Feb. 13, 1968 C. R. TURNER 3,369,103

ELECTRIC IRON

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FIG. 1.

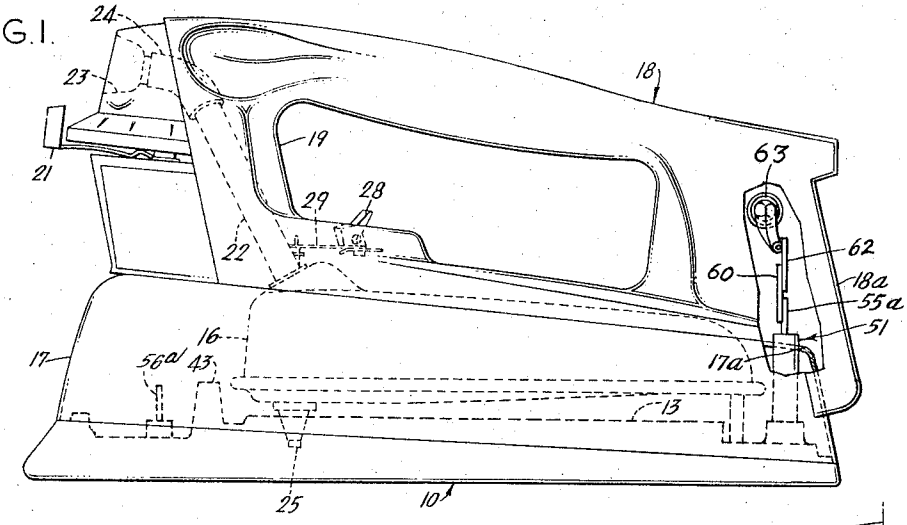
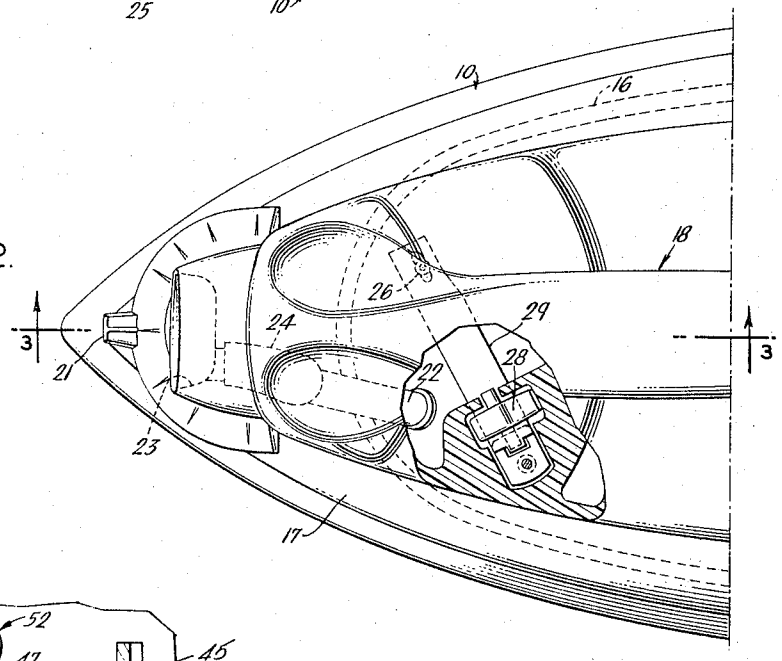


FIG. 2.



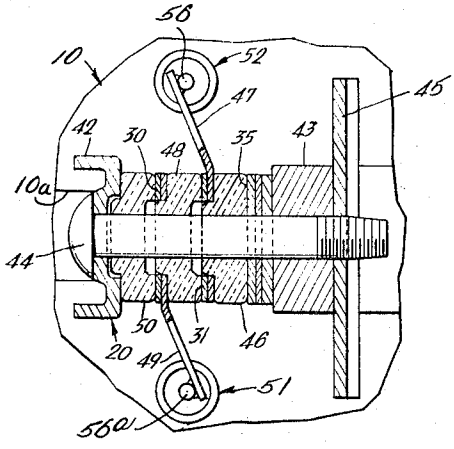


FIG. 4.

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FIG. 3.

