Nov. 8, 1955 A. G. SWENSON ET AL 2,723,336

THERMOSTATICALLY CONTROLLED ELECTRIC FLATIRON OR THE LIKE

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Fig. 1.

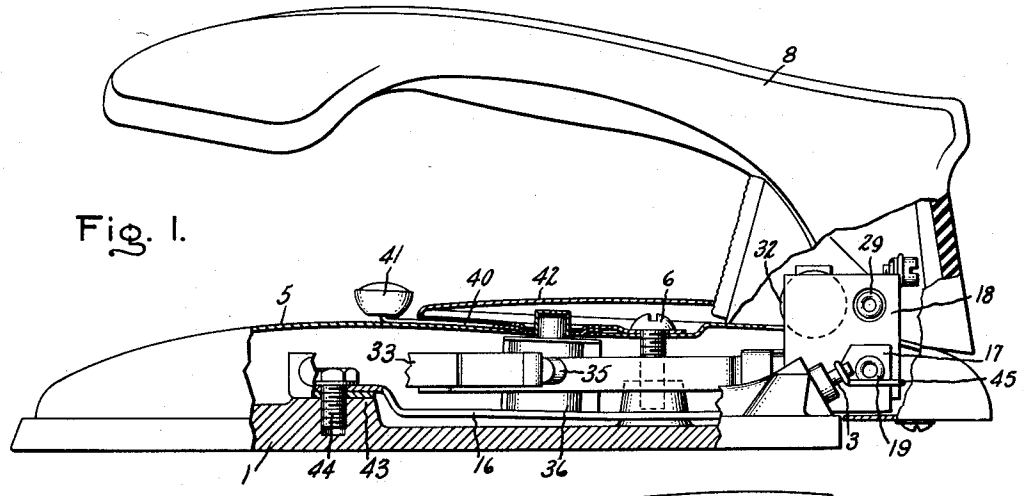


Fig. 2.

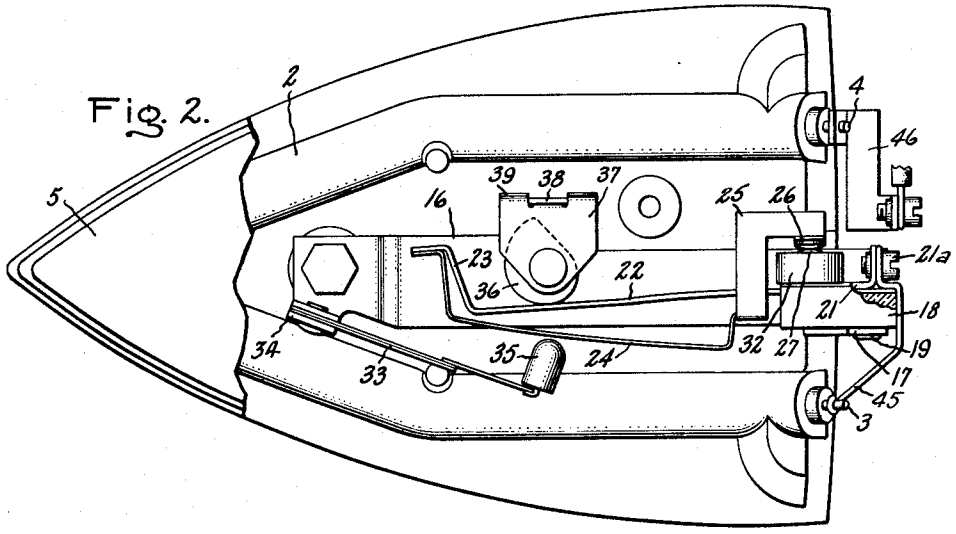


Fig. 3.

