plunger so as to compress the spring and move the tooth of the plunger into engagement with the ratchet wheel.

One such apparatus is described in my prior specification Serial No. 229,625 and the present invention is particularly applicable to such apparatus.

The object of the present invention is to construct the safety appliance in a manner which allows the parts to be produced and assembled cheaply and to provide means whereby the engagement of the plunger tooth with the ratchet wheel is more positively effected than hitherto.

According to the present invention in a switch of the kind specified we provide an inclined guide plate associated with the plunger for guiding its tooth laterally into engagement with the ratchet wheel when the plunger is moved by the closing of the switch.

Further, according to the invention the plunger is provided with a flange remote from the tooth, the flange forming a fulcrum about which the plunger can rock laterally in the tube or support such lateral rocking motion being produced through endwise movement of the plunger when the switch is closed by the engagement between the plunger and the guide plate.

The guide plate may have a portion formed as a socket slotted through one side and end and the plunger, a guide plate and spring can be assembled together as a unit by compressing the spring, passing the shank of the plunger through the slot in the side of the socket portion and then letting the spring expand somewhat to bring the plunger tooth into pressure contact with the end of the socket.

The tube or support in which the plunger is mounted may be provided with an internal shoulder forming an abutment for a portion of the guide plate and the tube or support may further be provided with means to prevent the guide plate from turning about the axis of the plunger so that the inclined part of the guide plate is retained in the correct position for guiding the plunger tooth.

The means for preventing the guide plate from turning may consist of a groove in the tube or support into which groove a portion of the guide plate engages.

Referring to the drawing:

Figure 1 is a plan view partly in section showing one form of the appliance.

Figure 2 is a sectional plan view taken through the safety appliance.

Figure 3 is a section on line 3—3 of Figure 2.

Figure 4 is a perspective view showing the plunger spring and guide plate.

In the construction illustrated the invention is shown applied to a safety appliance which co-operates with a plug and socket electric connector, the socket 10 being mounted in the wall of a vessel 11 adapted to be heated by an electric immersion heater 12.

The electric coupling comprises the usual connector 13 having sockets for engaging with the contact pins 14 carried by an insulating plug 15, this plug being mounted in a metal cap 16 having a flange 17 which co-operates with the member 10 and packing rings 18 but form a liquid tight joint with the vessel.

The ends 19 of the casing of the electric heating element are brought through the end of the cap 16 and the conductors are connected to the pins 14.

The end of the cap 16 is provided with a socket 20 at the centre which receives one end of a tube 21 forming the housing for the safety appliance. The tube 21 is shouldered as shown at 22 and brazed or otherwise secured into the cap 16.

At its opposite end the tube 21 is provided with a circular housing part 23 for the ratchet wheel 24 and screwing into the underside of the part 23 is a socket 25 which receives the shank 26 of the ratchet wheel 24, the shank 26 being attached to the end of the socket by fusible metal 27.

The opening in the tube is shouldered as shown at 28 and it is grooved as shown at 29 from the shoulder to the end of the bore.

The plunger may be made in two parts, one part 30 having a flange 31 which is a free fit in the tube 21 and the other part forming a shank 32 screwing into the part 30 and having a conical head 33 at its end, the conical head having

a shoulder 34 which engages behind one of the teeth of the ratchet wheel 24. The conical head 33 constitutes a tooth on the plunger.

Mounted on the shank 32 of the plunger is a guide plate having an inclined portion of curved section 35 for engagement by the head or tooth 33. Combined with the inclined part 35 and connected thereto by an integral spring neck 42 the guide plate has a socket portion 36 which is slotted through the side as shown at 37 and through the end as shown at 38.

A coil spring 39 is provided operating between the flange 31 and the end of the socket 36.

The three parts shown in Figure 4 can be assembled together by placing the spring on the shank 32, compressing the spring until the tooth 33 and the part of the shank adjacent thereto is exposed, then placing the exposed part of the shank through the slot 37 in the socket 36 and allowing the spring to expand somewhat until the shoulder 34 of the tooth 33 comes into contact with the end of the socket 36.