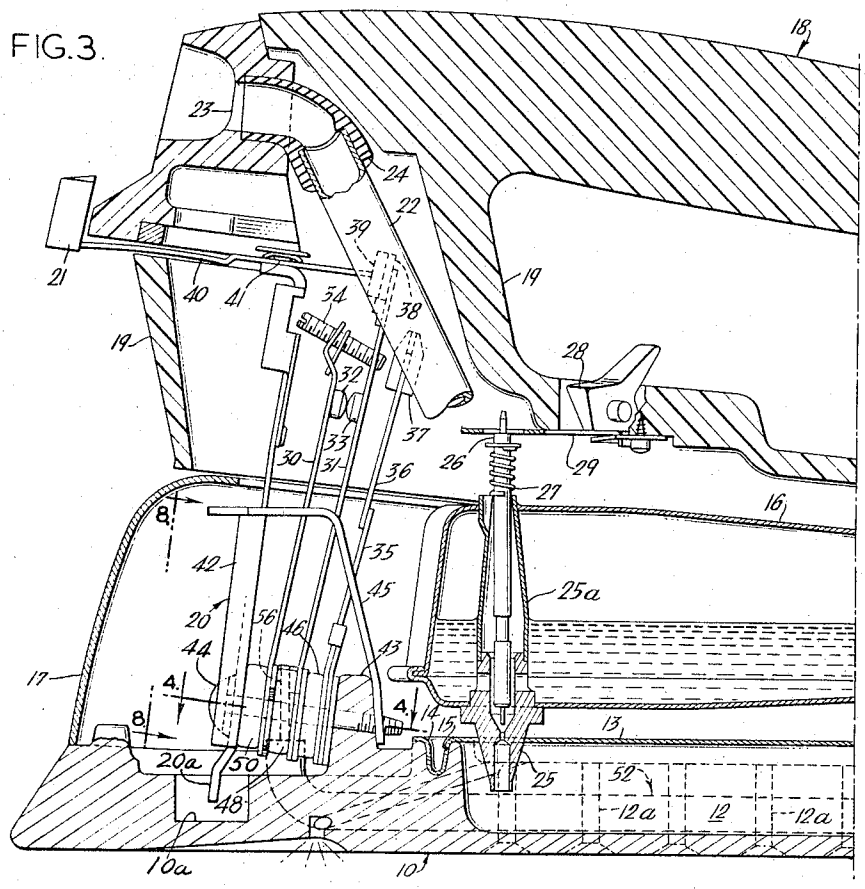
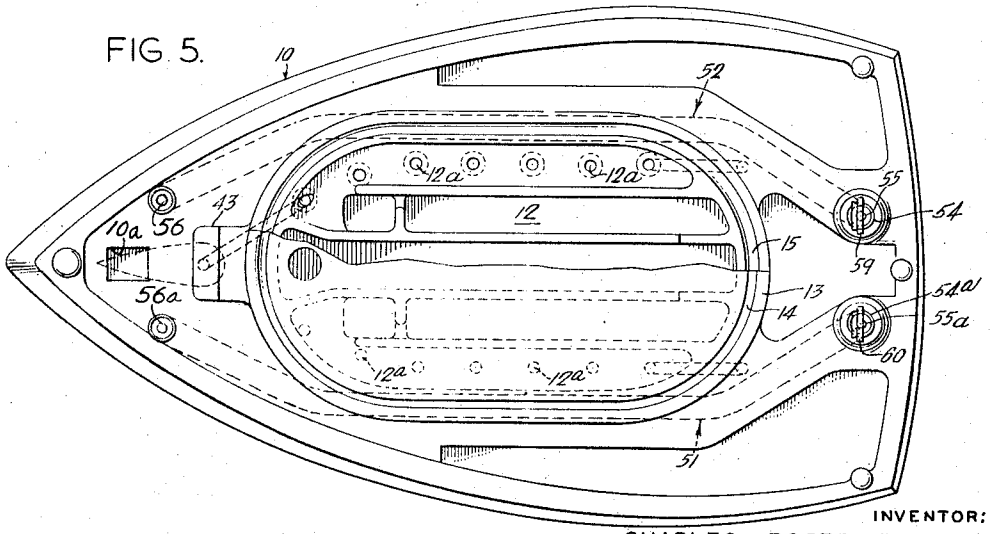


FIG. 5.



