Sept. 17, 1946. B. F. OEBBECKE 2,407,764

THERMOSTATIC SWITCH PLUG

Filed April 23, 1943

Fig. 1.

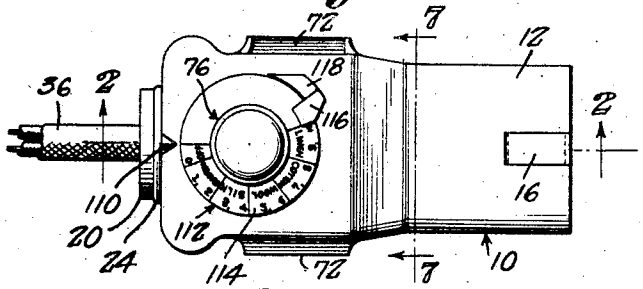


Fig. 2.

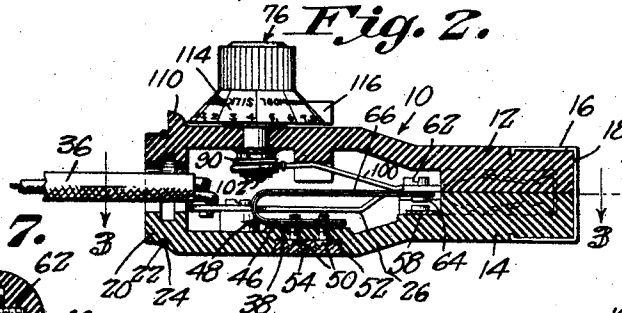


Fig. 6.

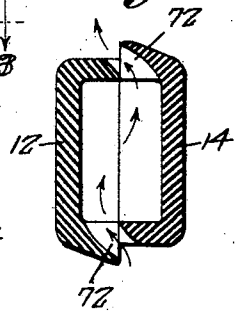


Fig. 7.

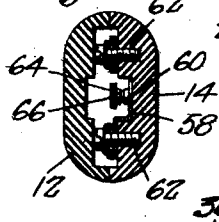


Fig. 3.

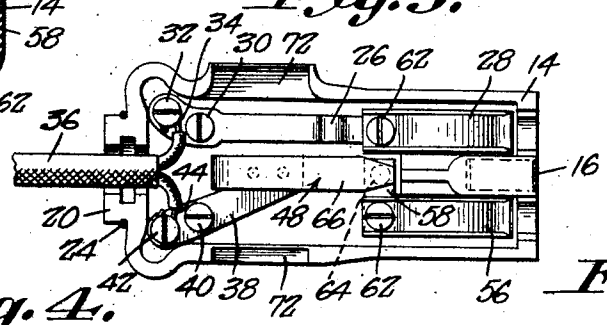


Fig. 4.

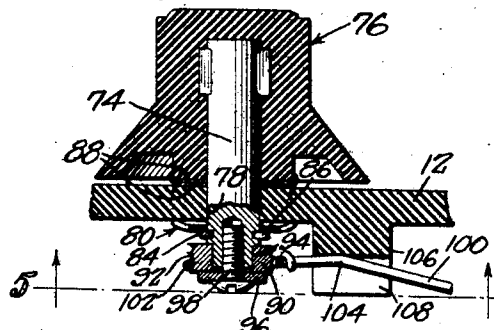


Fig. 5.

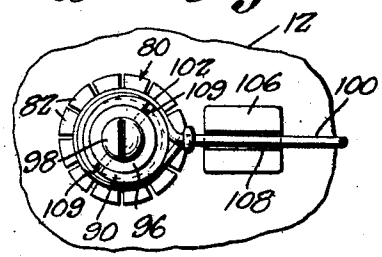
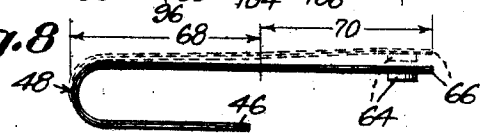


Fig. 8



Bernard F. Oebbecke,
INVENTOR.

BY
Victor J. Evans & Co.
ATTORNEYS

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THERMOSTATIC SWITCH PLUG

Bernard F. Oebbecke, Pittsburgh, Pa.

Application April 23, 1943, Serial No. 484,307

4 Claims. (Cl. 200—136.5)

1

My invention relates to circuit controls for electrical appliances, and has among its objects and advantages the provision of an improved thermostatic switch.

