April 16, 1946. E. K. CLARK ET AL 2,398,579

THERMOSTAT

Filed March 24, 1941 3 Sheets-Sheet 1

Fig. 1.

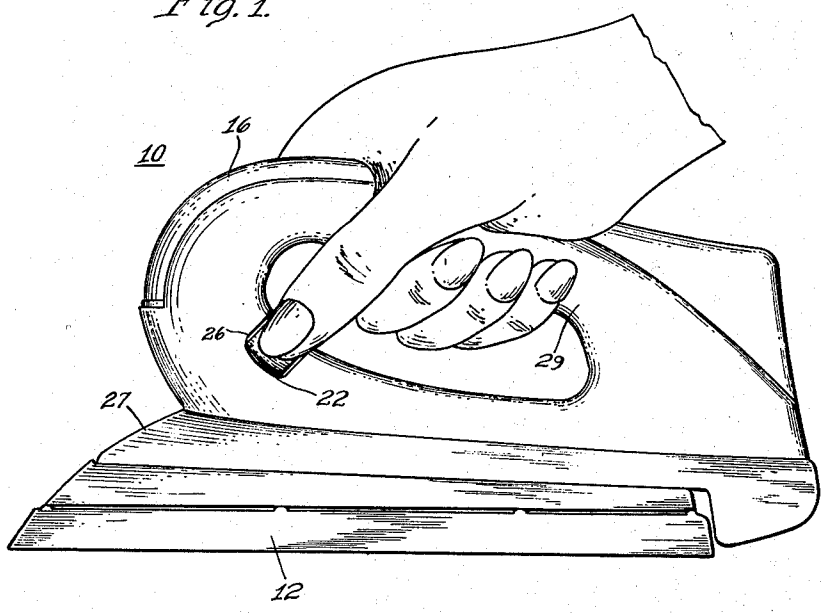
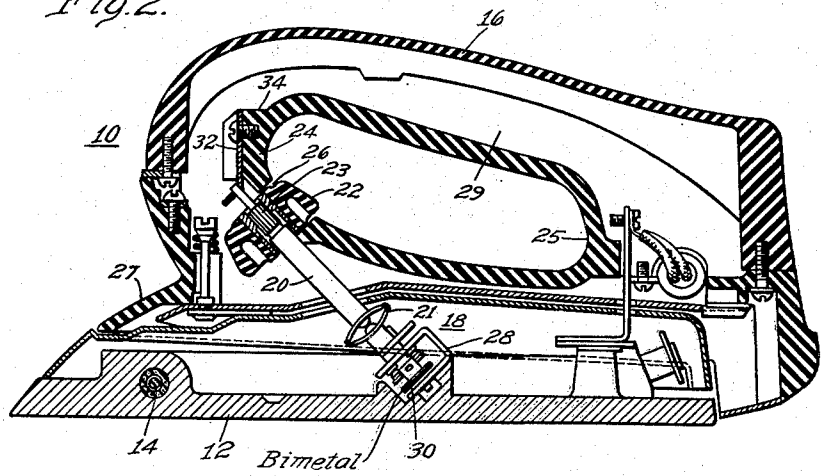


Fig. 2.



WITNESSES:

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April 16, 1946. E. K. CLARK ET AL 2,398,579

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Fig. 3.

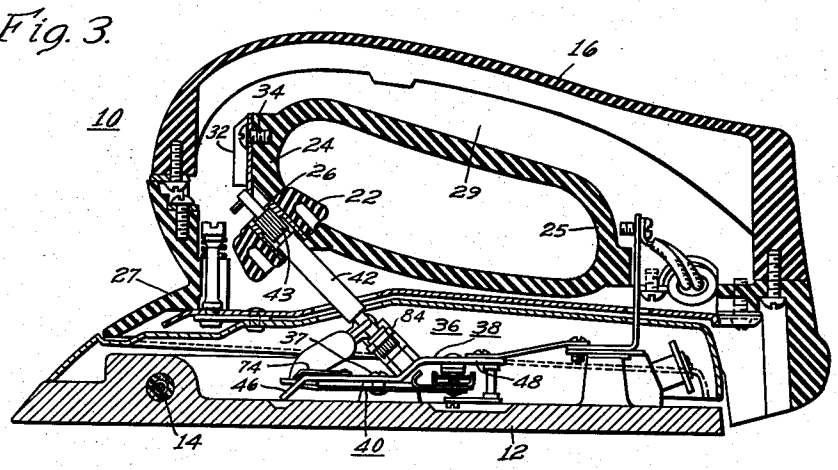


Fig. 7.