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FIG. 6.

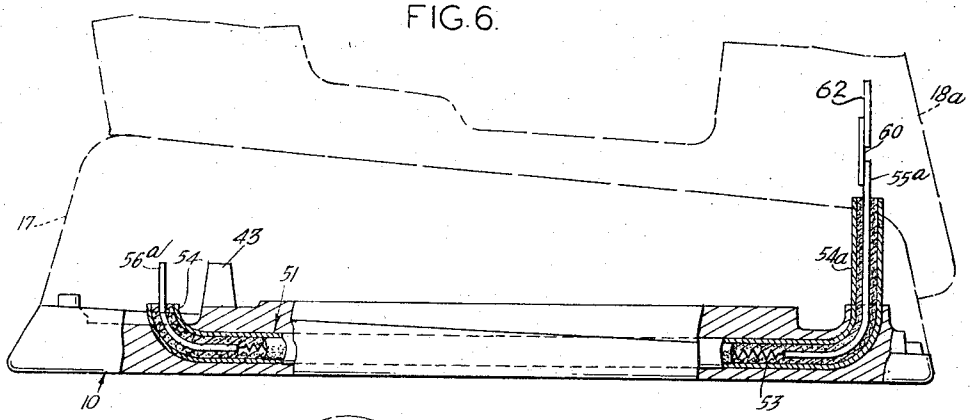


FIG. 7.

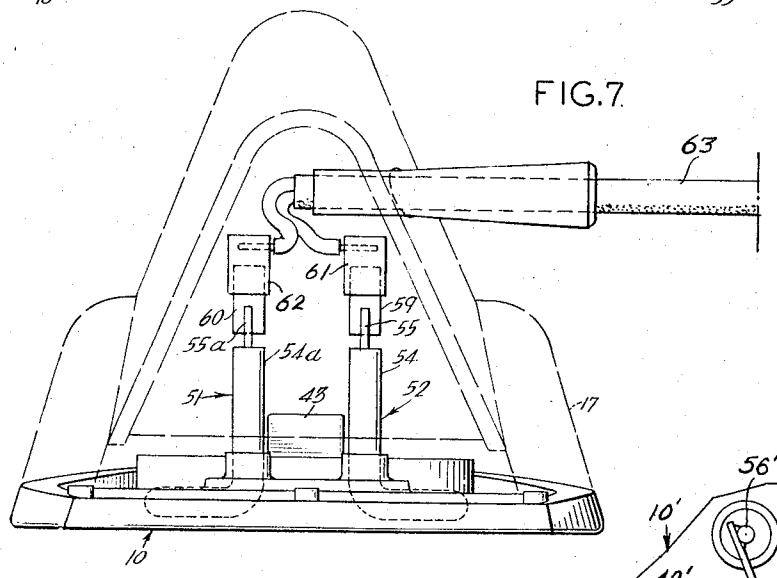


FIG. 8.

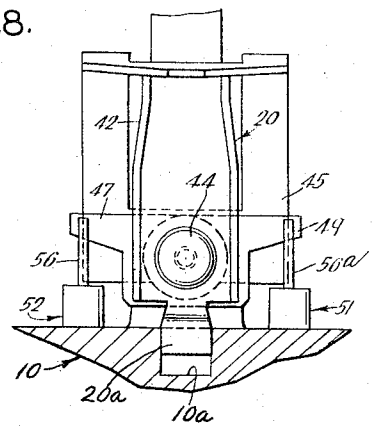
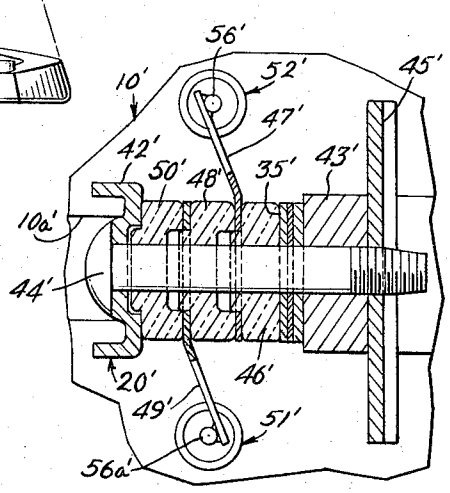


FIG. 9.



