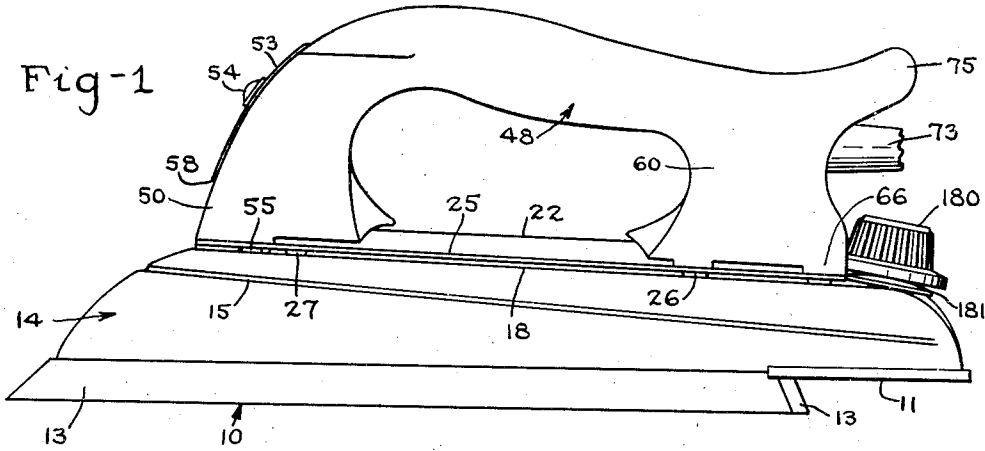
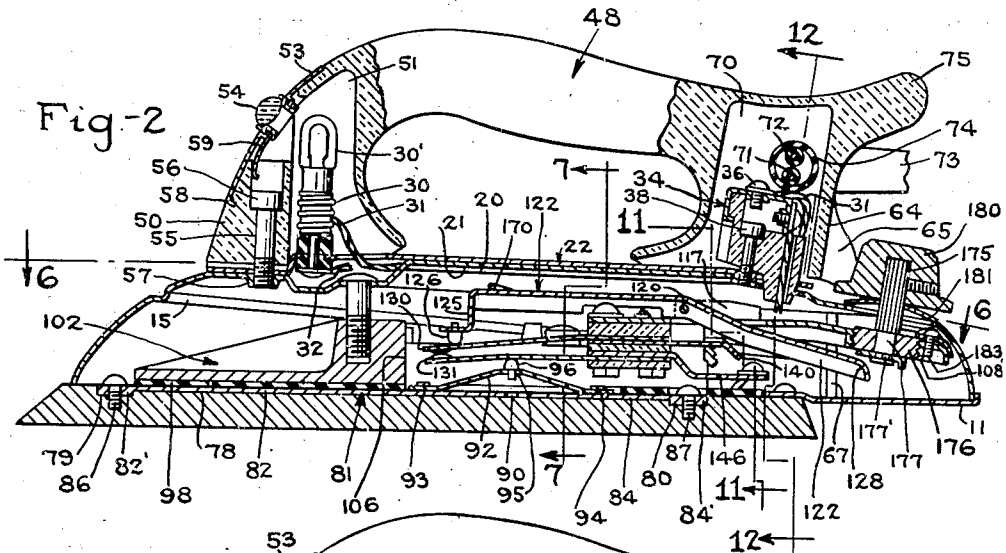
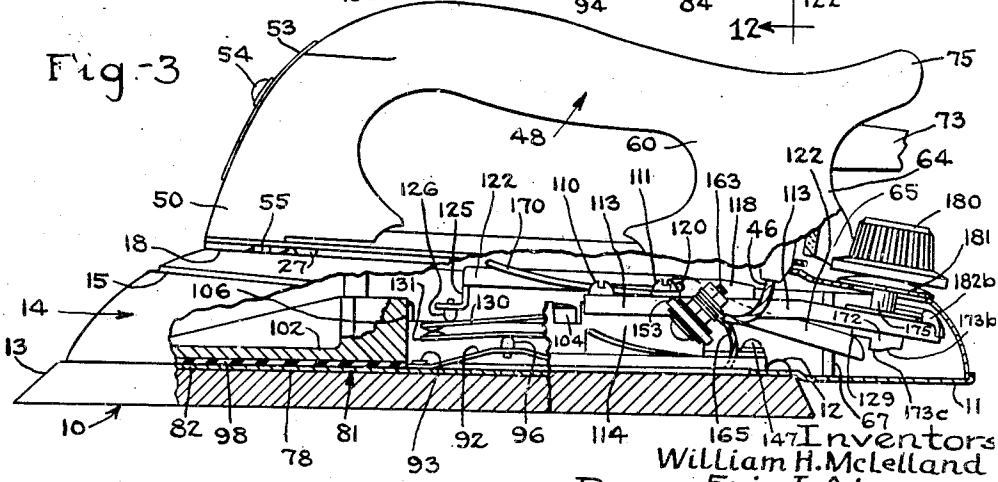