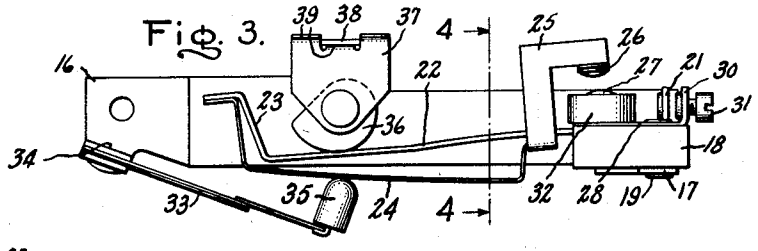


Fig. 4.

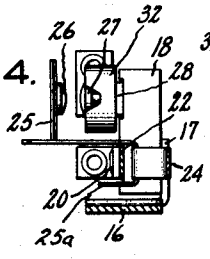
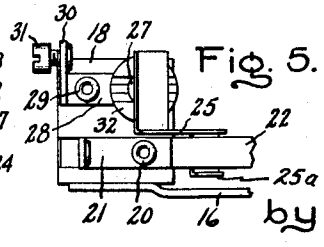


Fig. 5.



Inventors:
Alfred G. Swenson,
Frank E. Finlayson,
by Frank L. Neuhauser
Their Attorney.

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THERMOSTATICALLY CONTROLLED ELECTRIC FLATIRON OR THE LIKE

Alfred G. Swenson and Frank E. Finlayson, Ontario, Calif., assignors to General Electric Company, a corporation of New York

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15 Claims. (Cl. 219—25)

The present invention relates to electric flatirons or the like wherein an adjustable thermostat is provided for regulating the temperature of the flatiron and more particularly to the thermostat mechanism which may comprise preferably a unitary structure for mounting directly on the soleplate of the flatiron.

The primary object of the invention is to provide an improved thermostat mechanism which is simple in structure, relatively short in length whereby it is well adapted for use in small flatirons such as the so-termed "travel" flatirons, and wherein there is obtained a quick positive separation of the thermostat contacts, thus adapting the flatiron for use on direct current circuits as well as on alternating current circuits.

The invention and its advantages will be understood from the following description taken in conjunction with the accompanying drawing.

According to the invention, the thermostat mechanism comprises a spring member made up of two leaf springs which are connected together at what may be termed their outer ends and extend in generally parallel relation to each other. The spring member may be formed from a single spring strip reversely bent on itself or it may be formed from two separate leaf springs united at their outer ends by a weld, for example; and the leaf springs may be of the same or different thicknesses. When the invention is embodied in a flatiron, the other end of one leaf spring is mounted on the sole plate of the flatiron and the other end of the other leaf spring carries a contact adapted to engage with a fixed contact carried by the sole plate adjacent to the fixed end of the one leaf spring. Thus, the ends of the leaf springs which are connected together are free. For actuating the leaf spring which carries the contact to effect movement of the movable contact carried by it out of and into engagement with the fixed contact, there is provided a bimetal which is carried by the sole plate and has an actuating end which engages such leaf spring between its ends; and for varying the setting of the thermostat there is provided an adjusting member which engages the other leaf spring between its ends in opposed relation to, and preferably substantially in line with, the movable bimetal end. The adjusting member is preferably in the form of a cam which when rotated turns the one leaf spring about its fixed end as a pivot adjusting the other leaf spring with respect to the movable end of the bimetal. The several parts may be mounted on the sole plate in the desired relation to each other in any suitable manner. Preferably, however, they are mounted on the sole plate through the intermediary of a base plate. That is, the several parts are mounted on a base plate in the desired relation to each other to form unitary structure, the base plate being then attached to the sole plate. It is to be understood, however, that in its broader aspects the invention is not limited to the use of a base plate on which all the parts are mounted. A unitary structure is advantageous from a manufacturing standpoint. Preferably, the leaf springs are positioned edgewise with respect to the plane of the

sole plate and move transversely with respect thereto as this provides a thermostat mechanism of minimum vertical height, an especially desirable feature in a travel iron which should have a minimum thickness.