The unit thus formed is pushed into the tube 21 until the edge 40 of the socket portion 36 comes into contact with the shoulder 23. When in this position a part of the spring neck 42 of the guide plate engages in the groove 29 so that the guide plate is prevented from turning about the axis of the tube 21.

As seen in Figure 2 the spring 39 is compressed and the shoulder 34 of the tooth 33 has been moved laterally by the inclined part 35 of the guide plate into engagement with one of the teeth of the ratchet wheel 24.

The safety appliance is moved into this position by the act of engaging the coupling members 13 and 14, the coupling member 13 acting upon the end of the plunger 30.

The end 41 of the tube 21 is brazed or soldered to the casing of the heating element and preferably to the highest part thereof which first becomes uncovered when the liquid in the vessel evaporates.

Should the temperature of this part of the casing of the heating element rise above a certain predetermined level the heat will be transmitted to the end of the tube 21 and thence to the socket 25 and fusible metal 27 which melts thus releasing the ratchet wheel and allowing it to rotate so as to release the tooth at the end of the plunger. The plunger then moves outwardly under the influence of the spring 39 and disengages the coupling member 13.

The fusible metal 27 will quickly reset so that the ratchet wheel 24 becomes fixed again but the plunger can at any time be pushed inwardly. When the socket 13 is next pushed on to the pins 14 the plunger rocks somewhat about a point on the periphery of the flange 31 when the head or tooth 33 engages with the inclined part 35 of the guide plate and bends back the neck 42 until the shoulder 34 snaps behind one of the teeth of the ratchet wheel. In this way the head or tooth 33 is positively guided and forced laterally into engagement with the tooth of the ratchet wheel.

What I claim then is:

1. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, an inclined guide plate in the tube, said guide plate being resilient in a direction which is transverse to the length of the plunger, and means for locating the guide plate in the tube.

2. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, a head on the plunger adjacent said shoulder, an inclined guide plate in the tube, said guide plate being resilient in a direction which is transverse to the length of the plunger, and having a part of curved section which partially embraces said head, and means for locating the guide plate in the tube.

3. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, a head on the plunger adjacent said shoulder, said head being of conical form, an inclined guide plate in the tube, said guide plate being resilient in a direction which is transverse to the length of the plunger and having a part of curved section which partially embraces said head and a resilient neck and means for locating the guide plate in the tube.

4. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, an inclined guide plate in the tube, said guide plate comprising a part adapted to engage the end of the plunger adjacent said shoulder, a resilient neck, and a socket portion which engages the wall of the tube and means for locating the guide plate in the tube.

5. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, an inclined guide plate in the tube, said guide plate comprising a part adapted to engage the end of the plunger adjacent said shoulder, a resilient neck and a socket portion which engages the wall of the tube, said socket portion having a slot extending across its end and along the whole length of one side so that the plunger can be engaged therewith by a lateral motion and means for locating the guide plate in the tube.

6. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, an inclined guide plate in the tube, said guide plate comprising a part adapted to engage the end of the plunger adjacent said shoulder, a resilient neck and a socket portion which engages the wall of the tube, said tube having an internal shoulder forming an abutment for locating said socket portion in the tube and a longitudinal slot engaged by said neck portion to prevent the guide plate from turning in the tube.

7. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, a flange on the plunger remote from said peripheral shoulder, said flange being an easy fit in said tube so that the plunger can rock in the tube about said flange as a fulcrum, an inclined guide plate in the tube, said guide plate being resilient in a direction which is transverse to the length

of the plunger and means for locating the guide plate in the tube.

8. Thermal electric switch of the kind specified having a ratchet wheel and a tube, a plunger mounted for lateral and endwise movement in the tube, a peripheral shoulder on the plunger for engaging a tooth of the ratchet wheel, a flange on the plunger remote from said peripheral shoulder, an inclined guide plate in the tube, said guide plate comprising a part adapted to engage the end of the plunger adjacent said shoulder, a resilient neck and a socket portion which engages the wall of the tube, and means for locating the guide plate in the tube and a coiled spring on said plunger engaging the end of said socket and said plunger flange.

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