2,461,560

ELECTRIC IRON

Filed May 17, 1944

3 Sheets-Sheet 1



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2,461,560

ELECTRIC IRON

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3 Sheets-Sheet 2

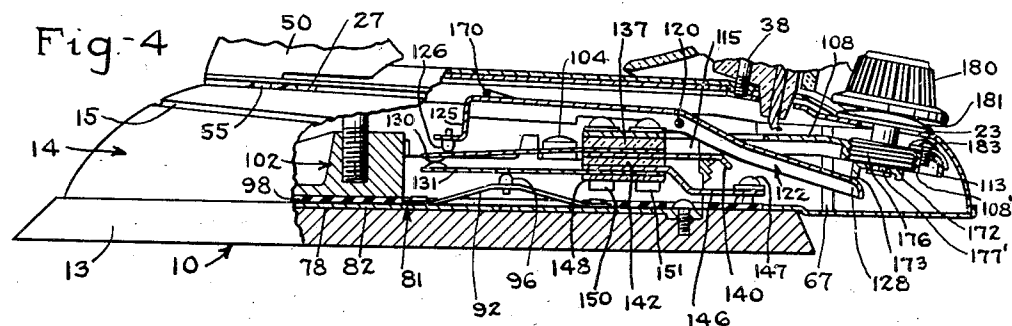
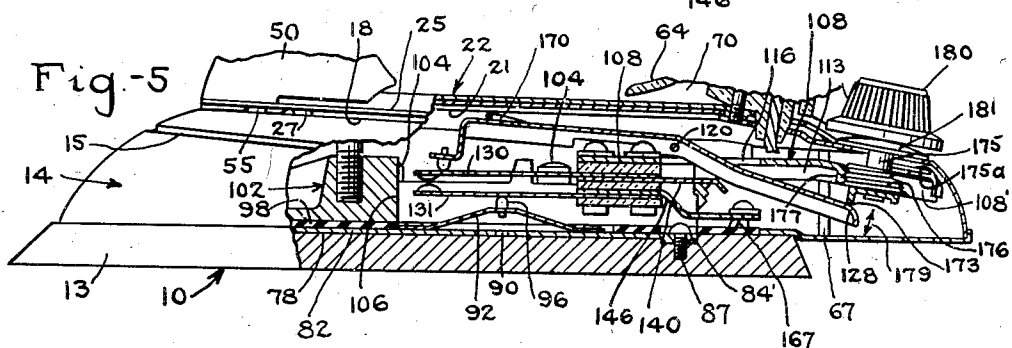
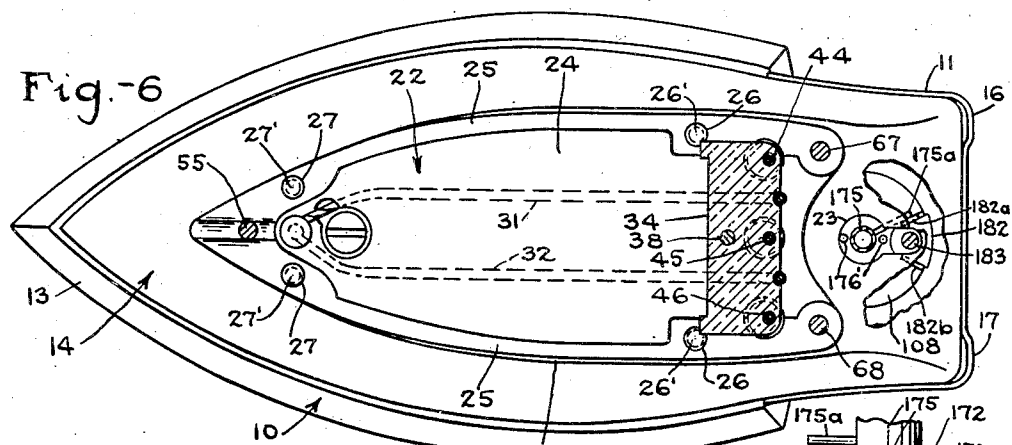
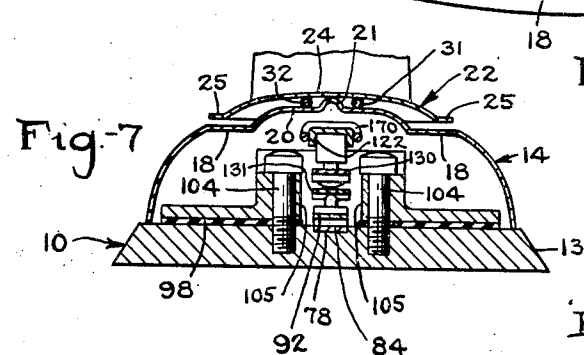
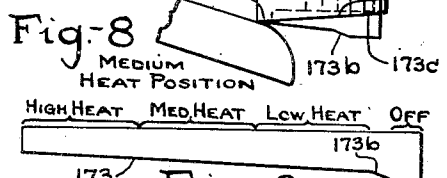
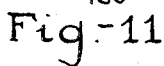
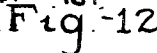
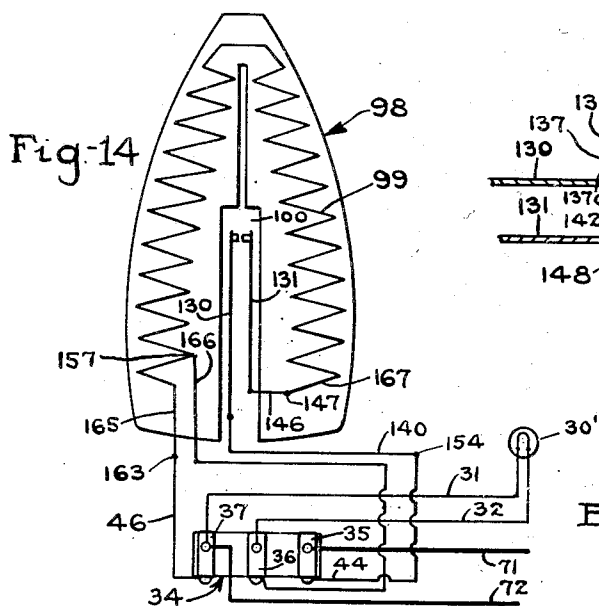
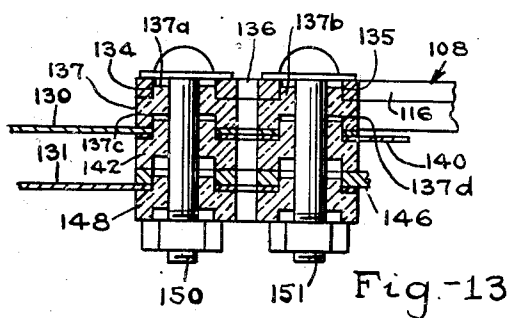


Fig-9
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,461,560

ELECTRIC IRON

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Application May 17, 1944, Serial No. 535,918

17 Claims. (Cl. 219—25)

1

This invention relates to improved sadirons of the electrically heated type and more particularly to improved thermostatic control for such irons and to electrically heated sadiron sub-assemblies.

It is an object of the invention to provide an improved control capable of operating upon small differentials of temperature and of maintaining the sole plate of the iron at any predetermined relatively constant temperature that may be selected throughout a range of temperatures. It is also an object of the invention to provide in such an electrically heated sadiron a manual control capable of varying the operating temperature of the iron and also of interrupting the operation of the iron.

It is a further object of the invention to provide an improved thermostatic control wherein the movement of the thermostatic control element is relieved during conditions of non-operation and distortion of said element is thereby prevented.