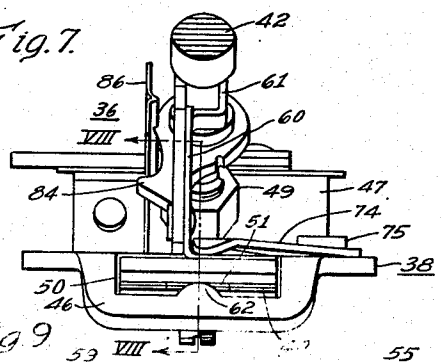


Fig. 8.

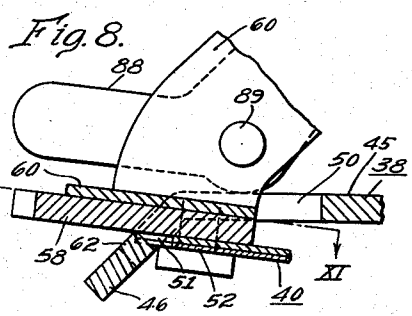


Fig. 9

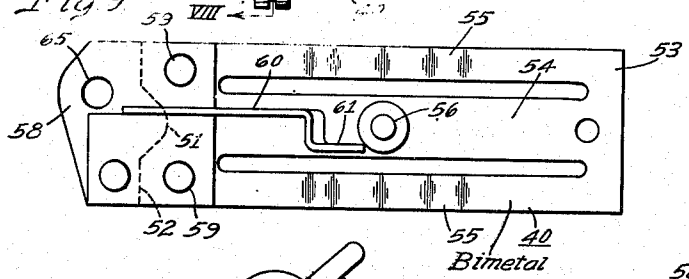


Fig. 11.

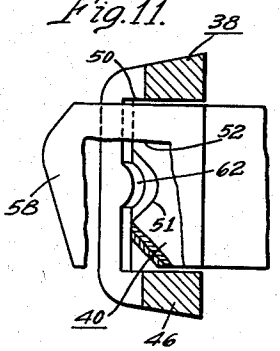


Fig. 10.

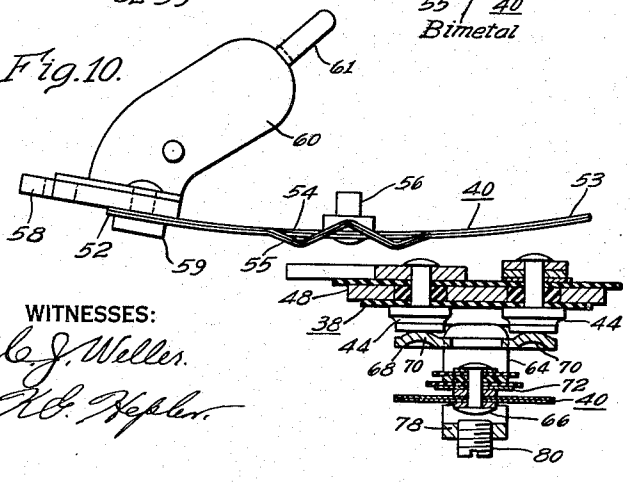


Fig. 12.

WITNESSES:

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THERMOSTAT

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Fig. 4.

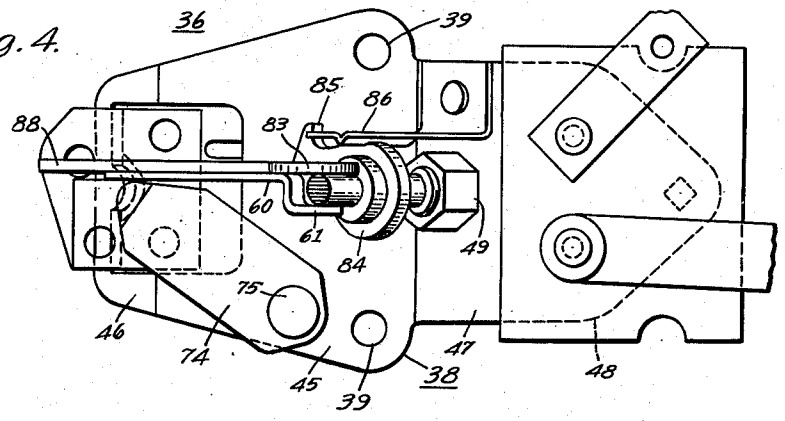


Fig. 5.

