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HEATING ELEMENT CONTROLLING DEVICE.

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1,388,589. **Patented Aug. 23, 1921.**

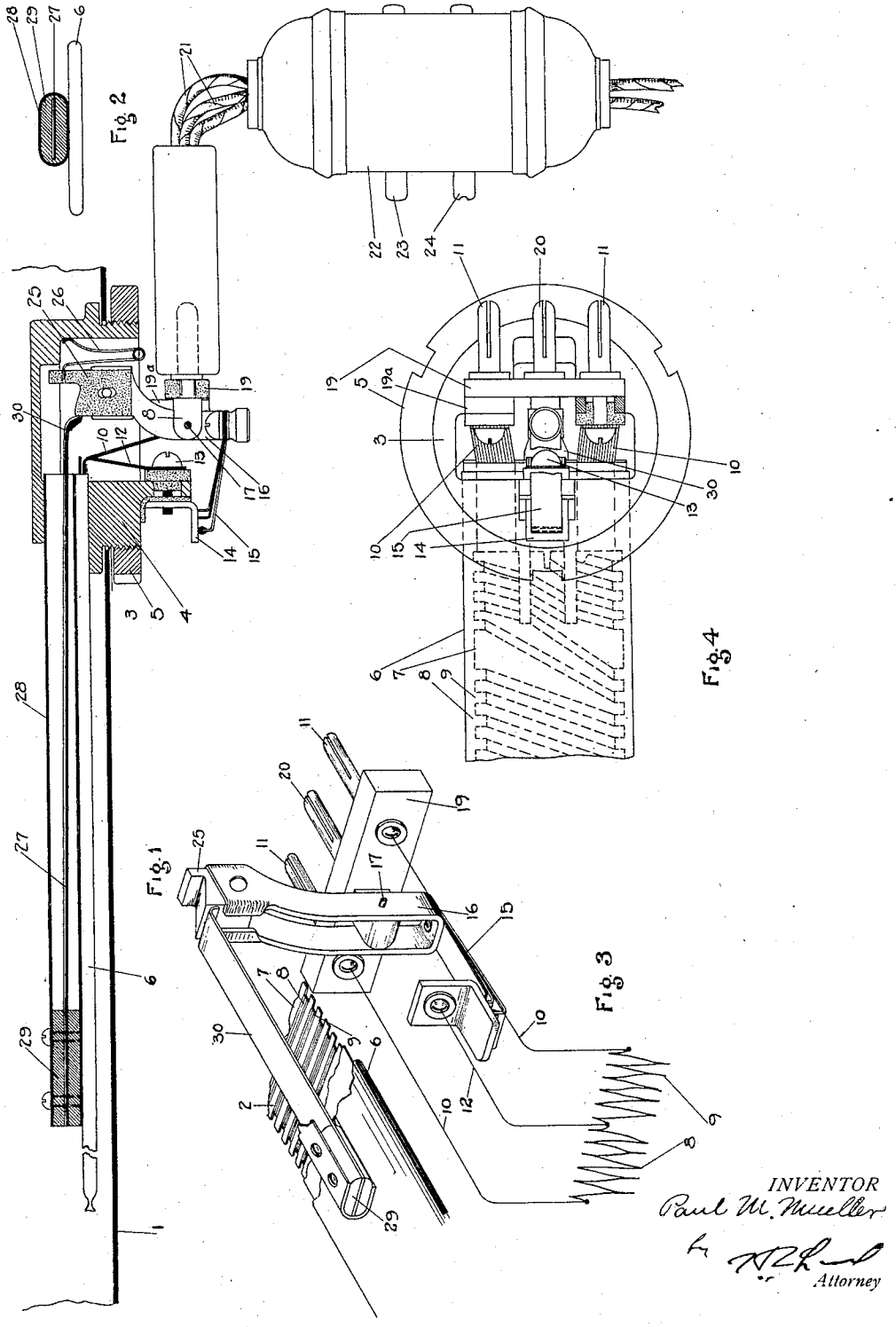


Fig. 2

Fig. 4

Fig. 1

Fig. 3

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HEATING-ELEMENT-CONTROLLING DEVICE.

1,388,589. Specification of Letters Patent. Patented Aug. 23, 1921.

Application filed March 24, 1920. Serial No. 368,246.

To all whom it may concern:

Be it known that I, PAUL MANNING MUELLER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in a Heating-Element-Controlling Device, of which the following is a specification.

With electric heating elements which are used for heating liquids difficulty is experienced when the element is accidentally uncovered through an excess of heat. Inasmuch as it is the heating element that is subject to such injury it is desirable that the heat of the element itself should operate as directly as possible on the means for varying the current on the element so as to relieve it of the excess heat. This has been accomplished through fuses but this manner of obviating the difficulty necessitates a rather inconvenient re-assembling of the parts, that is, the placing of new fuses.

In this invention the electric current is cut off from the heating element through a switch which is preferably directly operated by a thermal element which is subjected as directly as possible to thermal changes in the heating element and all that is necessary in order to re-set the device is to re-set the switch after it has been thrown out through the action of the thermal element acting under the influence of the heating element.

The invention is illustrated in the accompanying drawings as follows:—

Figure 1 shows a central section through the device.

Fig. 2 an end view of the heating element.

Fig. 3 a perspective view, partly in section, of the switch mechanism.

