May 30, 1933. H. FRANK ET AL 1,911,272

ELECTRIC HEATING DEVICE

Filed Dec. 16, 1929 2 Sheets-Sheet 1

Fig. 1.

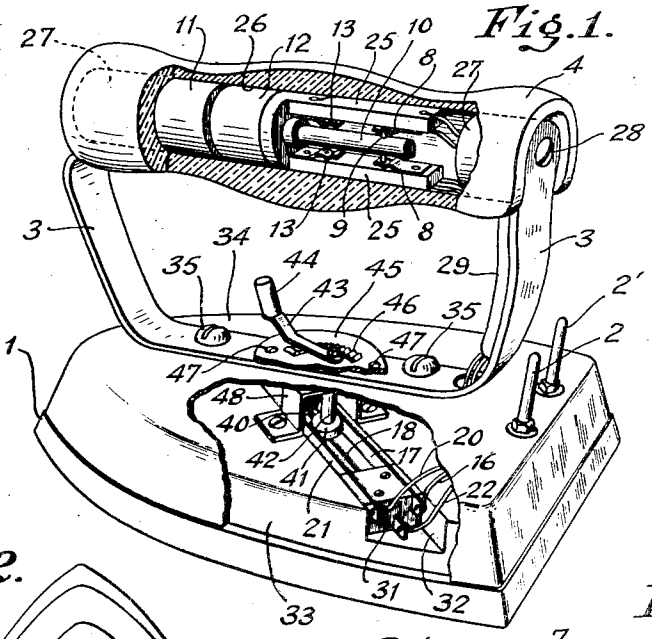


Fig. 2.

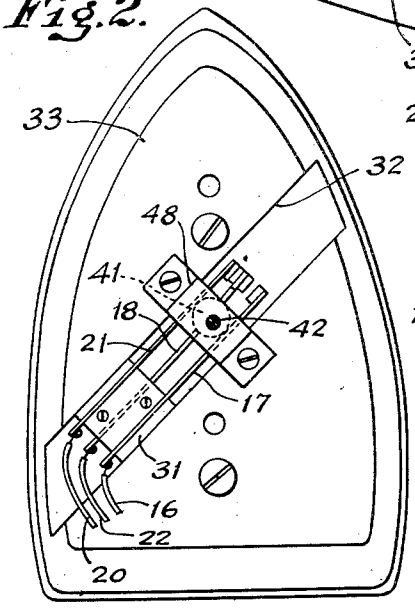


Fig. 3.

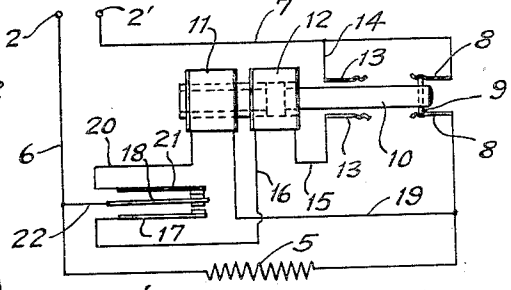
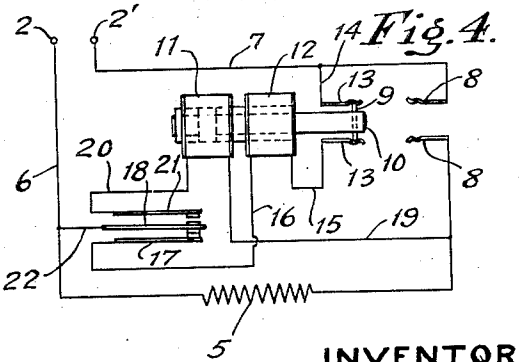


Fig. 4.



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Fig.5.

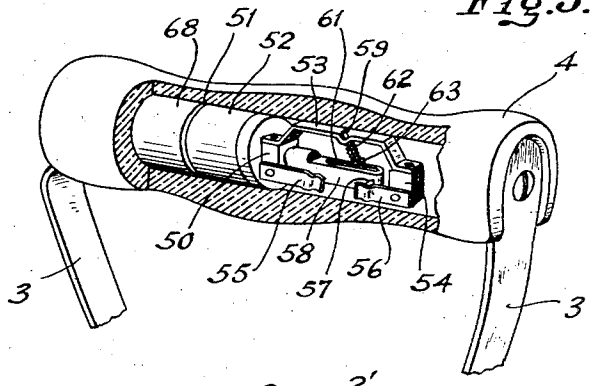


Fig.6.