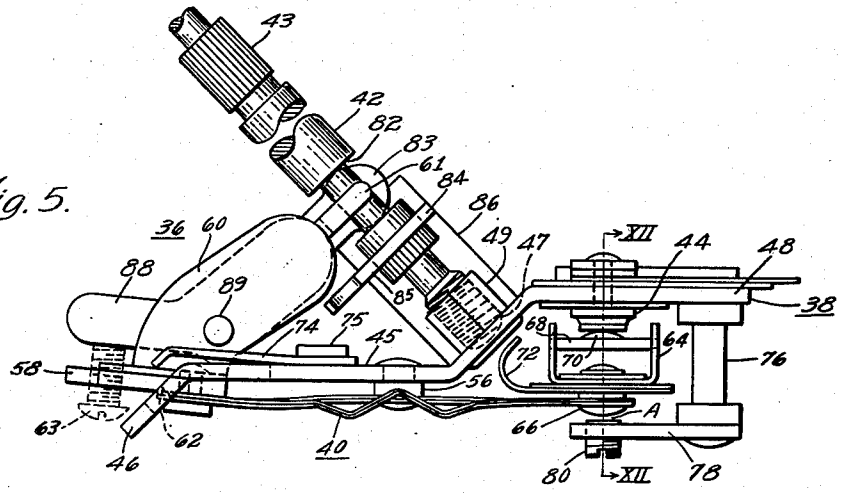
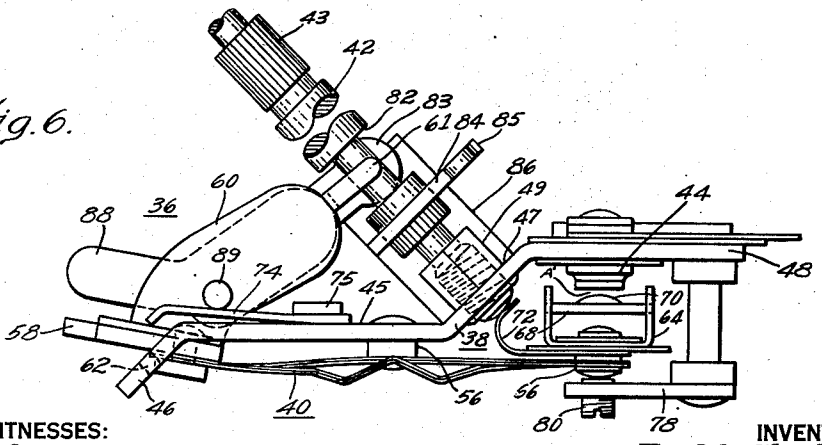


Fig. 6.



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Patented Apr. 16, 1946

2,398,579

UNITED STATES PATENT OFFICE

2,398,579

THERMOSTAT

Earl K. Clark and Joseph S. Wojcik, Mansfield, Ohio, assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application March 24, 1941, Serial No. 384,918

2 Claims. (Cl. 219—25)

Our invention relates to sadirons and, more particularly, to the control of the operating temperatures thereof.

An object of our invention is to provide an electric iron having a thermostat associated therewith for regulating the temperature output of the sole plate and having a control knob located in the handle at the point of maximum ease and quickness of operation by the operator's hand during the normal operation of the iron.

A further object of our invention is to provide an iron having a thermostatic device therein for regulating the operation thereof, said thermostat being controlled by an adjusting member which extends forwardly and upwardly so as to be inclined to the sole plate of the iron.

Another object of our invention is to provide a thermostat for an iron structure embodying a bimetallic element which may be mounted substantially parallel to the sole plate and which has an adjusting member extending forwardly and upwardly so as to be inclined to the plane of the bimetallic element and the sole plate.

Still another object of our invention is to provide a thermostat for an iron which embodies a bimetallic element fulcrumly retained by means of one end thereof by a supporting structure and which has an adjusting member inclined to the bimetallic element which in one operating position is adapted to retain the movable end of the element in an open position.

Still a further object of our invention is to provide a thermostat for an iron having a base or supporting structure which fulcrumly or rockably receives a bimetallic element and which receives an adjusting member inclined to the plane of the bimetallic element, which, in turn, actuates a member for changing the curvature of the bimetallic element by rotating such element about its fulcrum.