The specific arrangement of the two leaf springs connected together at what may be termed their outer ends and with the bimetal and the adjusting means engaging them between their ends and in opposed relation to each other is one outstanding feature of the invention, for by this arrangement there is obtained a maximum effective length of leaf spring with a minimum overall length.

In the drawing,

Fig. 1 is a side elevation, partly in section, of a flatiron embodying the invention.

Fig. 2 is a top plan view of the soleplate and thermostat.

Fig. 3 is a top plan view of the thermostat showing the thermostat contacts separated.

Fig. 4 is a sectional view taken on line 4—4, Fig. 3, the parts being turned through an angle of 90°.

Fig. 5 is a detail plan view of certain parts.

Referring to the drawing, 1 indicates the soleplate of an electric flatiron and 2 indicates the electric heating unit which is cast into the soleplate and has terminals 3 and 4 at the rear end of the flatiron. Positioned on the soleplate is a top shell 5 which may be attached to the soleplate by suitable means such as the screw 6. The handle of the flatiron is indicated at 8.

The structure so far described forms no part of the present invention. It is shown only by way of example and is to be taken as typical of any suitable flatiron structure.

The thermostat structure comprises a metal base plate or frame member 16 provided at its rear end with an angularly extending ear 17 to which a block 18 of insulating material, which may be formed from porcelain, for example, is fastened by suitable means such as rivet 19. Fastened to block 18 by a rivet 20 is a terminal 21 having an angularly bent up end provided with a tapped opening to receive a terminal screw 21*a*. Anchored on block 18 beneath terminal 21 and held by rivet 20 is a leaf spring 22 which extends along base plate 16 to a point adjacent to the forward end of the base plate, it being provided at its free end with an angularly bent portion 23 to which is attached, preferably by a weld, a second leaf spring 24 which extends back in spaced generally parallel relation to leaf spring 22 to a point adjacent to insulating block 18. Here leaf spring 24 is provided with an angularly bent end portion 25 which projects over block 18 and carries a contact 26. Leaf springs 22 and 24 form in substance a single leaf spring member which is reversely bent on itself with one end anchored to block 18 and the other end carrying a contact positioned in line with block 18. Leaf springs 22 and 24 may be of the same or different thicknesses, the thickness being such as to give the desired resiliency to the spring member. They are arranged edgewise with respect to soleplate so that in operation they move in a plane parallel to the soleplate. Contact 26 forms a movable contact which is adapted to make contact with a stationary contact 27 fixed to a line terminal 28 which in turn is fastened to block 18 by a rivet 29 and has an ear 30 provided with a tapped opening for a terminal screw 31. Surrounding contact 27 and held in place by it is a permanent magnet 32. Leaf springs 22 and 24 may be formed from nonmagnetic stainless steel. Accordingly, to provide a magnetic part for cooperating with permanent magnet 32, end portion 25 which carries contact 26 is formed from a separate strip of suitable magnetic material attached to the other portion of leaf spring 24.

End portion 25 is provided with an ear 25*a* which with the adjacent wall of end portion 25 forms an open ended

loop through which spring 22 passes (see Figs. 4 and 5). This loop serves as a guard to limit up and down travel of spring 22 to prevent the spring, which is a current carrying part, from accidentally contacting top shell 5.

The spring member comprising leaf springs 22 and 24 is biased by its inherent resiliency to hold contact 26 in engagement with contact 27 and it is adapted to be moved to separate the contacts by a bimetallic thermostat bimetal 33 fixed to an ear 34 at the forward end of base plate 16. Bimetal 33 may be of any suitable type. In the present instance, there has been illustrated a bimetal such as that disclosed in the patent to Winborne 2,128,869, patented August 30, 1938. Attached to the free end of bimetal 33 is an insulator 35 which when the bimetal flexes due to being heated engages leaf spring 24 to effect movement of contact 26 from engagement with contact 27.