It is also an object of the invention to provide an electric sadiron sub-assembly capable of being manufactured at low cost from relatively few parts.

Other and further objects of the invention are those inherent in the apparatus herein illustrated, described and claimed.

The invention is illustrated with reference to the drawings in which corresponding numerals designate corresponding parts and in which

Figure 1 is a side elevational view of the electrically heated sadiron of the present invention;

Figure 2 is a side elevational view, partly in section, the sectioning being along a longitudinal center line of the iron showing the thermostatic control elements in the high temperature condition of operation, but with the iron cold, as when disconnected from the power source;

Figure 3 is a side elevational view broken away at two levels and partly in section indicating the interior construction of the iron;

Figure 4 is a fragmentary side elevational view, partly in section, showing the thermostatic control elements in the condition in which a relatively low temperature of sole plate operation is maintained;

Figure 5 is a view corresponding to Figure 4 except that the thermostatic control element is shown in the "off" condition (circuit interrupted);

Figure 6 is a view on the line 6—6 of Figure 2 with the handle removed and the holding screws and junction block in section;

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Figure 7 is a cross sectional view along the lines and in the direction of arrows 7—7 of Figure 2;

Figure 8 is an enlarged fragmentary view of a portion of the thermostatic control element including the manually rotated cam;

Figure 9 is a developed view of the cam of the invention;

Figure 10 is a plan view of the iron showing the handle and shell removed;

Figure 11 is a cross sectional view taken along the line and in the direction of arrows 11—11 of Figure 2;

Figure 12 is a cross sectional view taken along the line and in the direction of arrows 12—12 of Figure 2;

Figure 13 is an enlarged fragmentary view illustrating the mode of mechanically supporting and electrically insulating the electrical contact strips of the thermostatic control element; and

Figure 14 is a wiring diagram of the electrical heater element, thermostatic control and pilot lamp.

Referring to Figure 1 the electric iron of the present invention includes a sole plate generally designated 10 having a plan contour illustrated in Figures 6 and 10. The sole plate is of metal, preferably aluminum or aluminum alloy and preferably plated with a bright coating so as to provide a mirror-like ironing surface. The sole plate is chamfered about its outer edge as illustrated at 13. Upon the sole plate there is mounted a rearwardly extending skirt 11 which is attached in place by a pair of screws 12—12, as illustrated in Figure 10. Skirt 11 is shaped so as to have protuberances 16 and 17 on it.

Upon the sole plate and skirt 11 there is mounted a shell generally designated 14 having a smooth downwardly extending contour as illustrated in Figure 1 and the sectional views, Figures 7, 11 and 12. The shell may be provided with an indented rib 15, if desired, for decorative and stiffening purposes. The upper portion of the shell is shaped as illustrated in the sectional views 7, 11 and 12 and includes marginal flat areas 18, a raised central area 20 and a central longitudinal rib 21. This portion of the shell is covered by a plate generally designated 22 having a smoothly curved upper surface 24 and a narrow marginal flat edge 25. The shell has down-turned apertured protuberances 26, as illustrated in Figures 6 and 11, two such protuberances 26 being provided at the rear portion of the iron and another pair provided at 27 near the rear end of the plate. The protuberances serve to space the

edges of the plate a uniform distance from the marginal flat portion 18 of the upper surface of the shell 14, the center of the plate 22 being also held in spaced relation with respect to the main body of the shell by contact with the rib 21 which runs lengthwise along the top of the shell. Near the front of the plate 22 there is a down-turned rib 28 which likewise serves as a spacing. Rivets 26' and 27' are provided through the apertures in protuberances 26 and 27, and as a result the plate is held firmly assembled on the upper part of the shell.

The forward end of the plate is provided with an insulated pilot lamp socket 30 containing pilot lamp 30'. The two wires 31 and 32 serving the pilot lamp extend between the upper portion 20 of the shell and the cover plate 22, the wires being maintained in spaced relation by the central rib 21. Preferably the wires are covered with a somewhat soft insulation which is of a diameter such as to be slightly compressed and thereby lightly held between the shell 14 and the plate 22 when the parts are assembled together.

At the rear end of the plate 22 there is mounted a terminal block generally designated 34 having three terminals 35, 36 and 37 thereon, the pilot lamp wires 30 and 31 being connected to terminals 36 and 37, respectively. The terminal block 34 is held in place on the cover plate 22 by means of a screw 38 which is threaded into the cover plate. The terminal block is provided with three down-turned tubular tips 40, 41 and 42 which extend through spaced apertures in the plate 22 and the shell 14 into the interior of the shell. The terminal block and tips 40, 41 and 42 are apertured and serve as insulating conduits for the three connection wires 44, 45 and 46 to the thermostatic control element and electric heater, as hereinafter described.

Upon the shell there is mounted a handle generally designated 48 having front support portion 50 and a rear support portion 59. The front support portion is provided with a recess 51 which is open at the bottom of the handle and shaped so as to receive the pilot lamp socket 30 and pilot lamp 30'. The front support portion is also provided with an aperture 52, covered by a decorative plate 53 having a lens 54 therein. The front support portion 50 has an aperture 55 extending directly downwardly from the aperture 52 and an attachment screw 56 is inserted through the opening 52 into the aperture 55 and is screwed through a hole in the cover plate 22 into a threaded down-turned boss 57 in the shell 14, thus attaching the front part of the handle solidly to the shell. It may be noted that the cover plate 53 is held in place on the front of the iron by means of an intumed tip 58 and retaining spring 59. The rear support 64 of the handle 48 is provided with rearwardly extending side bosses 65 and 66 which have threaded holes in them to receive a pair of attachment screws 67 and 68, which are inserted from the bottom of the skirt 11 and extend upwardly through the shell 14 and thence into the threaded openings in bosses 65 and 66, thus firmly attaching the rear portion of the handle to the assembly. The rear portion of the handle is also provided with an aperture 70 open from the bottom of the handle and shaped so as to provide space for the junction block 34, already described, and for the lead-in service wires 71 and 72. The wires 71 and 72 form a part of the electric service cord 73 which enters the rear handle support 64 at the aperture 74. The service cord 73 is suitably strengthened by a

tapered rubber section or a coil spring wire support mechanically fastened to the aperture 74, thereby strengthening the service cord where it enters the handle. The rear portion of the handle is also provided with a tip 75 which serves with the protuberances 16 and 17 on the skirt 11 to support the iron when it is tipped backwardly.