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United States Patent Office 3,369,103 Patented Feb. 13, 1968

3,369,103

ELECTRIC IRON

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Filed May 14, 1965, Ser. No. 455,902
4 Claims. (Cl. 219—252)

ABSTRACT OF THE DISCLOSURE

In an electric iron a pair of heater elements, each having a resistor contained within a metal sheath and separated therefrom by a material which is at the same time an electrical insulator and thermal conductor, embedded in the soleplate are made to extend above the soleplate at the pointed end of the iron at which is located a thermostat, preferably vertically oriented and connected to a part of the soleplate selected for accurate heat sensing, and the terminals of the resistor of the heater elements are made sufficiently rigid that when connected to the terminals of the thermostat, preferably at widely spaced points laterally of the iron, they serve to add rigidity to the thermostat and at the same time avoid the necessity of bus bar conductors above the soleplate to the thermostat.

This invention relates to electric irons, and more particularly to the arrangement of the heating element and the thermostatic switch in such irons.

In the evolution of the modern electric iron, a wide variety of proposals have been made having to do with the construction of the heating element and its configuration. Because of its manifold advantages, the industry has now substantially standarized on the use of a rod type heating element, preferably cast into the body of the soleplate. Such an element is commonly formed in a general U-shape, having its bight at the nose of the iron and with legs extending along the side portions of the soleplate, generally conforming to its contour.

When a thermostatic switch is provided to maintain a predetermined soleplate temperature, the contacts of this switch must be connected in series with the heating element. In order to connect such a switch to a U-shaped unit of the type described above, problems arise such as those exemplified in Patent No. 2,908,092, issued Oct. 13, 1959, to D. E. Clapp. This patent illustrates an electric iron in which the thermostatic switch is mounted in a substantially vertical position in the nose of the iron to provide numerous advantages described and claimed therein. In the rear of the iron are two terminals insulatingly secured to the soleplate, provided for the attachment of the lead-in wires of the cord provided for connection of the iron to an electrical outlet. A relatively short connector rod extends from one terminal to one end of the U-shaped heating element. A second, much longer, connector rod or bus bar is secured to the second terminal and follows the contour of one side of the soleplate to one terminal of the thermostatic switch, having at least one insulating support intermediate its length. A third connector rod or bus bar similar in length to the second follows the contour of the other side of the soleplate, connecting the other terminal of the thermostatic switch with the other end of the heating element. This rod also has at least one insulating support intermediate its length. Although the described arrangement calls for a maximum distance between the thermostatic switch and the ends of the heating element, many other conventional positions for the switch do not materially simplify the problem, requiring in each case connector rods or bus bars, with adequate support and insulation.

It will be seen that the above described construction

provides optimum protection against grounding or short-circuiting by the use of insulating supports for the connector rods or bus bars. However, many insulating materials tend to deteriorate under the high temperature conditions existing in an electric iron, and any insulating material may be damaged through accident or mishandling. As a consequence the heating element may be rendered ineffective due to being short-circuited out of the circuit or a dangerous potential may be applied to the soleplate and other exposed parts so that there is danger of electrical shock to a user.

A well known method of economically providing adequate electrical insulation for the electrical connectors or bus bars has been to arrange for a wide separation between such members and all other electrically conductive surfaces. However, with the advent of steam irons having a water reservoir located within the cover, the provision of such desirable electrical spacing has required either a cumbersome overall design or a sacrifice of adequate water reservoir volume and/or steam generator size.

One way in which this dilemma may be avoided is to eliminate the bus bar connections usually characteristic of the prior art. It is therefore an object of this invention to provide an electric iron that does not require connector rods or bus bars and thereby avoids the need for their attendant insulation.

Another object of the invention is to provide an electric iron in which each lead-in wire is secured to a connector directly supported by the heating element.

With the vertical arrangement of the thermostatic switch shown in the aforementioned Clapp Patent 2,908,092 and described in U.S. Patent 2,880,531, issued Apr. 7, 1959 to R. H. Houck, it is difficult to prevent a shifting of the upper end of the switch parts during use, and it is the principal object of this invention to provide an electric iron having a vertically extending switch that is mounted in such manner that such shifting will not occur.