Still another object of our invention is to provide an efficient, rugged, inexpensive, easily manipulated and manufacturable iron thermostat which may be used as a switch without the inclusion of any additional switching means.

A further object of our invention is to provide an iron handle having upper and lower longitudinal sections joined by two vertical end sections, with a recess in the inner portion of the front end section for receiving a thermostat control knob whereby the control knob blends into the handle and is positioned at the natural finger tip of an operator.

Yet another object of our invention is to provide a thermostat having a rotatable adjusting screw with an enlarged diameter friction and stop member which is engaged by a resilient member for frictionally retarding the movement of the adjusting screw throughout a portion of its rotative movements and which is engaged by the stop member at each limit in operation of said screw for limiting the rotative movements thereof.

Other objects of our invention will either be pointed out specifically in the course of the following description of a device embodying our invention, or will be apparent from such description.

In the accompanying drawings:

Figure 1 is a side elevational view of an iron embodying our invention illustrating the ease with which the thermostat may be regulated;

Fig. 2 is a longitudinal sectional view of the device shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2 illustrating the preferred form of a thermostat associated with the iron;

Fig. 4 is an enlarged top plan view of the thermostat embodying our invention;

Fig. 5 is a side elevational view of the thermostat shown in Fig. 4 with the contacts in a closed or engaged position;

Fig. 6 is a view similar to Fig. 5 with the adjusting member retaining the thermostat in its open or contact disengaged position;

Fig. 7 is an end view of the device shown in Figs. 4 to 6, inclusive;

Fig. 8 is an enlarged fragmentary sectional view taken along the line VIII—VIII of Fig. 7;

Figs. 9 and 10 are top and side elevational views, respectively, of the bimetallic element and adjusting member attached thereto;

Fig. 11 is an enlarged fragmentary sectional view taken along the line XI—XI of Fig. 8; and

Fig. 12 is a sectional view taken along the line XII—XII of Fig. 5.

Referring in particular to Figs. 1 and 2 of the accompanying drawings, in which like reference characters indicate like parts in the several figures, we show an iron structure 10 having a working portion or sole plate 12, a heating element 14 for supplying heat thereto, a handle 16 for operating the iron, a regulating device or thermostatic structure 18 embodying an adjusting member 20 which extends forwardly and upwardly so as to be inclined to the sole plate 12, and a control knob 22 positioned within the handle 16 at the point of maximum ease and quickness of operation by the hand of an operator during the normal operation of the iron.

The iron structure 10 embodies a sole plate 12,

a heating element 14, preferably of the sheathed type and cast therein, and a handle structure 16. The handle structure 16 comprises a front depending or upstanding portion 24, a rear depending or upstanding portion 25, a skirt portion 27 joining the lower ends of said portions and extending over the sole plate 12, and an upper grip portion 29 connecting the depending portions, which is slightly inclined to receive an operator's hand with the maximum of ease during the normal operation of the iron. The front depending portion 24 is hollow for receiving, among other things, the adjusting member 20 of the thermostat 18, as hereinafter described. In addition, a notch or opening 26 is located within the inner surface of the depending portion 24 of handle 16 for receiving the control knob 22 for a purpose to be hereinafter described. The general construction of the handle and iron is more fully described and claimed in Patent No. 2,333,521, of E. K. Clark and J. R. Heilman, granted November 2, 1943, and assigned to the assignee of this invention.

The thermostat 18 embodies a supporting structure 28 and a bimetallic member 30 attached thereto. The supporting structure 28 substantially encases the bimetallic element 30 and is adapted to rigidly attach the structure to the sole plate 12 of the iron 10. The thermostatic structure 18 per se forms no part of the present invention and need not be further set forth here, being more fully described and claimed in E. K. Clark Patent No. 2,194,999, assigned to the assignee of this application.

The thermostat 18 is, in this instance, mounted at an angle to the sole plate 12, whereby the adjusting member 20 therefor is inclined to the plane of such sole plate. The adjusting member 20 is thus adapted to extend forwardly and upwardly with respect to the sole plate 12 and to extend into the depending portion 24 of the handle 16. The upper end of the adjusting member 20 is journaled within a suitable bracket 32 attached to the handle 16 by, say, a suitable screw 34. If desired, a flexible union 21 may be positioned within and along the axis of adjusting screw 20 so as to prevent any binding action between said screw 20 and the supporting structure 28. A knurled portion 23 is formed within the upper part of said screw 20 for slidably receiving the control knob 22, as hereinafter described.

