Sept. 22, 1942. W. A. BARNES 2,296,591

THERMOSTATICALLY CONTROLLED ELECTRIC IRON

Original Filed Jan. 31, 1938

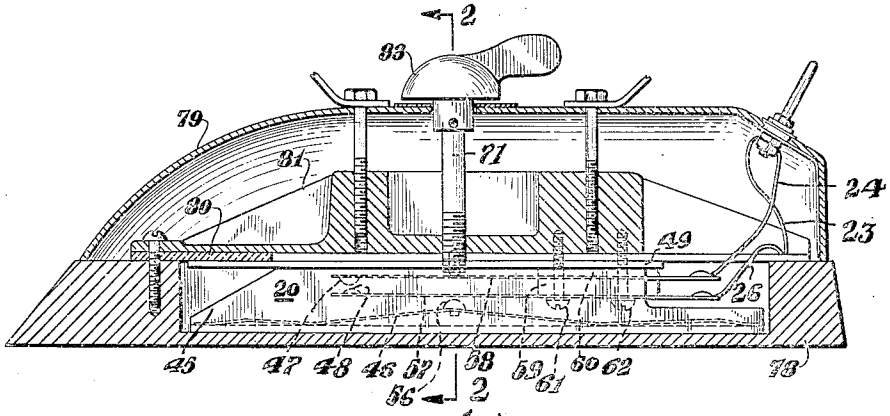


Fig. 1.

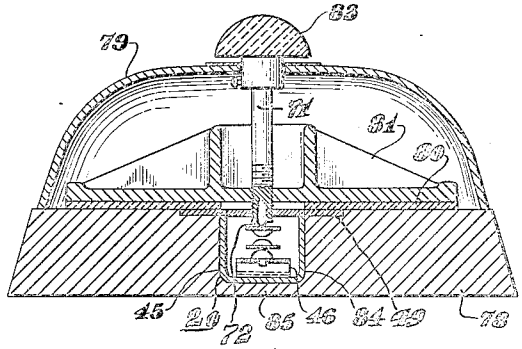


Fig. 2

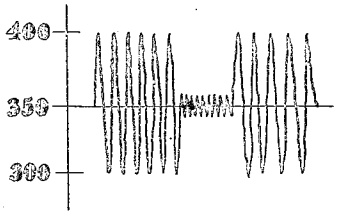


Fig. 3.

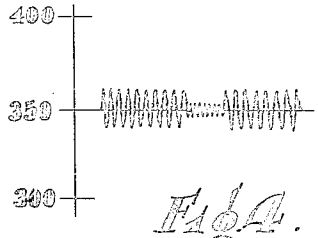


Fig. 4.

INVENTOR.
William A. Barnes.

BY

Woodling & Kroat.
ATTORNEY.

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2,296,591

THERMOSTATICALLY CONTROLLED ELECTRIC IRON

William A. Barnes, Evansville, Ind., assignor to Dominion Electrical Manufacturing, Inc.

Original application January 31, 1938, Serial No. 187,883. Divided and this application July 19, 1940, Serial No. 346,430

7 Claims. (Cl. 219—25)

This application is a division of my application Serial No. 187,883, filed January 31, 1938, for Temperature responsive device.

My invention relates in general to electric irons and more particularly thermostatically controlled electric irons.

An object of my invention is the provision of utilizing my temperature responsive device in an electric iron in which the temperature responsive device is positioned in a depressed portion in the base of the electric iron, so that the control of the energization of the heating element of the iron is governed in accordance with a temperature gradient less than that of the entire base plate of the iron to minimize the differential between the high and low peak of the ironing temperature.

Another object of my invention is the method of automatically supplying heat to an electric iron, in which the maximum and minimum temperatures of the ironing surface are governed in accordance with a temperature gradient less than that of the entire base plate of the iron.

A further object of my invention is to provide an electric iron having a base plate of high thermal capacity and having a depressed portion therein in which is mounted a thermostat to govern the supply of heat to the base plate substantially in accordance with the demands of the bottom of the base plate.

Another object of my invention is to provide an electric iron having a relatively thick base plate in which the supply of heat to the base plate is regulated substantially in accordance with the demand of the bottom of the base plate.

Still another object of my invention is to provide an electric iron having a thick base plate which comprises a reservoir for supplying heat to the bottom of the iron and which has a thermostat comprising metallic elements of different coefficient of expansions with their ends joined, mounted with freedom of movement throughout its entire length in a depression in the base plate for regulating the supply of heat to the reservoir substantially in accordance with the demand of the bottom of the iron.