An object of my invention is to provide a thermostatic switch wherein the operator is enabled to vary the point at which the thermostat automatically opens and closes the circuit so that the electrical appliance can be maintained substantially at a predetermined and constant temperature.

A further object is to provide a thermostatic switch wherein a contact carrying thermostatic member of novel construction associates with the pilot terminal only when the current flows to the heating element from which it derives the proportional temperature to open the circuit at a predetermined set standard; while in closing the circuit, the thermostat reacts to the accelerated cooling influence of the surrounding air of room temperature on the interior of the switch through openings of novel design on the sides of the casing in conjunction with a spring.

A further object is to provide a thermostatic switch so designed as to function in a highly efficient manner for use on electric irons, but in which the design is such as to be applicable to the other types of electrical appliances.

In the accompanying drawing:

Figure 1 is a face view of a thermostatic switch in accordance with my invention.

Figure 2 is a sectional view along the line 2—2 of Figure 1.

Figure 3 is a view taken from the position indicated by line 3—3 of Figure 2.

Figure 4 is an enlarged sectional view of an adjusting knob.

Figure 5 is a view taken from the position indicated by line 5—5 of Figure 4.

Figure 6 is a sectional view of the switch housing illustrating the air circulating openings therein.

Figure 7 is a sectional view along the line 7—7 of Figure 1, and

Figure 8 is an enlarged side view of a bimetallic element.

In the embodiment of the invention selected for illustration, the switch housing 10 comprises sections 12 and 14 of insulative material and appropriately recessed to provide accommodation for the structure forming the switch mechanism. These sections are connected into a unitary structure by a U-shape spring clamp 16 lying in a groove 18 in the outer side faces and one end face of each of the sections 12 and 14.

2

The opposite ends of the sections 12 and 14 are shaped to provide an annular neck 20 having a circumferential groove 22 for the reception of a tie element 24. The structure so far described is more or less conventional with respect to size and general contour.

In the section 14 is mounted the usual conductor strip 26 and socket 28 for connection with one prong of the appliance. This strip is made secure by a screw 30 and includes the usual terminal screw 32 for connection with the wire 34 of the cord 36.

A second conductor strip 38 is mounted in the section 14 and is made secure by a screw 40. This strip is also provided with a terminal screw 42 connecting with the second wire 44 of the cord 36.

One end of the strip 38 underlies the short leg 46 of a U-shaped thermostatic element 48 of bimetallic construction. Two screws 50 are threaded through the strip 38 and the leg 46 for fixedly securing the thermostatic element in addition to electrically connecting the two. A recess 52 is formed in the outer face of the section 14 or accommodating the heads of the screws 50, which recess is filled with an insulative material 54.

The second socket 56 is electrically connected with a lateral extension 58 provided with a contact point 60 best illustrated in Figure 7. Screws 62 secure the sockets 28 and 56 to the section 14. The contact point 60 is arranged in axial alignment with a second contact 64 carried by the longer leg 66 of the thermostatic element 48, so as to close the circuit through the appliance through electrical engagement between the two contact points.

In Figure 8 the thermostatic element 48 is so designed as to cause its longer leg 66 to bend upwardly throughout its length 68 and its remaining length 70 to bend downwardly, as when viewing Figure 8, when heated. The proportional lengths 68 and 70 are calculated so that their compound deflection maintains the contact point 64 substantially parallel to the stationary contact point 60 at any desired temperature within the desired limit. This arrangement reduces arcing to a minimum, thereby prolonging the life of the contact points.

A further advantage in the compound arrangement of the thermostatic element resides in the shortening of the travel distance of the movable contact point, which permits both cooperating forces, active in opening and closing the circuit, to be kept relatively small, which results in a finer interplay of those two cooperating forces and

in turn permits a finer regulation to and maintenance of the desired predetermined temperature.