The control knob 22 is positioned upon the knurled portion of the adjusting member 20 which prevents any relative rotative movement therebetween whereby said knob can rotate the adjusting member 20 in response to the rotated movements thereof. However, the cooperating knurled portions of member 20 and knob 22 permit said member 20 to slide longitudinally with respect to the knob 22 as the knob 22 rotates the member 20, it being understood that said adjusting member 20 moves along its longitudinal axis when rotated so as to vary the operations of the thermostat 18. The control knob 20 extends inwardly through the depending portion 24 of the handle 16 and is partially exposed.

It will be noted that by reason of the structural arrangement set forth, the knob 20 is located at the point of maximum ease and quickness of operation of the operator's hand. As clearly shown in Fig. 1, the thumb (or, if desired, the index finger) of the operator, without requiring any shifting of the operator's normal, comfortable grip on the handle, naturally and immediately is in a position to rotate the knob. No shifting of the operator's hand as a whole and no groping for the adjustable knob or halting the ironing operation while the operator stops to look for the knob before using the same is required, contrary to the requirements of all previous automatic irons of which we are aware. The knob 20 is thus in a position where the operator, without stopping to look and without shifting her grip, naturally and automatically places her thumb or index finger in a position to rotate the knob during the normal operations of the iron.

It will be seen that one reason for these advantages is that the plane of rotation of the knob 20 is substantially in line with the normal line of the operator's thumb when normally grasping the grip portion 25.

Our structure, therefore, not only increases the ease of manipulation of the knob but also reduces the muscular efforts of the operator since no shift of the comfortable grip is required. Further, since no delays are necessary in making thermostat adjustments, the total time of ironing a batch of goods may be reduced.

Referring in particular to Figs. 3 to 12, inclusive, we show a preferred form of a thermostat for operation in an iron in keeping with the teachings hereinabove disclosed. Said preferred thermostat 36 embodies a base 38, a bimetallic element 40, and an adjusting member 42 inclined to the plane of the bimetallic element.

The base or supporting structure 38 comprises, in this instance, an elongated irregularly formed strip of metal which insulatedly supports stationary contacts 44, fulcrumly retains a portion of the bimetallic element 40, and threadedly supports the adjusting member 42. Said base or support 38 embodies a main flat central portion 45 with a downward and outwardly extending end portion 46 at one end thereof and an upwardly substantially parallel flat portion 48 at the other end thereof, joined by an inclined portion 47. A substantially rectangularly-shaped aperture 50 is formed within the end portion 46 and the main portion 45 of the base 38 for receiving one end of the bimetallic element 40, as hereinafter described. A centrally located upwardly extending ear 62 on end portion 46 extends into the aperture 50 for fulcrumly supporting the end of the bimetallic element, as hereinafter described. In addition, an internally threaded sleeve 49 is rigidly attached to the inclined portion 47 of the base 38 intermediate the main portion 45 and the upper portion 48 so as to be inclined to the plane of the main portion. Said internally threaded member 49 receives the adjusting member 42, as hereinafter described.

The bimetallic element 40 comprises, in this instance, an elongated inherently snap-acting member having end portions 52 and 53 joined by a central strip 54 and to exterior strips 55. The end portion 52 has a centrally located notch 51 extending inwardly from the edge thereof. The exterior strips 55 are corrugated at substantially their midpoints to effectively reduce their length to make the bimetallic element 40 inherently snap-acting in keeping with the teachings of P. R. Lee, Patent No. 2,259,312, issued October 14, 1941, and assigned to the assignee of this application.

A mounting rivet 56 is rigidly attached to the mid-point of the central strip 54 and is rigidly attached to the main portion 45 of the base 38 for rigidly attaching the central strip 54 of the bimetallic element 40 to the base 38, and to main-

tain the element substantially parallel to said main portion. A fulcruming plate 58 is rigidly attached to the end portion 52 of the bimetallic element 40 by suitable rivets 59 (see Figs. 9 and 10). The plate 58 extends outwardly from the element 40 along the longitudinal axis thereof and has rigidly attached, preferably by rivet 59, to its upper surface a flanged bracket or finger-like member 60 which extends upwardly and backwardly over the element 40. An outwardly extending finger 61 integral with the upper portion of the bracket 60 is offset therefrom to cooperate with the adjusting member 42, as hereinafter described.