A further object of the invention is to provide an electric iron of maximum simplicity and sturdiness that can be produced inexpensively.

According to the invention, two embedded heating elements are provided, preferably extending along opposite sides of the soleplate from a point adjacent the conventional connection point at the rear of the iron to a point adjacent the thermostatic switch, preferably at the nose of the iron. The forward ends of the heating elements are spaced apart in a transverse direction and a thermostatic switch is mounted between them. The forward end of each of the heating elements is directly secured to an adjacent switch terminal, thus supporting the switch at two points that are spaced apart in a lateral direction. The lead-in wires from the appliance cord are directly connected to the rear ends of the heating elements.

In the following description, a steam iron is illustrated although the invention may be applied equally well to electric irons of any other type.

In the drawings:

FIGURE 1 is a side elevational view of a steam iron embodying the invention;

FIGURE 2 is a plan view of the front portion of the iron of FIGURE 1;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken along line 4—4 of FIGURE 3;

FIGURE 5 is a plan view of the soleplate taken from above;

FIGURE 6 is an elevational view partly in section of the soleplate showing one of the heating elements;

FIGURE 7 is a rear elevational view of the soleplate;

FIGURE 8 is an elevational view taken along lines 8—8 of FIGURE 3; and

FIGURE 9 is similar to FIGURE 4, showing an alternative arrangement in which the switch terminals are integral with the switch blades.

Referring to FIGURES 1 to 3, and particularly to FIGURE 3, numeral **10** represents a soleplate including a steam generating chamber **12** formed in its upper surface, which is closed by a cover **13**. Preferably, cover **13** is provided with a U-shaped lip **14** which is forced into a groove **15** in the upper surface of the soleplate and thereby secures the cover in sealed relationship with the steam generating chamber **12**. A plurality of steam emission apertures **12***a* communicate with the steam generating chamber and extend through the ironing surface of soleplate **10**.

Mounted above the soleplate and spaced therefrom is a hollow sheet metal reservoir **16** which is partially enclosed by a sheet metal housing or shell **17** extending above the periphery of the soleplate. A handle **18**, preferably moulded of phenolic resin, surmounts shell **17**, and these parts are secured to the soleplate in any suitable manner.

The front leg **19** of handle **18** is hollow as shown, and is adapted to house the upper part of thermostatic switch **20**, manual adjusting means **21** for the switch, and a fill tube **22**. Tube **22** is secured to the top of reservoir **16** and is connected to fill opening **23** in the forward face of the handle by means of flexible tubing **24**. Extending downward from water reservoir **16** and secured thereto is an annular valve body **25** providing a flow regulating construction and a valve seat arranged to provide a controlled flow of water from reservoir **16** to steam generating chamber **12**. A tubular member **25***a* is secured to valve body **25** and extends upward through the top of reservoir **16** to house a valve stem **26**. Valve stem **26** is arranged for axial movement to open or close communication between the reservoir and a steam generating chamber, being held normally open under the bias of spring **27**, and being adapted to be closed by the manual operation of cam **28** against valve actuator **29**.

Thermostatic switch **20** is similar to that shown and described in United States Patent 2,880,531 to R. H. Houck but differs in details. It comprises spring blades **30** and **31**, carrying cooperating contacts **32** and **33** respectively. A calibrating screw **34** is threaded through the upper end of blade **30** and projects through an aperture in blade **31**. A bimetallic member **35** is secured to an ambient temperature compensating bimetallic member **36** which is surmounted by an insulating member **37** arranged to engage the end of screw **34** and thereby separate normally closed contacts **32** and **33** when bimetallic member **35** flexes under the influence of heat derived from the soleplate. Blade **31** is surmounted by insulating member **38** which is in engagement with cam **39**. Cam **39** is supported by arm **40**, which is mounted for rotational movement on pin **41** supported by rigid column member **42** generally paralleling switch blades **30** and **31**. A rotation of arm **41** by means of knob **21** varies the overclosure of contacts **32** and **33** because of the varying contour of cam **39**, and thereby determines the temperature of the soleplate.