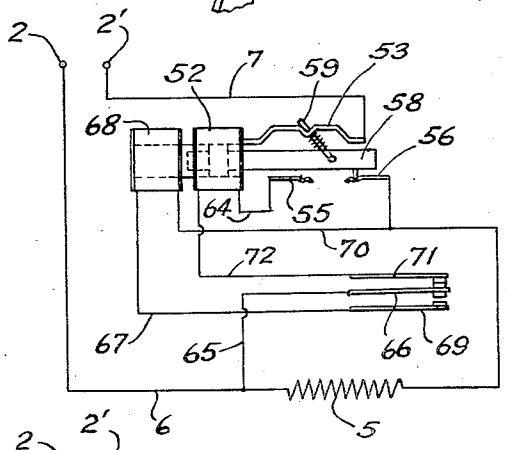
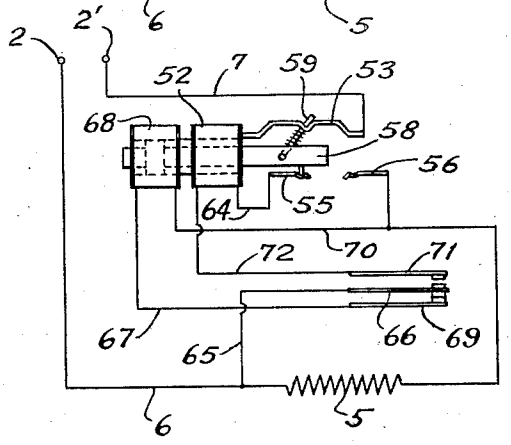


Fig.7.



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UNITED STATES PATENT OFFICE

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ELECTRIC HEATING DEVICE

Application filed December 16, 1929. Serial No. 414,486.

This invention relates to electric heating devices.

It has for its object to provide an improved heating device, and more particularly an improved electric heating device of the automatic type adapted to connect or disconnect the device from the line when the temperature drops below or exceeds predetermined limits. A further object of the same is to provide such a device wherein the control means utilizes only a small part of the current applied to the device, in such manner as to eliminate arcing and corroding of the contact parts and to obtain a closer control than is otherwise possible. A further object of the invention is to provide such an improved automatic control means wherein the same is adjustable and adapted to be set to maintain various predetermined temperatures of the device to be heated. A still further object of the invention is to provide improved control mechanism including improved circuit making and breaking mechanism and improved cooperating thermostatically controlled mechanism and in which said mechanisms are connected and arranged in an improved manner and also disposed with respect to the article to be heated in an improved arrangement. A more specific object of the invention is to provide an improved automatic flat iron having control means of the character set forth and having the elements of the control means disposed in an improved manner, with certain of the same within the handle of the iron and others of the same in such position as to be readily operable for adjustment by the hand of the operator on the handle. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings are shown, for purposes of illustration, two embodiments which the invention may assume in practice, the same being shown as applied to a flat iron, although it will be understood that the invention is not limited to irons.

In these drawings,—

Figure 1 is a perspective view of an iron equipped with this improvement, certain parts being broken away to facilitate illustration;

Fig. 2 is a plan view of the iron with the upper parts removed;

Fig. 3 is a diagram of the circuit connections, with the thermostat in one position;

Fig. 4 is a similar diagram showing the thermostat in another position;

Fig. 5 is a detail perspective view of an iron handle, partially in section, showing a modified form of the circuit making or breaking means;

Fig. 6 is a diagram of the circuit connections used with such a construction, showing the thermostat in one position, and

Fig. 7 is a similar diagram showing the thermostat in another position.

Referring first to the illustrative construction shown in Figs. 1 to 4, it will be noted that the flat iron 1 has usual terminals 2 and 2′, handle supports 3, and handle 4, and that it is provided with improved thermostatic control means operative and connected in an improved manner to control the circuit of its heating element 5 as hereinafter described.

Referring more particularly to Figs. 3 and 4, it will be observed that the terminals 2 and 2′ are connected to the heating element 5 through conductors 6 and 7. Each of the latter is connected to a resilient contact 8. These contacts 8 are adapted to be bridged by a contact member 9 carried on a suitable solenoid core or plunger 10. This plunger 10 is in turn actuated in opposite directions by coils 11 and 12. Thus, when one coil is supplied with current the member 9 and plunger 10 move from the position illustrated in Fig. 3, wherein the former engages the contacts 8 and closes the main circuit, to the position illustrated in Fig. 4, wherein the member 9 bridges the circuit between similar contacts 13, while when the other coil is energized the member 10 is moved