Adapted to engage leaf spring 22 to effect adjustment of the spring member is a control cam 36 formed from insulating material. Control cam 36 is pivotally mounted between base plate 16 and an ear 37 carried by the base plate, the cam being provided with trunnions which engage in openings in the base plate and the ear. Ear 37 is shown as being a separate piece of material detachably connected to a tongue 38 on base plate 16 by spring fingers 39 which engage opposite sides of tongue 38. This arrangement forms a simple easy means whereby the cam may be assembled on the base plate. The upper trunnion of cam 36 projects through an opening in top shell 5 and has attached to it an adjusting lever 40, the outer end of which is provided with a button 41. By turning lever 40 the cam can be adjusted which causes a lateral movement of leaf spring 22. Attached to top shell 5 over lever 40 is a suitable dial plate 42 on which are indicia to indicate the temperature setting of the thermostat.

The unitary thermostat structure is mounted on a boss 43 on the soleplate by a stud 44.

Terminal 3 of the heating unit is connected by a jumper wire 45 to terminal 21 and thence through leaf springs 22, 24 and contacts 26 and 27 to line terminal 28. Terminal 4 of the heating unit is connected to a line terminal 46.

In Fig. 2 movable contact 26 is shown held against stationary contact 27 with a pressure as predetermined by spring 24. The contact pressure is not much affected by the position of spring 22 because when spring 22 is flexed the leaf spring 24 and contact 26 tend to pivot with respect to fixed contact 27. Insulator 35 stands out of engagement with leaf spring 24. This is a heating or closed circuit position of the thermostat. As bimetal 33 heats due to heating of soleplate 1, the bimetal flexes toward leaf spring 24 eventually engaging the spring; and after a predetermined pressure of insulator 35 against leaf spring 24 has been built up contact 26 is moved away from contact 27. Due to permanent magnet 32 which tends to hold the contacts in engagement, the pressure built up in leaf spring 24 is sufficient to effect a quick break of the contacts with a positive snap action. At the same time a blowing out of the arc due to separation of the contacts in the field of permanent magnet 32 is effected.

When the high point of cam 36 is in engagement with leaf spring 22, contact 26 stands well away from contact 27 since leaf spring 24 is then forced down against the end of insulator 35. This corresponds to "off" position of the flatiron. As cam 36 is turned in a clockwise direction as viewed in Figs. 2 and 3, it releases pressure on leaf spring 22 eventually permitting leaf spring 24 to move from engagement with insulator 35 and contact 26 to move into engagement with contact 27. Such a position of the parts is shown in Fig. 2. It would correspond to one flatiron temperature. As soleplate 1 heats, bimetal 33 is correspondingly heated and when it reaches a predetermined temperature insulator 35 is brought into engagement with leaf spring 24 to effect movement of contact 26 away from contact 27. As already pointed out the separation of the contacts is effected with a snap action and the arc is blown out due to permanent magnet 32 thus adapting the structure for use on direct current circuits as well as on alternating current circuits. The maximum flatiron temperature setting is effected when the low portion of cam 36 is directly over leaf spring 22.

An important feature of the present invention is that of providing what is in substance a single spring member reversely bent on itself to provide two substantially parallel leaf springs connected together at their forward ends, the other end of the one leaf spring being mounted on a support, and the other end of the second leaf spring carrying the movable contact; and such spring member having the adjusting cam and the movable end of the bimetal arranged substantially opposite each other intermediate between the ends of the spring member. By this arrangement only a single spring member is utilized and at the same time a maximum effective spring length is obtained with a minimum over-all spring length, a thing especially important in a small flatiron such as a travel iron.

Another important feature of the invention resides in the use of the relatively long flexible spring 22 which extends lengthwise of the flatiron in combination with the permanent magnet.