The foregoing details of construction are described in greater detail in our copending applications entitled "Sadiron assembly" Ser. No. 535,919 and "Electric iron assembly" Ser. No. 535,920, and are illustrated in our design application entitled "Electric irons" Ser. No. Des. 113,630, now Patent Des. 139,040 filed concurrently herewith, to which reference is made.

The sole plate 10 is provided along its center line with a shallow groove 78 having recesses 79 and 80 at each end of the groove. In the groove there is fitted a composite thermostatic strip generally designated 81 composed of two pieces 82 and 84 of relatively stiff metal having a heat coefficient of expansion different than that of the sole plate. It is immaterial so far as the present invention is concerned whether the sole plate has a greater or lesser coefficient of expansion than the thermostatic strip 81, but it is preferred to make the sole plate of aluminum or aluminum alloy and the composite thermostatic strip is of iron, steel, invar, or similar metal, having a lesser heat coefficient of expansion than the aluminum and aluminum alloy of the sole plate. Each of the pieces 82 and 84 of the composite strip has a thickened end 82' and 84' which may very conveniently be merely a washer cut from the same material as the pieces 82 and 84, and spot welded or otherwise firmly affixed on the strip. The thickened end portions 82' and 84' of the two strips each has a plan contour such that it fits neatly into the recesses 79 and 80, and as a result these thickened portions serve as anchors for the ends of the strips to prevent endwise movement of the strip. The strips are held at their anchored ends by means of screws 86 and 87, but due to the fact that the end thrust or tension on the strips is taken by the thickened portions 82' and 84' (fitted into the recesses 79 and 80, respectively), the screws 86 and 87 do not have to absorb such forces and a firm hold at the end of the strips is accordingly maintained. The strips 82 and 84 are fitted into the groove 78 in endwise relation with a slight space 90 between them, the adjacent ends of the strips are attached by means of a spring metal loop 92 which is riveted or otherwise attached at 93 to strip 82 and similarly riveted or otherwise attached at 94 to strip 84. The loop 92 is preferably a piece of spring steel and is provided with an aperture at 95 into which there is fitted an insulator, preferably a little ceramic insulator button 96.

It will thus be observed that the upper surface of the sole plate is smooth (except for the heads of screws 12, 26 and 27) since the groove 78 is neatly filled by the composite thermostatic strip 81. Only the loop 92 protrudes upwardly in the middle of the sole plate. Upon the assembly of the sole plate and the thermostatic strip there is positioned a heater element generally designated 98 having the shape as illustrated in Figure 14. The heater element shape and configuration are more particularly described in our copending application entitled "Sadiron assembly" Ser. No. 535,919 to which reference is here made, and it is sufficient for the present purposes to state that the heater element is preferably of the flat

type, composed preferably of a pair of superimposed mica insulating panels between which there is placed a mica panel framework on which the electric resistance wire 99, Figure 14, is wound. The resistance wire 99 is preferably a flat strip of "Nichrome." The heating element is suitably provided with a rectangular cut-out along its center line, as indicated at 150 for clearance purposes around the loop 92 of the thermostatic control, and the heater panel is held in place on the sole plate by means of a pressure plate generally designated 102, the pressure plate being in turn attached to the sole plate by a plurality of screws 104, as illustrated in Figure 7. The pressure plate is cut away along its center line so as to provide a slot between walls 105 which extends from about the middle part of the iron at wall 106, Figure 2, to the rear portion of the iron. This slot serves as clearance for the loop 92 of the thermostatic strip assembly 81 which extends through a suitable aperture in the heater element 98 into the space between walls 105 of the pressure plate.

Upon the rear center portion of the pressure plate there is mounted a rearwardly extending supporting plate generally designated 108 which is attached to the pressure plate by screws 110 and 111. The plate 108 is stamped from metal and is provided with a down-turned edge 113 which serves to align the plate on the outer surfaces of the central bosses 114 and 115 of the pressure plate and thus serves to prevent any lateral displacement of the plate 108 with reference to the pressure plate once the attachment is made by means of screws 110 and 111. The down-turned flange 113 also extends around the rear portion of the plate 108 indicated in Figures 2-5 and adds considerably to the stiffness of this member. Near the center portion of the plate 108 there is provided a rectangular aperture 116 having upwardly turned side walls 117 and 118, Figure 11, that are apertured to receive a through pin 120 upon which a lever generally designated 122 is pivotally mounted. The lever has a forwardly and downwardly extending tip 125 having an insulating button 126, preferably of ceramic material, on its end. The rear end 128 of the lever is shaped so as to extend down through the rectangular opening 116 and under the tail end of the plate 108 as hereinafter described. The plate 108 also serves as a mounting for a pair of spring contact strips generally designated 130 and 131 which are hung below the plate 108 in a position so as to be located in the slot between walls 105-105 of the pressure plate.

Referring to Figure 13 it will be observed that the plate 108 is provided with two apertures 134 and 135 spaced along the center line of the plate and a smaller aperture 136 located between them also along the center line of the plate. Below the apertures 134 and 135 there is a rectangular block 137 of insulating material, preferably a ceramic molding having a circular protrusion 137a and 137b on its upper surface and circular recesses 137c and 137d in its lower surface. The protrusions 137a and 137b are spaced so as to fit into the apertures 134 and 135 in the plate 108. Assembled against the block 137 is contact spring 130 and immediately below it there is a terminal connection 140 which extends backwardly and to the right side of the iron (under plate 108), as shown in Figure 10, and terminates in an eye 141, the connection of which is later described. Both the contact strip 130 and the

terminal connection 140 have spaced apertures in them aligned with the apertures 137c and 137d in the insulator 137. Immediately below the strip 140 there is assembled another insulator 142 identical with that shown at 137 and the circular protuberances on the top thereof fit into the apertures of the terminal 130 and connection 140 and into the recesses of insulator 137, and lock the assembly from moving sideways. Against the bottom surface of the insulator 142 there is assembled a relatively heavy contact strip 146 which is shaped so as to extend backwardly and to the right side of the iron (also under plate 108), as illustrated in Figure 10, strip 146 being provided with a connection screw 147 at its end. Beneath the strip 146 there is assembled the lower spring contact 131 and both the contact and strip 146 are likewise apertured so as to receive the cylindrical protuberances on the upper surface of a bottom insulator 143 which is identical with the insulators at 142 and 137. Two through bolts 150 and 151, each having a washer immediately under its head, hold the assembly together, solidly clamped and suspended from the under side of the plate 108. It will be observed that the plate 108 may thus be provided with its contact assembly and with the lever arm 122 as an independent bench assembly which can then be assembled onto the pressure plate and connected.