Switch **20** is attached to soleplate **10** through a lug **43**, integral with and extending above the upper surface of the soleplate. By means of a bolt **44** which extends through clearance holes in the switch parts as well as in lug **43**, and is threaded into a U-shaped nut-plate **45**, thereby clamping the switch parts to the lug. As shown in FIGURE 4, bimetallic member **35** is bound against the forward face of lug **43** in thermal conductive relationship so as to be responsive to soleplate temperatures. A ceramic insulator **46** mechanically, thermally and electrically separates bimetallic member **35** from switch blade **31** and its associated terminal **47**; ceramic insulator **48** similarly separates blade **31** from blade **30** and its associated terminal **49**; and ceramic insulator **50** similarly separates blade **30** from rigid support member **42**. Insulators **46**, **48** and **50** are provided with a recess on one face and an annular projection on the opposite face so that these parts nest together and thereby provide electrical and thermal insulation between the switch parts and the bolt which is in direct electrical and thermal contact with the soleplate.

Rigid member **20** is provided with a tongue **20***a* which extends into a recess **10***a* in soleplate **10**, the relative dimensioning being such that there is negligible clearance between these parts in a transverse direction. This arrangement assures a correct orientation of member **20**, even if bolt **44** should loosen. Obviously it is not feasible to mount the switch blades in a similar manner, since they must be insulated from each other and also from the soleplate. Other means are required, therefore, to assure unchanging vertical orientation of these parts, and the problem has been solved by using the heating elements as anchoring supports for the switch terminals, as will be described hereinafter.

Referring to FIGURE 5, the dotted lines represent heating elements **51** and **52** of the rod type, embedded in the soleplate. As described for example in Patent No. 1,367,341, issued Feb. 1, 1921 to C. C. Abbott, and as shown in FIGURE 6, these comprise a resistor **53** surrounded by a tubular metallic sheath **54**, packed with electrical insulating, but thermally conductive material. Each end of the relatively fragile resistor is secured to rod-like terminals **55** and **56** which project beyond the sheath to provide sturdy means for connection into the circuit.

At the rear of the iron, the heating elements are curved inward so as to bring their end portions adjacent each other for convenient direct connection to the lead-in wires. The end portions are formed at 90° to the embedded portions with sheath ends **54** and **54***a* so oriented that they extend generally normally to the soleplate and parallel to one another and terminate at a point above the surface of the soleplate. As seen in FIGURE 7, resistor terminals **55** and **55***a* extend beyond the sheath and are conductively secured to vertically extending rigid members **59** and **60**, the upper ends of which are adapted to be clamped by wire connectors **61** and **62**. The electric cord **63** is introduced into the iron in any desired manner, and one lead-in wire is conductively attached to member **59** by means of connector **61** while the other lead-in wire is conductively attached to member **60** by means of connector **62**. Alternately, the rigid members may be omitted and the wires may be conductively secured directly to the resistor terminals by means of suitable connectors.

At the forward end of soleplate **10**, the heating elements are also curved inward toward one another and their end portions are also formed at 90° to the embedded portions and normal to the general plane of the soleplate. As shown in FIGURE 8, the conductive sheath terminates at a point above the surface of the soleplate and resistor terminals **56** and **56***a* extend beyond the sheath, being so positioned that they may readily be conductively secured to switch terminals **47** and **49**, respectively. As shown, the switch terminals **47** and **49** extend in generally transverse and opposite directions and are secured directly to the resistor terminals **56** and **56***a*, respectively, as by welding. Since both switch terminals **47** and **49** are mechanically rigid in the direction of their extension and terminals **56** and **56***a* and the structure of which they are parts are generally mechanically rigid, the switch is supported and secured to the soleplate not only by bolt **44** but also by the laterally spaced resistor terminals, thus precluding any shifting of the switch assembly.

Although FIGURES 3 and 4 show the switch blades and switch terminals as separate parts, bound together by bolt **44**, an alternative and preferable arrangement is as shown in FIGURE 9, wherein these parts are integral, either by being stamped out of a single piece of sheet metal or by being formed of separate parts permanently joined together as by welding or brazing. In FIGURE 9

parts are designated by primed numbers corresponding to unprimed numbers designating similar parts in FIGURE 4.