The use of a long flexible spring in combination with the magnet results in a construction which effects opening of the contacts with a very definite snap action with a relatively small build-up of force by the thermostat on the spring; and the use of the magnet performs the further function of magnetically blowing out the arc which means that the thermostat may be operated without a wide separation of the contacts.

The arrangement of springs 22, 24 edgewise with respect to soleplate 1 has the advantage that it results in a structure of minimum vertical height, a thing especially advantageous in a small flatiron such as a travel iron; and also the advantage that there is less tendency for the contacts to bounce during use of the flatiron than would be the case were the springs arranged flatwise with respect to the soleplate so their movement was in a vertical direction. This is especially important in a structure such as the present one where the springs are relatively long and flexible, a thing which increases their tendency to bounce when the flatiron is being used.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an electric flatiron or the like, a soleplate, a first leaf spring which extends longitudinally of the soleplate, insulating means through which such leaf spring is attached at one end to the soleplate, the other end of such leaf spring being free, a fixed contact, insulating means through which the fixed contact is mounted on the soleplate adjacent to the fixed end of said first leaf spring, a second leaf spring which is attached to the free end of the first leaf spring, extends along it in generally parallel relation thereto and has at its free end a movable contact adapted to engage said fixed contact, a bimetal carried by the soleplate the free end of which is positioned to engage said second leaf spring between its ends to effect movement of said movable contact out of and into engagement with said fixed contact, and an adjusting member positioned to engage said first leaf spring between its ends to effect movement of said first leaf spring to adjust said second leaf spring with respect to said bimetal.

2. The combination defined by claim 1 wherein the point of contact between the bimetal and the second leaf spring and the point of contact between the adjusting member and the first leaf spring are substantially opposite each other.

3. The combination defined by claim 1 wherein the adjusting means for the first leaf spring comprises a

rotatable cam the active face of which engages such spring.

4. The combination defined by claim 1 wherein there is provided in connection with the fixed and movable contacts magnet means for delaying separation of the contacts until a predetermined pressure is exerted on said leaf spring by said bimetal and for blowing out the arc when the contacts separate.

5. The combination defined by claim 1 wherein at least said second leaf spring is relatively long and flexible and wherein said leaf springs are arranged edgewise with respect to the base whereby the vertical thickness of the flatiron may be made relatively small and the tendency of the springs to bounce during use of the flatiron minimized.

6. In an electric flatiron or the like, a soleplate, a base plate mounted on the soleplate and extending longitudinally thereof, a first leaf spring which extends along the base plate, insulating means through which such spring at one end is attached to the base plate, the other end of such leaf spring being free, a fixed contact, insulating means through which said fixed contact is attached to said base plate adjacent to the fixed end of said first leaf spring, a second leaf spring which is attached to the free end of said first leaf spring, extends along it in generally parallel relation thereto and has at its free end a movable contact adapted to engage said fixed contact, a bimetal carried by the soleplate the free end of which is positioned to engage said second leaf spring between its ends to effect movement of said movable contact out of and into engagement with said fixed contact, and an adjusting member carried by said base plate positioned to engage said first leaf spring between its ends to effect movement of said first leaf spring to adjust said second leaf spring with respect to said bimetal.

7. The combination defined by claim 6 wherein the adjusting means for the first leaf spring comprises a rotatable cam the active face of which engages such leaf spring.

8. A unitary thermostat structure for mounting in a flatiron or the like comprising a base plate, a first leaf spring which extends along the base plate, insulating means through which such leaf spring is mounted at one end on said base plate adjacent to an end of the base plate, the other end of such leaf spring being free, a fixed contact, insulating means through which the fixed contact is mounted on said base plate adjacent to the fixed end of said first leaf spring, a second leaf spring which is attached to the free end of said first leaf spring, extends along it in generally parallel relation thereto and has at its free end a movable contact adapted to engage said fixed contact, a bimetal carried by the base plate the free end of which is positioned to engage said second leaf spring between its ends to effect movement of said movable contact out of and into engagement with said fixed contact, and an adjusting member carried by the base plate positioned to engage said first leaf spring between its ends to effect movement of said first leaf spring to adjust said second leaf spring with respect to said bimetal.