The plate 108 likewise serves to carry a pair of binding posts, this being accomplished by providing at each side of the plate 108 a pair of downwardly and outwardly extending slightly twisted eyes 152 and 153. In the eye 152 there is mounted an insulated terminal 154 upon which the eye 141 of the strip 140 is likewise assembled. The connection wire 44 from the terminal block 34 is also connected to the terminal 154. The similar downwardly extending twisted eye 153 at the left side of plate 108 is also provided with an insulated terminal 153 to which the connecting wire 46, from the terminal block 34, and one of the heater element connections 155 is made fast. A low voltage tap connection is provided from the heater element at 156 and extends upwardly as shown in Figure 12 to the center terminal 33 of the junction block, and serves as a low voltage source for the pilot lamp. The other heater connection is indicated at 157 and is connected to the terminal screw 147 on the stiff terminal plate 146. Referring to Figures 10, 12 and 14, it will be observed that the service supply lines 71 and 72 entering the iron handle at electric cord 73 are connected to terminals 35 and 37. From terminal 35 a lead wire 44 extends downwardly through the insulated tip 40 of the terminal block to the terminal 154 on strip 140 and thence through strip 140 to the upper spring contact 130, thence through the contacts to the lower spring contact 131 and through the stiff contact strip 146 to the terminal screw 147 and through the heater element connection 157 to the heater element wire 99. The circuit continues through the heater element and extends through the heater element lead connection 155 to the binding post 153 and thence through the connection wire 46 to terminal 37 of the terminal block 34, and thence to supply line 72. The pilot lamp supply voltage connection is made to the heater element at 157. The heater element wire 99 is usually ribbon-type Nichrome, and since it operates at red heat, the service connection can be made only with difficulty. However, a serviceable connection at 157 can be accomplished by utilizing a brass wire flattened out at the end so as to be of approxi-

mately the same thickness as the ribbon-type heater element 99. The flattened end of the brass wire (connection wire 166) is then plated with nickel or chrome plate and is simply laid in contact with the heater element wire 99 at point 157. If desired, connection can also be made by using for the connection wire 167 a piece of round Nichrome wire which is then flattened throughout its end portion and laid in contact with heater element wire 99 at point 157. The wire 166 is brought out of the heater unit and is threaded through the tip 41 of the junction block and connected at center terminal 36. The lead wires 31 and 32 from the pilot lamp 30 are brought through holes in the rear part of the cover plate 22 and, as shown in Figure 12, wire 31 is connected to terminal 36, wire 32 being connected to terminal 37.

Mounting screws 110 (Figure 10) which serve to attach the plate 108 to the pressure plate also serve as a mounting for a U-shaped spring 170 which extends forwardly and across the front end portion 124 of the lever 122 as indicated at 171. The spring 170 is tensioned so as normally to force the end 124 of the lever downwardly, thus bringing the insulated tip 126 into engagement with the upper contact spring 130. The spring 170 is of sufficient strength so as to overcome the resiliency of the contact spring 130. The degree of motion of lever 122, that is occasioned by the resiliency of spring 170, is determined by the rear tip 129 of the lever which is normally pushed against a cam generally designated 172 by spring 170. The cam surface 173 is formed on the edge flange of the cup-shaped cam member 172 and has a gradually increasing portion 173a of gradually increasing axial width which breaks at the abruptly increasing portion 173b and terminates in a "flat" portion 173c of uniform axial width. Figure 9 is a developed view of the cam and illustrates the gradually sloped portion 173a and abruptly sloped portion 173b and the flat portion 173c. The cam 172 is riveted or otherwise attached to a shaft 175 which extends through a bearing member 176, the latter in turn being threaded into a threaded, in-turned flange 108' in the plate 108. The position of the cam 172 is such that the cam edge 173 bears against the upper surface of the lever at 126, and by rotating the shaft 175 the cam 173 causes a movement of the end lever 122 up or down, as indicated by the double arrows 179, the degree and direction of such movement depending upon the direction and amount of rotation of the cam. The cam shaft 175 extends through a hole 23 in the shell 14 of the iron and is provided with an adjustment knob 180 which is fitted onto the upper end of the shaft 175. A flat disk washer 181 is provided between the adjustment knob and the shell 14, the washer being of sufficient size so as to cover the keyhole-shaped opening 23. As illustrated in Figure 2, the bearing member 176 is fitted on a reduced portion 177 of the shaft 175 and thus the shaft 175 is restrained from endwise movement but is free to rotate within the bearing 176. The bearing 176 is assembled onto the reduced portion 177 of the shaft; the cam 172 which fits on the small end 177' of the shaft is then placed on the shaft and the end 177' is riveted over so as to hold the cam 172 immovable upon the shaft.

The bearing member 176 may be rotated in the plate 108 by means of a pair of spaced holes 176' in the upper surface of the bearing member, as illustrated in Figure 10. A wrench of suitable de-

sign so as to fit over shaft 175 and having a key to fit one or both of holes 176' is applied to the bearing and by turning the bearing the cam can be caused to move axially without, however, rotating the cam. Adjustment of the thermostatic control can be accomplished in this manner. After adjustment the bearing 176 is locked against rotation by a heel plate 182 which is shaped to overlie a small segment of the rear end of plate 108 and is held in place by a screw 183 which extends through the heel plate and is threaded into the supporting plate 108. The segment 182 clamps onto the top surface of the bearing plate 176 and prevents its rotation after adjustment. The heel plate 182 is provided with up-turned edges 182a and 182b which serve as stops for pin 175a which protrudes radially from shaft 175 at a suitable level so as to engage the stops 182a and 182b. Access to the locking screw 183 and to bearing plate wrench holes 175' can be had even after the iron is fully assembled by removing knob 180 by removing its set screw. The washer 181 can then be lifted off, and this uncovers the keyhole-shaped opening 23 in the shell 14. Locking screw 183 is then loosened and the bearing 176 turned by means of a special wrench inserted through hole 23.