reversely. Herein it will also be noted that one of the contacts 13 is connected through a conductor 14 with the conductor 7, while the other is connected through a conductor 15 with the coil 12. The latter coil is also connected through a conductor 16 with a resilient contact carrying member 17 adapted to cooperate with a thermostat member 18 carrying contacts on each side thereof. The coil 11 is also connected by a conductor 19 with the conductor 6 at a point between the heating element 5 and one of the contacts 8, while the coil 11 is also connected by a conductor 20 with a resilient contact carrying member 21, likewise adapted to cooperate with the contact carrying thermostat member 18. Attention is also directed to the fact that this member 18 is connected by a conductor 22 with the conductor 6 at a point between the heating element 5 and the terminal 2.

Thus, it will be evident that when the parts are in the position shown in Fig. 4, the circuit between the contacts 8 will be open, and the thermostatic contact carrying member 18 will have its contact in engagement with the contact carried on the member 17, i. e. the parts are in the position which they will assume when the device is cold. Current will flow, however, whenever the terminals 2 and 2′ are connected to the line, as by a plug, from, let us say, the terminal 2 through the conductor 6, the conductor 22, the thermostatic contact carrying member 18, the cooperating contact carrying member 17, the conductor 16, the coil 12, the conductor 15, the contact 13, the bridging contact 9, the cooperating contact 13, and the conductors 14 and 7, to the terminal 2′. Thus, while the contact on the member 18 remains in the position indicated, the coil 12 will be energized momentarily in such manner as to kick the plunger 10 from the position shown in Fig. 4 to the position shown in Fig. 3, wherein its bridging member 9 closes the main circuit between the contacts 8. When this occurs, the current will flow through the main circuit including the conductors 6 and the heating element 5. Should, however, the temperature of the device increase to a sufficient degree, the thermostat 18 will move from the position shown in Fig. 4 to the position shown in Fig. 3, in such manner as then to close the circuit through the coil 11 and thereby cause the contact carrying member 10 to be kicked from the position shown in Fig. 3 to the position shown in Fig. 4 and break the main circuit at the contacts 8 preparatory to further current flow through the circuit first described. Thus, it will be evident that the device will function repeatedly to make and break the main circuit at the contacts 8 in accordance with the temperature of the device to be controlled, the same thus being adapted, through successive making and breaking of the circuit when the temperature falls below or rises above predetermined limits, to maintain the desired temperature.

In applying the invention to an electric flat iron, the coils 11 and 12 and the circuit making an breaking contacts 8, 9 and 13 are preferably disposed in the handle 4 of the iron. Herein, the coils 11 and 12 and cooperating contact carrying side members 25 extending from the coils on opposite sides of the plunger 10, are formed in a single unit insertible endwise in a suitable chamber 26 formed in the handle 4 of the iron between the supports 3. Further, the construction is preferably such that the contacts 8 and 13 are disposed inside the members 25 in such manner as to be protected thereby, and the members 25 and the handle 4 are formed of insulating material in such manner as to eliminate any danger to the operator grasping the handle. It will also be noted that the chamber 26 is open at its ends, and that it carries end members 27 of insulating material which fit in its ends and position the unit and are adapted to receive screws 28 extending through the handle supports 3 and thus provide a sturdy construction of usual external appearance. The conductors, which in this construction include the conductors 6, 7, 20 and 16, also extend downward from the handle 4 to the body of the iron inside one of the supports 3 and are also suitably insulated, as by enclosing them, herein in a suitable insulating sheath 29.

In the body of the iron is preferably the thermostatic control means, herein the members 17, 18 and 21 being mounted on a suitable insulating support 31 in an angularly disposed slot 32 in the cover plate 33, disposed above the resistance element 5 in a well-known manner, the conductors 20 and 16 preferably being connected to their contact carrying members in one end of the slot, while the conductor 22 leading to the line conductor 6 is connected to its terminal 2. Thus, it will be evident that the thermostat member and its cooperating contacts are disposed in close proximity to the heating element 5 in such manner as to be responsive to changes in temperature of the latter. Moreover, it will be observed that the casing 34, which is, as usual, preferably held on by the usual screws 35 holding on the handle supports 3, may be removed to permit access to these elements.