A further object of my invention is to prevent wide variations in the temperature of the bottom of an iron by providing a heat reservoir for supplying heat to the bottom of the iron and by regulating the flow of heat to the reservoir in accordance with relatively small variations in the temperature of the bottom of the iron.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which like parts are designated by like reference characters, and in which:

Figure 1 shows a longitudinal cross-sectional view of an electric iron employing my temperature device mounted in a depressed portion of the base plate of the iron;

Figure 2 shows a transverse cross-sectional view of my iron, taken along the line 2—2 of Figure 1;

Figure 3 shows a graph representing the high and low peak of the ironing temperature of an iron, in which the differential between the high and low temperature peaks are relatively wide; and

Figure 4 is a graph similar to Figure 3, in which the differential between the high and low peaks of the ironing temperature is reduced to a low minimum.

In Figures 1 and 2, I show a temperature responsive device 20 mounted in an electric iron having a base plate 78 and a shell 79. An extended heating element 80 is positioned on top of the base plate 78 and is held in position by means of a clamping plate 81. The adjustment of the temperature responsive device may be effected by a temperature knob 83. As illustrated, the base plate 78 is relatively thick and possesses a relatively high thermal capacity constituting a heat storage element. The central longitudinal portion of the base plate 78 is provided with a depressed portion 84 into which my temperature responsive device 20 may be inserted. The portion 85 between the bottom of the depressed portion 84 and the bottom of the base plate 78 is relatively thin, so that my temperature responsive device is substantially directly responsive to the temperature of the material being ironed. The extended heating element 80 is in direct heat transfer engagement with the top of the base plate 76 and the heating capacity of the heating element is greater than any possible working absorption of heat from the iron in use.

The temperature responsive device 20 is the same as that shown and described in my application entitled Temperature responsive device filed on January 31, 1938, and assigned Serial No. 187,883, and from which this application was divided. The metallic elements of the temperature responsive device 20 comprise a longitudinal channel member 45 and a longitudinal crimped strip 46 having their ends joined together. As shown in Figure 2, the channel member 45 closely fits into the depressed portion 84 with freedom of movement throughout its entire length with reference to the base plate due to expansion and contraction. I preferably construct the channel member 45 of aluminum which has a relatively high coefficient of expansion and the longitudinal crimped strip 46 is preferably constructed of a piece of stainless steel which has a relatively low coefficient of expansion. As illustrated, the central portion of the longitudinal crimped strip 46 is provided with an insulated actuating mem-

ber 56 arranged to actuate a contact member 48 relative to a contact member 47. The contact member 48 is carried on the left hand end of a resilient contact finger 57 and the contact member 47 is carried on the left hand end of a resilient contact finger 58. The right hand ends of the resilient contact fingers 57 and 58 are positioned within the channel member 45 and are mounted to a supporting plate 49 by means of insulating washers 59 and 60 which are held in position by bolts 61 and 62.

The contact member 47 is arranged to be adjustably positioned with reference to the contact member 48 by means of an adjustable screw 71 threadably mounted through the clamping plate 64. The lower end of the adjustment screw 71 is recessed and provided with an insulating member 72 which directly engages the resilient contact finger 58. The adjustment screw 71 may be adjustably turned in any suitable manner and as illustrated I employ the knob 83 which may be actuated by the user to regulate the temperature of the iron.

The energization of the heating element 80 is controlled by the contacts 47 and 48 governed by the contraction and expansion of the channel member 45 and the stainless steel strip 46. When the temperature of the bottom portion of the base plate 78 exceeds a predetermined value, as determined by the setting of the adjustment screw 71, the aluminum channel member 45 expands and draws the central portion of the stainless steel strip 46 downwardly and thereby permits the contact 48 to separate from the contact 47 to de-energize the heating element 80. When the temperature of the bottom portion of the base plate 78 recedes to a predetermined low value, the aluminum channel member 45 contracts and forces the central portion of the stainless steel strip upwardly and causes the contact 48 to engage the contact 47 which closes the circuit for energizing the heating element 80. When the circuit is closed, the flow of the current may be traced from one terminal through a conductor 23, the heating element 80, a conductor 26, the resilient contact finger 57, the contacts 48 and 47, the resilient finger 58, and a conductor 24 to the other terminal.

The supporting plate 49 which is secured to the upper edges of the sides of the channel 45 provides a shield or screen so that the heat from the heating element does not directly effect my responsive device 20. By mounting my temperature responsive device 20 in the bottom of the depressed portion 84, I thereby provide for controlling the energization of the heating element in accordance with a temperature gradient less than that of the entire base plate to minimize the differential between the high and low peaks of the ironing temperature. In other words, when the bottom of the base plate reaches a predetermined maximum temperature, my temperature responsive device deenergizes the heating element in accordance with a temperature gradient less than that of the entire base plate, but when the ironing surface recedes to a predetermined minimum temperature, my temperature responsive device restores the application of heat in accordance with a temperature gradient less than that of the entire base plate. If the entire base plate were as thin as the portion 85, the differential between the high and low peaks of the ironing temperature would be quite large, as illustrated in Figure 3, in which the peak periods having the larger temperature differential designates the temperature characteristic while ironing damp material and the peak periods having the smaller temperature differential designates the temperature characteristic during idling. However, by employing a base plate of relatively high thermal capacity, the differential between the high and low peaks of the ironing temperatures is reduced or stabilized because the capacity of the thick base plate smooths out the difference between the high and low temperatures. In order words, in my embodiment, I obtain the quick responsiveness of a thin base plate and the smoothness of a thick base plate, as shown in Figure 4.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, the element having the higher coefficient of expansion rigidly engaging the bottom of the depressed portion and being directly responsive to the temperature of the thin portion of the base plate between the bottom of the depressed portion and the bottom of the base plate, an extended electric heating element in direct heat-transferring engagement with the base plate, means for screening the heat responsive device from direct heating effect of the heating element, the heat capacity of said element being greater than any possible working absorption of heat from the iron in use, and means for causing the temperature responsive device to control the energization of the heating element in accordance with a temperature gradient less than that of the entire base plate to minimize the differential between the high and low peaks of the ironing temperature.

2. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, the element having the higher coefficient of expansion at all times rigidly engaging the bottom and sides of the depressed portion and being directly responsive to the temperature of the thin portion of the base plate between the bottom of the depressed portion and the bottom of the base plate, an extended electric heating element in direct heat-transferring engagement with the base plate, means for screening the heat responsive device from direct heating effect of the heating element, the heat capacity of said element being greater than any possible working absorption of heat from the iron in use, and means for causing the temperature responsive device to control the energization of the heat-

ing element in accordance with a temperature gradient less than that of the entire base plate to minimize the differential between the high and low peaks of the ironing temperature.

3. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, the element having the higher coefficient of expansion at all times rigidly engaging the bottom of the depressed portion and being directly responsive to the temperature of the thin portion of the base plate between the bottom of the depressed portion and the bottom of the base plate and the element having the lower coefficient of expansion at all times and substantially throughout its length being spaced from direct thermal contact with the said element having the higher coefficient of expansion and from direct thermal contact with the said base plate, an extended electric heating element in direct heat-transferring engagement with the base plate, means for screening the heat responsive device from direct heating effect of the heating element, the heat capacity of said element being greater than any possible working absorption of heat from the iron in use, and means for causing the temperature responsive device to control the energization of the heating element in accordance with a temperature gradient less than that of the entire base plate to minimize the differential between the high and low peaks of the ironing temperature.

4. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, the element having the higher coefficient of expansion engaging the bottom of the depressed portion substantially throughout its length and having upwardly turned edges to give rigidity to the said element and insure contact with the said bottom whereby said element is at all times and throughout its entire length directly responsive to the temperature of the thin portion of the base plate, an electric heating element in heat-transferring engagement with the base plate, and means for causing the temperature responsive device to control the energization of the heating element in accordance with the demands of the base plate as evidenced by the temperature change at the thin portion thereof.

5. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, said elements having their ends attached together and being shorter than the length of the depressed portion, said temperature responsive device being free to expand and contract longitudinally within the said depressed portion, the element having the higher coefficient of expansion engaging the bottom of the depressed portion substantially throughout its length and having upwardly turned edges to give rigidity to the said element and insure contact with the said bottom whereby said element is at all times and throughout its entire length directly responsive to the temperature of the thin portion of the base plate, an electric heating element in heat-transferring engagement with the base plate, and means for causing the temperature responsive device to control the energization of the heating element in accordance with the demands of the base plate as evidenced by the temperature change at the thin portion thereof.

6. An automatic electric iron comprising, in combination, a thick base plate constituting a heat storage element, shell means above and attached to said base plate, an electric heating element in heat transfer relationship with said base plate, means for supplying electric current to said heating element, said base plate having a depressed portion therein establishing a thin portion in the said base plate between the bottom of the depressed portion and the bottom of the base plate, and thermostatic means in said depressed portion adapted to regulate the flow of electricity from said supply means to said heating element in accordance with the demands of the base plate as evidenced by the temperature change at the thin portion of the base plate, said thermostatic means comprising two metallic elements with different coefficients of expansion and having their ends secured together and the element having the higher coefficient of expansion being free upon expansion and contraction to move with respect to the said base plate and engaging the bottom of the depressed portion substantially throughout its length.

7. An automatic electric iron having a base plate of relatively high thermal capacity constituting a heat storage element, said base plate having a depressed portion therein, the thickness between the bottom of the depressed portion and the bottom of the base plate being relatively small, a temperature responsive device comprising metallic elements having different coefficients of expansion mounted in the depressed portion, the element having the higher coefficient of expansion engaging the bottom of the depressed portion substantially throughout its length and having upwardly disposed means to give rigidity to the said element and insure contact with the said bottom whereby said element is at all times and throughout its entire length directly responsive to the temperature of the thin portion of the base plate, an electric heating element in heat-transferring engagement with the base plate, and means for causing the temperature responsive device to control the energization of the heating element in accordance with the demands of the base plate as evidenced by the temperature change at the thin portion thereof.

WILLIAM A. BARNES.