The thermostatic element responds to the direct heat of the heating element only in opening the circuit at the desired set temperature. This is the exact proportional temperature in the interior of the switch structure about which the thermostat functions to maintain the desired predetermined temperature in the heating appliance. Non-association of terminal and thermostat during the off periods prevents a further increase of temperature in the latter by direct contact, leaving only the possibility of a slight increase through radiation from the other parts of the switch. This low marginal increase of heat in the interior of the switch above the proportional is easier absorbed by the surrounding air thereby promoting an accelerated cooling of the thermostat below the proportional to close the circuit. For an exceptional appliance such as an electric iron, the cooling process within the switch structure is carried further. During the unavoidable rest periods in which the cloth is prepared for ironing, a greater amount of heat is absorbed by the switch through radiation with a tendency toward equalization, causing a slightly larger temperatural margin above the proportional heat within the switch structure. This constitutes on the one hand a saving of electricity, and on the other hand it may cause delay in recontacting depending on the duration of the rest periods. To limit this increase of marginal temperature above the proportional and to assure a speedy decrease and recontacting after resumption of ironing, the surrounding air of room temperature is brought into direct contact with the interior of the switch structure through slanted and rectangularly contoured openings 72 in the sections 12 and 14. The cooling is further accelerated at the resumption of ironing by the air currents created within the switch structure by each stroke of the iron through the reversed angularity and arrangement of the openings 72. The air flows in on one side and out the other at each stroke, the change in direction of movement of the iron reversing the direction of travel of the air currents.

In the section 12 is rotatably journaled a shaft 74 having a knob 76 of insulative material attached thereto. This shaft extends through an opening 78 in the section 12 and carries a spring washer 80 of saucer like contour and slit radially to provide spring fingers 82 engaging the section 12. This washer is held in place on the shaft 74 by a split latch ring 84 made of spring steel, which is slipped over the end of the shaft 74 and closes in a circumferential groove 86 in this shaft. Metallic bearing plates 88 are respectively attached to the knob 76 and the section 12 to limit wear between the relative movable parts.

To the inner end of the shaft 74 is connected a body 90 having a screw thread formation 92. This body is provided with a central opening fitting the neck 94 at the end of the shaft 74, and the body is clamped in position against the resultant shoulder on the shaft by means of a lock washer 96 and a screw 98 passing through the lock washer and threaded into the shaft 74.

A spring wire 100 is provided with a loop 102 at one end of such diameter as to have threaded engagement with the body 90. This wire includes a bend 104 engaging a body 106 on the section 12, which body is provided with a slot 108 which loosely receives the wire 100 but restrains the wire from rotation when the knob 76 is turned. The

body 90 is secured to the shaft 74 for rotation therewith as a unit after radial adjustment by means of the tool receiving slot 109 across the lower face of the body 90. The free end of the wire 100 is inclined in the direction of the thermostatic element 48 and has its free end resting on the upper leg 66 slightly rearwardly of the contact point 64.

Rotation of the knob 76 in a clockwise direction imparts axial movement to the loop 102 in the direction of the knob. Such movement causes the free end of the spring wire to pivot against the leg 66 about the bend 104 as a fulcrum, thus the spring pressure on the leg 66 may be adjusted through rotation of the knob 76, which in turn conditions the thermostatic element so that it may effect the desired temperatures in the appliance.

A projection 110 is formed on the section 12 to constitute a pointer arranged for indicating coaction with respect to a scale 112 on the flared face 114 on the knob 76. The knob 76 in Figure 1 is illustrated in its off position, with the lateral projection 116 on the knob engaging a stop 118 on the section 12, while the other side of the lateral projection 116 limits the rotation of the knob 76 by engaging the adjacent side of the pointer 110. The graduations of the scale 112 are marked "Off," "Rayon," "Silk," "Wool," "Cotton" and "Linen." Rotation of the knob 76 to bring any marking on the scale other than the "Off" marking into registration with the pointer 110 increases the tension of the spring 100 to bring the contact point 64 into engagement with the contact point 62 to effect an initial closing of the circuit. The spring tension increases through continued clockwise rotation of the knob and the scale is marked in accordance with the respective temperatures required for the materials indicated thereon. The intermediate markings on the scale 112 are numbered from zero to ten, and for convenience read oppositely in cases where the switch is to be employed in connection with appliances other than electric irons.

When the knob 76 is rotated clockwise, the pressure brought to bear on the resilient steel wire 100 is transmitted to the free end of the compound thermostat, which closes the circuit to pass current to the heating appliance. When the heat in the appliance reaches the desired predetermined temperature, a considerably lower temperature, but in direct proportion to that prevailing in the heating appliance, reaches the switch through the conducting terminals, thereby increasing the temperature of the compound thermostat and in proportion the value of the torque of the latter to the point where the pressure of the resilient steel wire and the value of the torque balance. This temperature is the proportional temperature of each desired setting around which the two forces interplay to maintain the predetermined temperature in the heating appliance, which differs by each different setting.