When the bimetallic element 40 is rigidly attached to the supporting structure by means of rivet 56, the fulcruming plate 58, attached to the end portion 52, extends outwardly through the aperture 50 in the base 38, permitting the fulcruming plate 58 to rest against the centrally located upwardly extending semi-circular ear 62. The fulcruming plate 58 is thus retained by means of substantially a point contact (see Figs. 8 and 11), due to the angular relationship between said plate and ear. Inasmuch as the end portion 52 of bimetallic element 40 has an inwardly extending notch 51 cut therein, it follows that the ear 62 engages the fulcruming plate 58 without engaging the bimetallic element 40. However, the cooperation between the ear 62 and fulcruming plate 58 is on a line passing along the end of the element 40. The element 40 is thus fulcrumly retained by the supporting structure or base 38 so as to be rotatable about an edge thereof. With the element 40 and plate 58 mounted upon the base 38 in such a manner it follows that the bracket 60, attached to the plate 58, extends above the base 38 for cooperating with the adjusting screw 42, as hereinafter described.

A resilient finger-like member 74 is rigidly attached to the main portion 45 of base 38 by means of a rivet 75. This resilient member 74 extends over the fulcruming plate 58 engaging the bracket 60 and fulcruming plate 58 so as to bias the fulcruming plate 58 into engagement with the ear 62 in the depending portion 46 of base 38. The resilient member 74 thus keeps the fulcruming plate 58 in contact with the ear 62 of base 38 at all times.

An irregularly shaped calibrating arm 88 is rotatably attached to the bracket 60 in juxtaposition therewith by means of a suitable rivet 89. The calibrating arm 88 has an outwardly extending portion 83 substantially circular in shape which is adapted to cooperate with the adjusting member 42. The diameter of the circular portion 83 is substantially equal to the length of an undercut portion 82 cut within the adjusting member, whereby said circular portion 83 is free to fit under and be actuated by the shoulder marking the end of such undercut portion 82 in the adjusting member. The longitudinal movements of adjusting member 42, responsive to its rotation within threaded sleeve 49, are then transmitted to the arm 88 through the circular portion 83.

The arm 88 thus tends to rotate about rivet 89 as an axis when the adjusting screw 42 is rotated. However, since the arm 88 is rigidly attached to the bracket 60 after the thermostat is calibrated, as hereinafter described, it follows that such longitudinal movement of the adjusting member 42 is transmitted to the bracket 60 and fulcruming plate 58, whereby the longitudinal movements of the adjusting member 42 change the angular position of the fulcruming plate 58 and end portion 52 of bimetallic element 40 with respect to the base or supporting structure 38 so as to adjust the operation of the thermostat.

A movable contact structure 64 is insulatedly attached to the second (shown as right-hand) end portion 53 of the bi-metallic element 40 by means of a suitable rivet 66. The movable contact structure 64 includes a loosely mounted bridging member 68 having upwardly extending contact portions 70 which are spherical in shape. In addition, the lower head of the rivet 66 is similarly spherical in shape. Specifically, the contact portions 70 of the bridging member 68 and the lower surface of the rivet 66 are positioned one with respect to the other so as to be segments of an identical sphere. This structure thus permits a uniform switching gap A (Fig. 5) at all operating temperatures of the bimetallic element and all angular positions of the contact end portion of the element. The contact portions 70 of the movable bridging member 68 are adapted to cooperate with the stationary contacts 44 which are insulatedly attached to the upper portion 48 of the base 38 in any well known manner. Suitable terminal members are rigidly attached to the stationary contacts 44 to permit such contacts to be connected in circuit with the iron heating element 14 and a power supply (not shown).

A horizontally-positioned J-shaped resilient member 72 is rigidly attached to the end portion 53 of bimetallic element 40 intermediate the contact portions 70 and the element 40 by means of the rivet 66. The resilient member 72 extends inwardly from the movable contact assembly 64 and curves upwardly in line with the end of the adjusting member 42 so as to contact the end of such adjusting member to permit the adjusting member to independently disengage the cooperating contacts, as is hereinafter described.