In assembling the apparatus the thermostatic strip 91 is first fastened to the sole plate and the heater element 98 placed thereon and clamped in place by the pressure plate 102, the latter being held firmly in place by screws 104. An independent assembly is then made using plate 109 as the basis of the assembly. On the rear end of the plate there is assembled the shaft 175 on which the bearing 176 and cam 172 have already been assembled, the bearing 176 being screwed into the plate 108. The heel plate 182 is then fastened in place. The lever arm 122 is then assembled to the plate 108 by means of pin 120 and the contact springs 130 and 131, terminal connections 149 and 146 and binding posts 163 and 154 are then all assembled on plate 108. It will be observed that the major portion of the thermostatic control, binding posts, switch parts, etc., are all on one plate which may be made up independently. The plate 108 is then assembled in place in the groove between walls 105-105' of the pressure plate and is held in place by means of four screws 110 and 111, spring 170 being fastened on screws 111. The shell 14, plate 22 and handle 48 are then assembled on the iron, the wiring connections being made as previously indicated. The iron is then connected to a source of electric power for initial (or factory) adjustment and heating begins. Where the sole plate is of a material having a greater heat coefficient of expansion than the thermostatic strip assembly, the heating of the sole plate above ambient temperature causes the loop 92 to be retracted downwardly, thus allowing the contact spring 131 also to move downwardly, due to its resiliency. The contact spring 130 is sprung so as to bear against the insulating tip 126 of lever arm 122, the lever arm in turn being tensioned by spring 170 towards rotation in a counter-clockwise direction, as illustrated in the drawings. However, the movement of the lever 122 is limited by the cam 172 and thus the upper spring contact 130 has, in effect, a predetermined position as determined by the cam 172. After the iron has heated sufficiently, the loop 92 permits the contact spring 131 to move downwardly until the circuit is broken between its contact and the contact on

spring 130, and this action then continues intermittently heating the iron.

For factory adjustment the cam is turned by means of knob 180 until it is at the high temperature end of the "High heat" range with pin 175a against tip 182a. The sole plate temperature may actually be too high or too low. If it is too low, the knob 180 and washer 181 are removed, screw 193 loosened and bearing plate 176 turned clockwise so as to lower the whole cam and hence push the end 129 of lever 122 downwardly, i. e. in the same direction it would be moved if the cam is turned counter-clockwise toward the "high" temperature end of the scale. Adjustment is continued until the actual temperature of operation of the sole plate corresponds to the temperature selected for the "High" temperature end of the scale. Usually this high temperature is about 400° F., but it may be set lower or higher as desired.

Figure 4 illustrates the position of cam 172 and the remaining parts in the "Low" heat condition. As shown in Figure 9, the low heat range of the cam has the greatest axial dimension except for the "Off" position which will be described hereinafter. By rotating the cam to the "Low" heat position the lever arm 122 is moved upwardly at the left end 125, against the action of spring 170, to a position such that it permits the upper spring contact 130 to assume the position shown in Figure 4. As the iron heats the loop 92 of the thermostatic strip assembly 81 is drawn downwardly and contact strip 131 which rests against the insulating button 95 on the loop 92 is tensioned so that it follows the button 95 downwardly as the loop is drawn down. As the iron heats the loop finally permits the spring 131 to move under its own resiliency and break contact with strip 139, thereby interrupting a circuit through the heating element of the iron. As the sole plate cools it contracts and loop 92 increases in elevation, thus raising contact 131 until a circuit is again established with contact strip 130 whereupon heating is resumed. This cycle of operation continues indefinitely as long as the iron is in use.

When it is desired completely to interrupt the circuit through the heating element of the iron the knob 180 on the cam shaft 170 is turned counter-clockwise until the pin 175a engages the stop 182b in which condition the cam surface 173c of the cam 172 is brought into engagement with the lever 122, thus causing the lever 122 to be rotated a maximum amount in the clockwise direction, as shown in Figure 5. This permits contact 130 to raise under its own resiliency to the condition shown in Figure 5. The contact 130 is elevated so much that even when the sole plate has cooled to ambient temperature, the loop 92 is not elevated sufficiently to bring the contact strip 131 into circuit-closing condition with contact strip 130. The axial dimension of the cam 173 at the "Off" position 173c is such that the circuit will not be completed until the temperature of the sole plate is reduced to 35 or 40 degrees below zero Fahrenheit, and thus under any ordinary temperature conditions, the contacts 130 and 131 are maintained in open condition.

By rotating the knob 180 in the clockwise direction until the rod 175a on shaft 175 abuts against the stop 182a, the high heat position of the cam (the portion that has the shortest axial dimension) is brought into line with the point 129 on the lever 122. When this adjustment to "High" temperature is made while the sole plate is cold,

the parts of the iron will assume the condition shown in Figure 2. When the iron is cold, the loop 92 on the thermostatic strip 81 is at its maximum elevation and it exerts a lifting force against contact spring 131 which transfers the force through its contact and the contact on strip 139 to the insulator button 126 on the end 125 of the lever arm 122, and as a result the lever arm 122 is lifted against the action of spring 170. The opposite end 128 and the lever 122 is moved away from the "High" heat portion of the cam 173. If it is assumed that after such adjustment is made electric power is now supplied to lines 71 and 72, the electric heating element is energized through the contacts 130 and 131. The sole plate heats until the loop 92 is drawn downwardly. As the loop 92 is drawn downwardly, the lifting force against contact spring 131 (which as previously explained was transferred through contact spring 131 to the lever 122) is gradually decreased and due to the tension of spring 170 the lever 122 and contacts 130 and 131 follow the movement of loop 92 downwardly as the iron heats, until the tip 129 of the lever finally engages the "High" heat portion of the cam 173, as shown in Figure 3, whereupon further downward movement of the lever 122 is rendered impossible. As the sole plate then heats, the contact 131 is permitted to move further downwardly, away from contact 139. As the sole plate then cools, the loop 92 again rises and lifts contact spring 131 into circuit-closing condition with contact spring 130, whereupon the sole plate heats and the operation is continued indefinitely while the iron is thus in service. The make and break of contacts 130—131 at any temperature setting of cam 172 is not sufficient to force lever 122 away from the cam, as the temperature over-run is negligible. The mechanism is very sensitive and will maintain any set temperature within 10° F. Should the power supply to lines 71 and 72 be interrupted while the adjustment knob 175 is in the "High" heat condition, the lifting force produced by the thermostatic strip 181 and loop 92 will not cause any permanent deformation of contacts 131 and 129, since, as previously explained, once the contacts are brought into engagement, they serve to lift the lever 122 against the action of spring 170 and to cause the opposite tip of the lever 92 to move away from the high heat portion of the cam surface 173. In this way damage of the thermostatic control mechanism is obviated and uniform actual operation temperatures, corresponding to the established scale markings on knob 180, are maintained throughout the life of the apparatus.