Fig. 4 a plan view of the switch.

1 marks a receptacle which is adapted to retain a liquid, 2 a heating element, 3 a hollow plug in which the heating element is secured, 4 external screw threads on the plug, and 5 a nut by means of which the plug is secured in the walls of the receptacle, the usual packing (not shown) being ordinarily supplied.

The heating element has the usual casing 6 in which the heating element proper is placed. The heating element may be of any of the well-known designs. As shown it has the insulating core 7 and windings 8 and 9. The windings 8 and 9 are connected by the extensions 10 with the plugs 11 which lead to one side of the main circuit and the coils lead through a connection 12 to a contact post 13 which connects to a switch table 14. Contact fingers 15 are carried by a swinging switch lever 16 into and out of contact with the bracket 14. The switch lever is pivoted by means of a pin 17 on a post 18. The post 18 is carried by an insulated block 19. The insulated block is secured to lugs 19^a extending from the hollow plug 3. The post 18 is connected with a plug 20 and this plug is connected with the other side of the line from the plugs 11, the lines being carried out through the wires 21 controlled by the switches 23 and 24 in the switch case 22 whereby both coils, or one, may be used in the ordinary manner. An insulated block 25 is secured to the switch lever and a spring 26 tends to move the switch lever to open the switch by swinging the lever 16 in carrying the contact plates out of engagement with the contact bracket 14. A thermal element 27 is mounted in a receptacle 28 arranged in contact with the case 2 and extending along the case. One end of this receptacle 28 opens into the hollow plug 3. The thermal element 27 is secured at the outer end of the receptacle 28 by means of blocks 29 which form a closure for the end of the receptacle 28 and at the same time hold the thermal element in position lengthwise of the receptacle and case. The end 30 of the thermal element at normal temperature engages the insulated block 25 on the switch lever and holds the switch fingers 15 in contact with the table 14. When, however, the thermal element is heated above the normal temperature it bends, thus disengaging the lever 16 which acting under the influence of the spring 26 swings so as to carry the contact fingers 15 out of contact with the table 14, thus opening the circuit.

When the parts are assembled and the thermal element is initially heated it bends so as to contact the wall remote from the heating element and in this position the metal of the heating element is stretched or strained so that when it returns on cooling it with certainty reaches a position to operate to hold the switch lever in position. After this initial heating the thermal element is not ordinarily subjected to sufficient heat to bend it to a point where it will reach the extreme wall of the inclosing tube. By using this means of assembling the thermal

element is automatically adjusted regardless of its initial shape.

The thermal element is one of ordinary commercial type usually formed of two kinds of metal having different qualities of expansion. I prefer to coat this element with some black coloring matter so that variations in temperature along the case are not only communicated to the element through the block 29 but also through radiation.

What I claim as new is:—

1. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element in direct thermal relation with the casing; a conductor leading to the heating element; a switch in the conductor; and means controlled by the thermal element opening the switch.

2. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element; a thermal element receptacle in contact with the casing; a conductor leading to the heating element; a switch in the conductor; and means controlled by the thermal element opening the switch.

3. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element extending lengthwise of the heating element; a thermal element receptacle in contact with the casing in which the thermal element is arranged; a conductor leading to the element; a switch in the conductor; and means controlled by the thermal element opening the switch.

4. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element extending lengthwise of the casing; a thermal element receptacle in which the thermal element is arranged, said receptacle limiting the movement of the thermal element; a conductor leading to the heating element; a switch in the conductor; and means controlled by the thermal element opening the switch.

5. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element formed of two metals of varying expansive quality; a thermal element receptacle in which the thermal element is arranged extending along and in contact with the casing; a conductor leading to the heating element; a switch in the conductor; and means controlled by the thermal element opening the switch.

6. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element in direct thermal relation with the casing; a conductor leading to the heating element; a switch in the conductor; and means controlled by the thermal element opening the switch, said thermal element acting directly on the movable element of the switch.

7. In a heating element controlling device, the combination of a heating element; an inclosing casing; a thermally sensitive element extending lengthwise of the heating element; a thermal element receptacle in contact with the casing in which the thermal element is arranged; a conductor leading to the element; a switch in the conductor; and means controlled by the thermal element opening the switch, said thermal element acting directly on the movable element of the switch.

8. In a heating element controlling device, the combination of a hollow plug; a heating element leading from the plug; an inclosing casing secured to the plug; a thermally sensitive element in direct thermal relation with the casing; an inclosing receptacle for said thermally sensitive element leading to the hollow plug; a conductor leading to the heating element; a switch in the conductor; and means controlled directly by the thermal element opening the switch.

9. In a heating element controlling device, the combination of a hollow plug; a heating element leading from the plug; an inclosing casing secured to the plug and opening into the interior of the plug; a thermally sensitive element extending lengthwise of the case and into the hollow plug; an inclosing receptacle for the thermal element; a switch carried by the plug comprising a spring-actuated lever engaging the thermal element when the thermal element is subjected to normal temperature and adapted to be released by a movement of the thermal element to open the switch; and a conductor leading to the heating element through the switch.

10. In a heating element controlling device, the combination of a heating elevent; an inclosing casing; a thermally sensitive element extending along the casing, said element having a black coating for the purpose described; and an inclosing receptacle for the thermally sensitive element.

In testimony whereof I have hereunto set my hand.

PAUL M. MUELLER.