With the arrangement described, the direct connection of the lead-in wires to one end of the heating elements avoids the need for additional terminals at the rear of the iron. The direct connection of the other end of the heating elements to the switch terminals eliminates all connector rods or bus bars and provides two of a plurality of supports for the switch that assure an unchanging vertical alignment. With these features, the construction is of the utmost simplicity and provides an iron that is eminently sturdy and trouble-free.

In the described arrangement, the two heating elements in combination generally follow the contour of the edges of the soleplate in the same manner as the previous U-shaped unit. The invention may, however, be applied to any desired configuration of heating element. In the same way the invention may be applied to any desired location of the thermostatic switch. These and other modifications will be apparent to persons skilled in the art, and it is therefore to be understood that the invention is not to be limited in interpretation except by the scope of the claims.

I claim:

1. In an electric iron, a soleplate, first and second heating elements of the rod type including a resistor, a tubular metallic sheath surrounding the resistor and a heat transmitting electrical insulation therebetween, said heating elements being embedded in said soleplate and extending from a point adjacent the rear of the iron to a point adjacent the nose of the iron, the ends of the heating elements being formed to extend above the upper surface of the soleplate with conductive terminals of the resistor extending beyond the ends of the sheath, the terminal size and length beyond the sheath being selected to be relatively rigid at the end of the terminal and the portion of the heater elements above the soleplate being rigidly supported by the soleplate, means for connecting the rear resistance heater terminals to a source of electric power, a thermostatic switch comprising first and second contact-carrying blades with associated switch terminals mounted to the soleplate in the forward end of the iron, the blades being arranged substantially vertically with the switch terminals adjacent the upper surface of the soleplate, and means for rigidly securing said switch to the soleplate including a direct joining of said first and second switch terminals to the forward resistor terminals of said first and second heating elements, respectively, whereby said switch is mechanically supported by, as well as electrically connected to, said heating elements.

2. An electric iron in accordance with claim 1, wherein the forward ends of the heating elements are spaced apart in a lateral direction and the switch is mounted between them in such position that each forward end of the heating element is closely adjacent a corresponding switch terminal thereby to provide improved lateral stability.

3. In an electric iron, a soleplate, first and second heating elements of the rod type comprising a resistor and a tubular metallic sheath surrounding said resistor with heat-transmitting electrical insulation therebetween, said heating elements being embedded in said soleplate and extending from a point adjacent the rear of the iron to a point adjacent the nose of the iron, said resistors being secured to terminals within the confines of said sheath, the ends of the sheath being formed to extend above the upper surface of the soleplate with the resistor terminals extending beyond the sheath, the terminal size and length beyond the sheath being selected to be relatively rigid at the ends and the portions of the heater elements above the soleplate being rigidly supported by the soleplate, means for connecting the rear terminals of said resistors to a source of electric power, a thermostatic switch comprising a pair of contact-carrying blades with associated first and second switch terminals mounted in the forward end of the iron between the forward ends of said heating elements, said blades extending in a substantially vertical direction with their contacts in an elevated position and with said switch terminals lying adjacent the upper surface of the soleplate and means in elevated position for adjusting the switch blades, and means for rigidly securing said switch to the soleplate including a direct joining of said first and second switch terminals to the forward resistor terminals of said first and second heating elements, respectively, whereby said switch is mechanically supported by, as well as electrically connected to, said heating elements.

4. In an electric iron, a soleplate, a pair of heating elements of the rod type comprising a resistor, a tubular metallic sheath surrounding said resistor with heat-transmitting electrical insulating material therebetween, said heating elements being embedded in the soleplate and extending from a point adjacent the rear of the iron to a point adjacent the nose of the iron, said resistors being secured to terminals within the confines of said sheath, the ends of the sheath being formed to extend above the upper surface of the soleplate with the resistor terminals extending beyond the sheath, the terminal size and length beyond the sheath being selected to be relatively rigid at the ends and the portions of the heater elements above the soleplate being rigidly supported by the soleplate, a thermostatic switch comprising a pair of contacts each connected to an associated switch terminal, means for connecting said switch terminals to the forward resistor terminals so that said heating elements are electrically connected in series through the contacts of the switch and mechanically supported by the soleplate through the heating elements, and connector means attached to the rear resistor terminals and supported thereby for connecting said heating elements to a source of electric power.

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