A suitable stop structure embodying a depending shaft 76 and an inwardly extending member 78 are rigidly attached to the upper portion 48 of base 38. The inwardly extending portion 78 is located at the lower end of shaft 76 and extends beneath the movable end portion 53 of element 40 substantially parallel to the portion 48 of base 38. A suitable stop screw 80 is threadedly engaged into the member 78 and is aligned with the spherical head portion of the rivet 66 so as to determine the contact gap A (Fig. 5) or the space between the rivet 66 and stop screw 80 when the thermostat is in its closed or operating position. It is to be understood that the contacts will, accordingly, have a separation A' equal to this gap when the contacts are in their open position, as illustrated in Fig. 6.

The adjusting member 42 is, in this instance, an elongated shaft-like member having a knurled upper portion 43 which receives the control knob 22 and an undercut notch portion 82 intermediate the ends thereof for receiving the bracket 60 and calibrating arm 88 for a purpose hereinafter described. The adjusting member 42 also has a threaded lower portion which is threadedly engaged within the bushing 49 so as to be threadedly supported by the base 38 and to be aligned with the J-shaped resilient member 72. In addition, since the bushing is retained at an angle to the main portion 45 of base 38 and to the element 40, the adjusting member 42 is thus retained along an axis inclined to the bimetallic element 40.

When assembling and calibrating the thermostat embodying our invention, the stationary

contacts 44 are rigidly and insulatedly attached to the lower surface of the upper end portion 48 of base 38, and the bimetallic element 40 including fulcruming plate 58 and bracket 60 are rigidly attached to the main portion 35 of base 38 by means of rivet 56 attached to the central strip. The resilient finger 74 is then rigidly attached to the base 38 to bias or retain the fulcruming plate 58 in direct contact with ear 62 at all times. The stop assembly including shaft 76, bracket 78, and stop screw 80 are likewise rigidly attached to the upper portion of base 38 and the stop screw 80 is adjusted so as to provide the desired contact gap A.

The adjusting screw member 42 is then run downwardly into the threaded sleeve member 50 until the inner end of the screw engages the J-shaped resilient member 72 so as to force the movable end 53 of the bimetallic element 40 downwardly, disengaging the cooperating contacts. A stop lug or washer-like member 84 having a radially protruding portion 85 is then fitted upon and rigidly attached to the lower portion of adjusting screw member 42 so that the protruding portion 85 of lug 84 engages a resilient stop pin 86 (Figs. 4 and 7) rigidly attached to the supporting structure or base 38. In other words, the position just described is one limit of the adjusting screw, namely, the "off" position of the thermostat. The adjusting screw 42 is then rotated back as far as it will go, such movement being limited by the stop lug 84 engaging the resilient stop bracket 86. (See Figs. 4 and 7). This position corresponds to the upper limit or "high" position of the thermostat.

The thermostat, with a calibrating screw 63 positioned through a threaded aperture 65 in fulcruming plate 58 so as to engage calibrating arm 88, is then placed within a suitable oil bath, the temperature of which corresponds to the upper or "high" setting of the thermostat. After the thermostat, including bimetallic element 40, has increased in temperature and has become stable in operation at the high value thereof, the thermostat is removed from the bath. The calibrating screw 63 threaded through fulcruming plate 58, is then run upwardly so as to engage the calibrating arm 88. A continued upward movement of the screw 63 then causes the fulcruming plate 58, attached bracket 60, and the end portion 52 of bimetallic element 40 to rotate in a counterclockwise direction about the ear 62 as a fulcrum.

The counterclockwise movement of the end portion 52 of bimetallic element 40 thus causes such element to change its curvature, since the midpoint of the central leg thereof is rigidly attached to the base 38. Upon the continued changing in curvature of element 40 due to the upward movement of calibrating screw 63, said element will snap to its closed or contact engaged position. This action determines the position of the fulcruming plate 58 and end portion 52 of element 40 for the "high" setting of the thermostat. In addition, the position of bracket 60, with respect to calibrating arm 88 and adjusting screw 42, is thus individually obtained for each thermostat. The bracket 60 and calibrating arm 88 are then spot-welded or rigidly attached together so as to permanently fix this angular position with respect to the adjusting member 42. The thermostat is thus calibrated between its manual openable or contact-disengaged position and its highest operating value, and the calibrating screw 63 may then be removed from the fulcruming plate 58 and used on further thermostatic structures. In addition, the thermostat is then calibrated throughout its entire range, permitting the adjusting screw 42 to selectively adjust the operating value of the thermostat by being rotated within sleeve 50. This rotative movement causes the adjusting member 42 to be moved along its longitudinal axis and, in turn, to rotate the fulcruming plate 58 and end portion 52 of element 40 about ear 62 through the rigidly joined calibrating arm 88 and bracket 60 so as to change the curvature of bimetallic element 40 and vary the operation thereof.