If desired, the thermostatic strip element 181 may be made of a metal having a greater coefficient of expansion than the sole plate, in which case the loop 92 is elevated as the sole plate and thermostatic strip are simultaneously heated. Where such construction is desired, the loop 92 is caused to actuate the contact spring 130 while the lever 122 is caused to actuate the contact spring 131. However, it is more desirable from the standpoint of weight and convenience of manufacture to utilize aluminum or aluminum alloy for the sole plate 10 and utilize a material such as iron or invar, having a smaller heat coefficient of expansion, for the thermostatic strip element 81.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it

is to be understood that we do not limit ourselves to the specific embodiments herein except as defined by the appended claims.

What we claim is:

1. In an electrical device having a plate and an electric heating element therefor, a control for said heating element comprising a composite strip of metal composed of two relatively stiff pieces aligned end to end with a space between them and having their outer ends fastened to said plate, said pieces being joined together across said space with an upwardly flexed loop of thinner material and a pair of electric contacts connected in circuit with said electric heating element, said contacts being operable by change in elevation of said loop to open and close the circuit to said heater responsive to variations in temperature of the plate and composite strip assembly.

2. In an electrical device having a plate and an electric heating element therefor, a switch connected in circuit with the electric heating element comprising a thermostatic means for opening and closing said switch including a strip of metal recessed into a groove in the upper surface of the plate, said strip being entirely within said groove except that it is flexed upwardly at one place only for operating the switch but otherwise held in place in the groove, said groove being recessed at each end and the strip shaped at each of its ends to fit said recesses for restraining endwise movement of the ends of the strip, and means for holding the strip in the groove.

3. In an electrical device having a plate and an electrical heater therefor, a control for said heater comprising a strip of metal having a different heat coefficient of expansion than said plate attached at its ends to the plate, said strip including a separate central upwardly bowed flexible portion interposed between two flat rigid portions, but otherwise in contact with the plate, said strip being held in axial alignment on said plate, a heater superimposed upon the plate and a pressure plate mounted on the heater and attached to the plate for holding the assembly together, said heater element and pressure plate being centrally apertured to receive said central upwardly bowed flexible portion of the strip, a pair of switch contacts mounted on said pressure plate and positioned to be actuated by said upwardly bowed strip portion, for opening and closing the switch responsive to variations in temperature of the plate.

4. The combination comprising a plate in which there is a shallow groove in the surface thereacross, a composite strip composed of pieces of a material having a different heat coefficient of expansion than the plate and of a size such as to fit into said groove placed in the groove end to end with a space between them, said strips being joined together across said space by a flexible upwardly bowed piece of material, means for fastening the extending ends of the strip in the groove, a flat electrical heating element having an aperture in its center positioned on the plate with the upwardly bowed piece of material extending therethrough, a pressure plate superimposed upon the heating element and fastened to the plate for clamping the heating element therebetween, said pressure plate being recessed to receive said upwardly bowed portion of the composite strip, a pair of electric contacts connected in circuit with said heating element mounted on the pressure plate and mechanically

connected to the upwardly bowed portion of the composite strip to be actuated thereby responsive to variation in temperature of the plate.

5. The apparatus of claim 4 further characterized in that said electrical contacts are positioned one above the other, one contact being actuated by the upwardly bowed portion of the composite strip and the other contact being manually adjustable with reference to the first contact.

6. The apparatus of claim 4 further characterized in that the plate has a greater heat coefficient of expansion than the composite strip, and the contacts are positioned one over the other with the lower contact positioned so as to be lifted by the upwardly bowed portion of the flexible strip, the upper contact being manually movable up and down for varying the temperature at which said contacts part.

7. The apparatus of claim 4 further characterized in that the electric contacts are positioned one over the other, the lower contact being mechanically movable upwardly and downwardly responsive to variations in flexure of the upwardly bowed portion of the composite strip and the upper contact is normally movable upwardly and mechanical means is provided for moving the upper contact up and down for varying the temperature of the sole plate at which the contacts part.

8. A switch for an electric heater sub-assembly having a heating plate and an electric heater mounted on the heating plate, the combination of thermostatic means on the heating plate movable vertically in response to variations in temperature of the heating plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the heating plate temperature decreases, lever means mounted in oscillating relation on the heating plate and into engagement with said second contact for moving it towards the first contact, spring means sufficiently strong to overcome the resiliency of said contact strips and movable against the lever means for urging said second contact into engagement with the first contact and manually adjustable stop means movable against said lever to move it in a direction opposite to the direction imposed by said spring means.

9. In an electric radiator sub-assembly having a sole plate and an electric heater mounted on the sole plate, the combination of thermostatic means on the sole plate movable vertically in response to variations in temperature of the sole plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the sole plate temperature decreases, lever means mounted in oscillating relation on the sole plate and into engagement with said second contact for moving it towards the first contact, spring means sufficiently strong to overcome the resiliency of said contact strips and movable against the lever means for urging said second contact into engagement with the first contact and manually adjustable stop means movable against said

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lever to move it in a direction opposite to the direction imposed by said spring means, said lever being free to move away from said stop when the second contact is moved by the first contact when the latter moves responsive to the thermostatic means.

10. In an electrically heated device having a plate and an electrical heater therefor, a control for said heater comprising thermostatic means on the plate movable vertically in response to variations in temperature of the plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the plate temperature decreases, lever means mounted in oscillating relation on the plate and into engagement with said second contact for moving it towards the first contact, spring means sufficiently strong to overcome the resiliency of said contact strips and movable against the lever means for urging said second contact into engagement with the first contact and manually movable cam means mounted so as to engage the lever for moving it to varying positions against the action of said spring means.