9. The combination defined by claim 8 wherein the point of contact between the bimetal and the second leaf spring and the point of contact between the adjusting means and said first leaf spring are substantially opposite each other.

10. The combination defined by claim 8 wherein the adjusting means for the first leaf spring comprises a rotatable cam the active face of which engages such spring.

11. The combination defined by claim 8 wherein there is provided in connection with the fixed and movable contacts magnet means for delaying separation of the contacts until a predetermined pressure is exerted on said second leaf spring by said bimetal and for blowing out the arc when the contacts separate.

12. The combination defined by claim 8 wherein at least said second leaf spring is relatively long and flexible and wherein said leaf springs are arranged edgewise with respect to said base plate.

13. In an electric flatiron, a soleplate, a top shell on the soleplate, a base plate mounted on the soleplate and extending flatwise longitudinally thereof, a first leaf spring which extends along the base plate, insulating means through which such spring at one end is attached to the base plate, the other end of such leaf spring being free, a fixed contact, insulating means through which said fixed contact is attached to said base plate adjacent to the fixed end of said first leaf spring, a second leaf spring which is attached to the free end of said first leaf spring, extends along it in generally parallel relation thereto and has at its free end a movable contact adapted to engage said fixed contact, said leaf springs being positioned edgewise with respect of the plane of said base plate, a bimetal carried by the soleplate the free end of which is positioned to engage said second leaf spring between its ends to effect movement of said movable contact out of and into engagement with said fixed contact, an adjusting cam having trunnions through which it is supported on said base plate, said cam being positioned to engage said first leaf spring between its ends to effect movement of said first leaf spring to adjust said second leaf spring with respect to said bimetal, one of said trunnions projecting to a position beyond the top shell, and an operating member connected with said one trunnion for turning said cam.

14. In an electric flatiron or the like, a soleplate, a first leaf spring which extends longitudinally of the soleplate, insulating means through which such leaf spring is attached at one end to the soleplate, the other end of such leaf spring being free, a fixed contact, insulating means through which the fixed contact is mounted on the soleplate adjacent to the fixed end of said first leaf spring, a second leaf spring which is attached to the free end of the first leaf spring extends along it in generally parallel relation thereto and has at its free end a movable contact adapted to engage said fixed contact, said leaf springs being relatively long and flexible and being arranged edgewise with respect to the soleplate to minimize bounce of the springs when the flatiron is in use, a bimetal carried by the soleplate the free end of which is positioned to engage said second leaf spring to effect movement of said movable contact out of and into engagement with said fixed contact, and an adjusting member carried by said soleplate positioned to engage said first leaf spring for adjusting said second leaf spring with respect to said bimetal.

15. In an electric flatiron or the like, a soleplate, a first leaf spring extending longitudinally of said soleplate, means for fixedly supporting said first leaf spring at one end, the other end of said first leaf spring being free, a fixed contact mounted adjacent to the fixed end of the first leaf spring, a second leaf spring attached to the free end of the first leaf spring and extending along it in generally parallel relationship thereto, said second leaf spring having at its free end a movable contact adapted to engage said fixed contact, a bimetal the free end of which is positioned to engage second leaf spring between the ends to effect movement of said movable contact out of and into engagement with said fixed contact, and an adjusting member positioned to engage said first leaf spring between its ends to effect movement of said first leaf spring to adjust said second spring with respect to said bimetal, said second leaf spring including near its free end upper and lower horizontally extending portions adapted to extend respectively above and below said first leaf spring in the region of its fixed end, whereby vertical movement of said free end of second leaf spring is limited by engage-

ment of said horizontally extending portions with said first leaf spring.

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