A further increase in temperature above the proportional will increase the value of the torque of the compound thermostat above the pressure of the wire, thus breaking the circuit automatically and separating the compound thermostat from direct contact with the terminal. It is obvious that through this non-association of the terminal and thermostat the temperature of the latter must necessarily decrease and consequently the value of the torque to the point where the latter sinks below the pressure of the

wire to again close the circuit. Thus it will be seen that the variable pressures applied to the wire 100 through rotation of the knob 76 results in corresponding proportional temperatures in the switch around which the pressure of the wire and the torque of the thermostat interplay to maintain automatically the predetermined temperature in the heating appliance.

My invention is in the nature of an ordinary plug wherein there is incorporated thermostatic means which render ordinary electric irons automatic through attachment of the plug to the iron in the usual manner. The switch eliminates the danger of fires caused by overheating and prevents discoloration of the appliance through such overheating. Such control prevents destruction of the heating element through overheating thereby greatly prolonging the life of the appliance. In contrast to high priced automatic electric irons, the thermostatic switch may be manufactured at a low cost and may be used in connection with other electrical appliances. The sturdy construction of the switch makes it possible to service the device by any one acquainted with such work without injuring the switch mechanism. The two sections 12 and 14 are easily separated without danger of injuring the thermostatic structure.

Without further elaboration, the foregoing will so fully explain my invention, that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim:

1. A thermostatic switch plug comprising first and second terminal means for connection with an electrical appliance, said first terminal means being adapted for connection with a circuit wire, a stationary contact electrically connected with said second terminal means, a temperature responsive thermostat adapted for connection with a second circuit wire and having a second contact engageable with said stationary contact, adjustable resilient means bearing against said thermostat to yieldingly hold the second contact in engagement with the stationary contact to close the circuit through the appliance but yielding upon a predetermined temperature condition of the appliance to cause the second contact to move away from said stationary contact and break the circuit through the appliance means for adjusting said resilient means to vary its resisting pressure on said thermostat, means for holding the adjusting means in adjusted position, a visible indicating means on the adjusting means for displaying the extent of adjustment, said stationary and second contacts having meeting faces, and said thermostat being U-shaped and having one leg fixed to a support and comprising a bimetallic member having a first length flexing in one direction and a second length carrying the stationary contact flexing in a reverse direction to maintain said meeting faces in parallelism.

2. A thermostatic switch plug comprising first

and second terminal means for connection with an electrical appliance, said first terminal means being adapted for connection with a circuit wire, a stationary contact electrically connected with said second terminal means, a temperature responsive thermostat adapted for connection with a second circuit wire and having a second contact engageable with said stationary contact, an adjustable elongated wire bent intermediate its extremities and having one end bearing against said thermostat to yieldingly hold the second contact in engagement with the stationary contact to close the circuit through the appliance but yielding upon a predetermined temperature condition of the appliance to cause the second contact to move away from said stationary contact and break the circuit through the appliance, a visible indicator for showing the extent of adjustment of the wire, and an insulative housing for said terminal means, said thermostat and the resilient means, said housing having oppositely angled openings to circulate air through the housing through movement thereof.

3. In a switch plug of the type described, a casing, the combination of a stationary contact, a heat responsive thermostat, a second contact carried by said thermostat for engagement with said stationary contact, said stationary and second contacts having meeting faces, said thermostat comprising a bimetallic member having a first length flexing in one direction, a second length carrying said second contact flexing in a reverse direction to maintain said meeting faces in parallelism, an elongated adjustable wire bearing on said second length to yieldingly hold the second contact in engagement with said stationary contact and a rotary screw means connected with the wire for adjusting said wire, means for indicating the extent of adjustment, said means accessible from without the casing, and means for holding the screw means in adjusted position against accidental displacement.

4. In a switch of the type described, comprising a casing, a stationary contact, a heat responsive thermostat, a second contact carried by said thermostat for engagement with said stationary contact, said stationary and second contacts having meeting faces, said thermostat comprising a bimetallic member having a first length flexing in one direction, a second length carrying said second contact flexing in the reverse direction to maintain said meeting faces in parallelism, an elongated adjustable spring wire fulcrumed intermediate its ends having one end bearing on said second length to yieldingly hold it in engagement with said stationary contact, a rotary screw means threadedly connected with the opposite end of the spring wire for rocking the same on its fulcrum, means on the outside of the casing for operating said screw, and means co-operating with the screw operating means and casing for indicating the extent of the adjustment of said screw.

BERNARD F. OEBBECKE.