11. In an electrically heated device having a plate and an electrical heater therefor, a control for said heater comprising thermostatic means on the plate movable vertically in response to variations in temperature of the plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the plate temperature decreases, lever means mounted in oscillating relation on the plate and into engagement with said second contact for moving it towards the first contact, and manual means for oscillating said lever for moving the second contact through a limited range of positions in which it is engageable by said first contact when the latter is moved responsive to said thermostatic means and to an extreme position wherein the second contact is beyond the range of movement of said first contact.

12. In an electrically heated device having a plate and an electrical heater therefor, a control for said heater comprising thermostatic means on the plate movable vertically in response to variations in temperature of the plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the plate temperature decreases, lever means mounted in oscillating relation on the plate and into engagement with said second contact for moving it towards the first contact, and manual means including a flanged disk rotatably mounted and including a cam on the flange thereof for moving said lever through a range of positions thereby to vary the position of the second contact.

13. In an electrical device having a plate and an electrical heater therefor, a control for said heater comprising thermostatic means on the

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plate movable vertically in response to variations in temperature of the plate, a pair of contact strips having contacts thereon connected in circuit controlling relation to the electric heater, said contact strips being resiliently urged away from each other, a first one of said contacts being mounted so as to be engageable by the thermostatic means and movable thereby towards the second of said contacts as the plate temperature decreases, lever means mounted in oscillating relation on the plate and into engagement with said second contact for moving it towards the first contact, and manual means including a flanged disk rotatably mounted and including a cam on the flange thereof for moving said lever through a range of positions thereby to vary the position of the second contact, the mounting for said flanged disk being mounted for moving the disk axially, and stop means for limiting the rotation of said flanged disk.

14. In an electric sadiron sub-assembly having a sole plate and an electric heater mounted on the sole plate, the combination of thermostatic means on the sole plate movable upwardly when the sole plate is cooled and downwardly when the sole plate is heated, a pair of cooperating electrical contacts mounted on spring contact strips mounted on the sole plate one above the other, said spring strips being flexed so as normally to urge the contacts away from each other, the lower contact being mounted in respect to the thermostatic means so as to be raised thereby when the sole plate temperature decreases and to be lowered when the sole plate temperature increases, a lever pivotally mounted on the sole plate having one portion thereof positioned so as to engage and move the upper contact downwardly, spring means for moving the lever in a direction to cause the upper contact to move towards the lower contact, said spring means being of sufficient strength to overcome the resiliency of the upper contact spring and to cause its contact to close against the lower contact, and a stop positioned with reference to said lever to stop movement of said lever under the influence of said spring means.

15. In an electric sadiron sub-assembly having a sole plate and an electric heater mounted on the sole plate, the combination of thermostatic means on the sole plate movable upwardly when the sole plate is cooled and downwardly when the sole plate is heated, a pair of cooperating electrical contacts mounted on spring contact strips mounted on the sole plate one above the other, said spring strips being flexed so as normally to urge the contacts away from each other, the lower contact being mounted in respect to the thermostatic means so as to be raised thereby when the sole plate temperature decreases and to be lowered when the sole plate temperature increases, a lever pivotally mounted on the sole plate having one portion thereof positioned so as to engage and move the upper contact downwardly, spring means for moving the lever in a direction to cause the upper contact to move towards the lower contact, said spring means being of sufficient strength to overcome the resiliency of the upper contact spring and to cause its contact to close against the lower contact, and a stop positioned with reference to said lever to stop movement of said lever under the influence of said spring means, the position of said stop being manually variable so as consequently to vary the position of said lever and upper contact.

16. In an electric sadiron sub-assembly having

a sole plate and an electric heater mounted on the sole plate, the combination of thermostatic means on the sole plate movable upwardly when the sole plate is cooled and downwardly when the sole plate is heated, a pair of cooperating electrical contacts mounted on spring contact strips mounted on the sole plate one above the other, said spring strips being flexed so as normally to urge the contacts away from each other, the lower contact being mounted in respect to the thermostatic means so as to be raised thereby when the sole plate temperature decreases and to be lowered when the sole plate temperature increases, a lever pivotally mounted on the sole plate having one portion thereof positioned so as to engage and move the upper contact downwardly, spring means for moving the lever in a direction to cause the upper contact to move towards the lower contact, said spring means being of sufficient strength to overcome the resiliency of the upper contact spring and to cause its contact to close against the lower contact, and a stop positioned with reference to said lever to stop movement of said lever under the influence of said spring means, and manual means connected to said stop for smoothly varying the position of said lever and the upper contact operated thereby throughout a range of positions corresponding to the range of positions of the cooperating lower contact as moved by said thermostatic means and for abruptly varying the position of said lever and the upper contact operated thereby to a remote position beyond the upper end of the range of movement of the lower contact.

17. In an electric radiator sub-assembly having a sole plate and an electric heater mounted on the sole plate, the combination of thermostatic means on the sole plate movable upwardly when the sole plate is cooled and downwardly when the sole plate is heated, a pair of cooperating electrical contacts mounted on spring contact strips mounted on the sole plate one above the other, said spring strips being flexed so as normally to urge the contacts away from each other, the lower contact being mounted in respect to the thermostatic means so as to be raised thereby when the sole plate temperature decreases and to be lowered when the sole plate temperature increases, a lever pivotally mounted on the sole plate having one portion thereof positioned so as to engage and move the upper contact downwardly, spring

means for moving the lever in a direction to cause the upper contact to move towards the lower contact, said spring means being of sufficient strength to overcome the resiliency of the upper contact spring and to cause its contact to close against the lower contact, and a stop positioned with reference to said lever to stop movement of said lever under the influence of said spring means, and manual means connected to said stop for smoothly varying the position of said lever and the upper contact operated thereby throughout a range of positions corresponding to the range of positions of the cooperating lower contact as moved by said thermostatic means and for abruptly varying the position of said lever and the upper contact operated thereby to a remote position beyond the upper end of the range of movement of the lower contact, and manually variable adjustment means for moving the manual means in a direction to vary the position of said lever without movement of said manual means.

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