While it will be evident that the construction may be used to operate a thermostat over a limited range in order to maintain approximately a single desired temperature, it is also desirable to enable the temperature range to be adjusted to meet different conditions. To permit this, it will be noted that adjusting means are provided adapted to engage the contact carrying members 17 and 21 and vary their position relative to the thermostatic contact carrying member 18 so that the temperature required to bring the member 18

into engagement with these members may be varied, and consequently different operating temperature ranges be maintained. In the present construction, the member 18 is disposed below the members 17 and 21 and is provided with an upwardly extending neck or portion 40 thereon which carries contacts on the opposite sides of its upper end adapted to engage the contacts on the members 17 and 21. Moreover, it will be noted that an eccentric 41, preferably of insulating material and suitably journaled in the casing 34 on a shaft 42 is so disposed that in different positions of the shaft the eccentric will engage and press the resilient members 17 and 21 into different positions relative to the member 18 to obtain the variations in temperature referred to above.

It will be obvious that various means of supporting this eccentric may be used, but herein it will be noted that the shaft 42 carrying the same, in turn carries on its upper end an adjusting member or pointer 43 of suitable form, herein in the form of a handle having an insulated grasping portion 44 and movable relative to a dial 45 having suitable graduations 46 thereon, and suitably attached, as at 47, to the handle supports 3 between the screws 35. It will also be noted that herein a supplemental journal beneath the casing 34 is provided by a bracket 48 suitably supported on the member 33. Thus it will be evident that by a suitable adjustment of the member 43 the maximum temperature to be maintained may be varied by varying the position of the eccentric 41, and consequently of the members 17 and 21 relative to the thermostat 18; while it will be evident that these members 17 and 21, being of resilient material and bearing against the eccentric, will move together and follow the eccentric whenever the latter is rotated.

In Figs. 5 to 7, a modified construction is illustrated, wherein instead of relying simply upon the kicking action of the coils, a snap switch mechanism is included in the unit carried in the handle 4. Referring more particularly to the switch mechanism, it will be noted that a suitable block 50 is carried at the end of the coil unit 51 adjacent the coil 52 and connected by a bridge 53 to a cooperating block 54, and that spring contacts 55 and 56 are carried on the blocks 50 and 54, respectively, which are engagable successively by a contact 57 carried on a conducting plunger 58, while a spring connected throwing member 59 is disposed in a suitable aperture or depression 60 in the member 53 and has its inner end connected to the contact 57 and movable in a slot 61 in the plunger 58, while a spring 62 between the member 53 and a washer 63 and surrounding the member 59 acts to assist the throwing operation. In this construction, attention is directed to the fact that the conductor 7 is connected directly to the member 53 and, through the member 59 and contact 56, successively connected to engage the contact 56 which is connected to the conductor 6, or the contact 55 which is connected to the coil 52 by a conductor 64; while a conductor 65 connects the conductor 6 to the thermostat member 66 and a conductor 67 connects coil 68 with the contact carrying member 69, and this coil 68 is also connected to the conductor 6 by a conductor 70, while the other coil, 52 is connected to the contact carrying member 71 by a conductor 72.

As a result of this improvement, it will be noted that the full current required to energize the heating element is not carried through the controlling mechanism, and that, as a result, arcing and corroding of the control parts in such manner as to make them unreliable and unsafe is eliminated, at the same time that a much more close control is possible than with control devices using a full flow of current through the controlling mechanism. It will also be evident that when the desired temperature is reached, the thermostat causes only a small amount of current to flow through one coil of the solenoid in such manner as to throw the switch and open the main circuit, and that is soon as the device cools below the desired temperature the thermostat acts to direct a small amount of current through the oppositely wound and acting coil to cause the switch to be thrown to close the main circuit and thus again reheat the device to the desired temperature. In practice, the variation from the desired heat is so small as to be practically unnoticeable. Attention is further directed to the convenient disposition of the parts including the switch controlling coils and the thermostat adjusting means, whereby all parts of the control mechanism are rendered conveniently accessible and the construction is also made such as, while possessing the advantages above set forth, to enable the iron to have the appearance of an ordinary iron of the automatic or adjustable type. These and other advantages of the improvement will, however, be clearly apparent to those skilled in the art.

While this application specifically describes two forms which the invention may assume in practice, it will be understood that these forms are shown for purposes of illustration only, and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claim.

What we claim as new and desire to secure by Letters Patent is:—

In a thermostatically controlled flat iron having a body and a handle, heating means on said body, and circuit making and breaking means controlling said heating means and disposed in said handle and removable there-

from as a unit, said unit comprising a frame carrying a plurality of controlling electromagnetic coils, a movable contact member, and a plurality of contacts engageable thereby, said contact member including an armature located within said coils.

In testimony whereof we affix our signatures.

HUGO FRANK.
RANSOM L. GALINAT.