It is, therefore, obvious that the adjusting member or screw 42, inclined to the plane of the bimetallic element 40, changes the fulcruming position of the element with respect to the base 38 by means of bracket 60 and arm 88, whereby the operating temperature of the bimetallic element is selectively adjusted by means of said adjusting member. In addition, it is obvious that the adjusting member 42 by engaging the J-shaped resilient member 72 forces the element to a contact disengaged position so as to manually interrupt the circuit through the thermostat.

The thermostat 36 is rigidly attached to the sole plate 12 of the iron 10 substantially parallel thereto by means of suitable screws 37 which pass through suitable apertures 39 in the thermostat base 38 so that the bimetallic element 40 is positioned in thermal communication with the iron sole plate. The adjusting member 42 is, therefore, inclined to the bimetallic element 40 and sole plate 12 and extends upwardly into the front depending portion 24 of handle 16. The upper end of the adjusting member 42 is journaled within a suitable bracket 32 rigidly attached to the handle 16 by means of a suitable screw 34, as hereinabove described. The control knob 22 is slidably attached to the adjusting member 42 through the cooperation of the knurled portion 43 thereof. The control knob 22 thus is capable of rotating the adjusting member 42 to regulate the operations of the bimetallic element 40 through the cooperation of brackets 60 and arm 88 and permits said member to slide therethrough as it is rotated.

It, therefore, follows that an operator grasping the handle 16 of iron 10, in a normal, comfortable manner, may very readily adjust the operation of the thermostat through the inclined adjusting member 42 by merely rotating the knob by either her forefinger or thumb without shifting the position of her hand on the iron during the normal operations thereof, as previously set forth.

It, therefore, follows that the heating element of the iron is selectively adjusted by means of an adjusting member which extends forwardly and upwardly along an axis inclined to the sole plate and which has means attached thereto positioned above the front portion of the iron and within the depending front portion of the handle engageable by an operator's hand during the normal operation of said iron for selectively determining the operating temperature of the sole plate.

Various other modifications may be made in the device embodying our invention without departing from the spirit and scope thereof, and we desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and the appended claims.

We claim as our invention:

1. In a sadiron, an iron body having a sole plate, a handle attached to said iron body and

comprising a front upstanding portion, a rear upstanding portion, a grip portion and a skirt portion extending rearwardly from said front portion, said handle having an opening in its surface disposed near the inner junction of the front upstanding portion and the skirt portion, a thermostat disposed near the central portion of said sole plate for controlling the temperature of the iron body, said thermostat embodying an adjusting shaft extending along an axis inclined forwardly and upwardly from said thermostat with respect to the sole plate and terminating within the handle, and means rotatable about the axis of said shaft near the upper end of said shaft and having a rotatable surface protruding through said opening in said handle and engageable between an operator's thumb and forefinger extended from a natural gripping of said grip portion so as to be operable by one or both extended digits for selectively determining the operating temperature of the sole plate, said axis of said adjusting shaft being approximately perpendicular to a plane defined by said digits.

2. In a sadiron, an iron body having a sole plate, a handle attached to said iron body and comprising a front upstanding portion and a grip portion extending rearwardly from the upper end of said front portion, said sadiron having an opening in its surface disposed near the lower end of said front upstanding portion and on the rear or inner side thereof, a thermostat disposed near the central portion of said sole plate for controlling the temperature of the sole plate, said thermostat embodying an adjustable shaft for adjusting the temperature setting of the thermostat, said shaft extending along an axis inclined forwardly and upwardly from said thermostat with respect to the sole plate and terminating within the handle, and manually operable means rotatable about the axis of said shaft and connected to said shaft for rotating the same, said means having a portion protruding through said opening and naturally engageable by an operator's thumb while maintaining a normal, comfortable grip on said grip portion during the normal operation of the sadiron for selectively determining the operating temperature of the sole plate by movement of said means by the operator's thumb, the shaft being disposed at such an angle that the operator's thumb while so extended is disposed substantially in a plane normal to the axis of the shaft.

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