

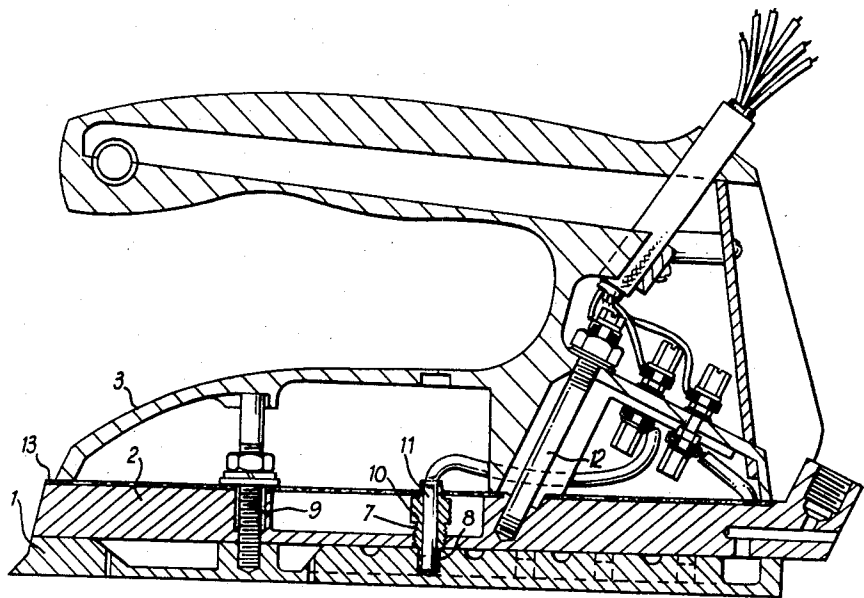
[54] **IRON**
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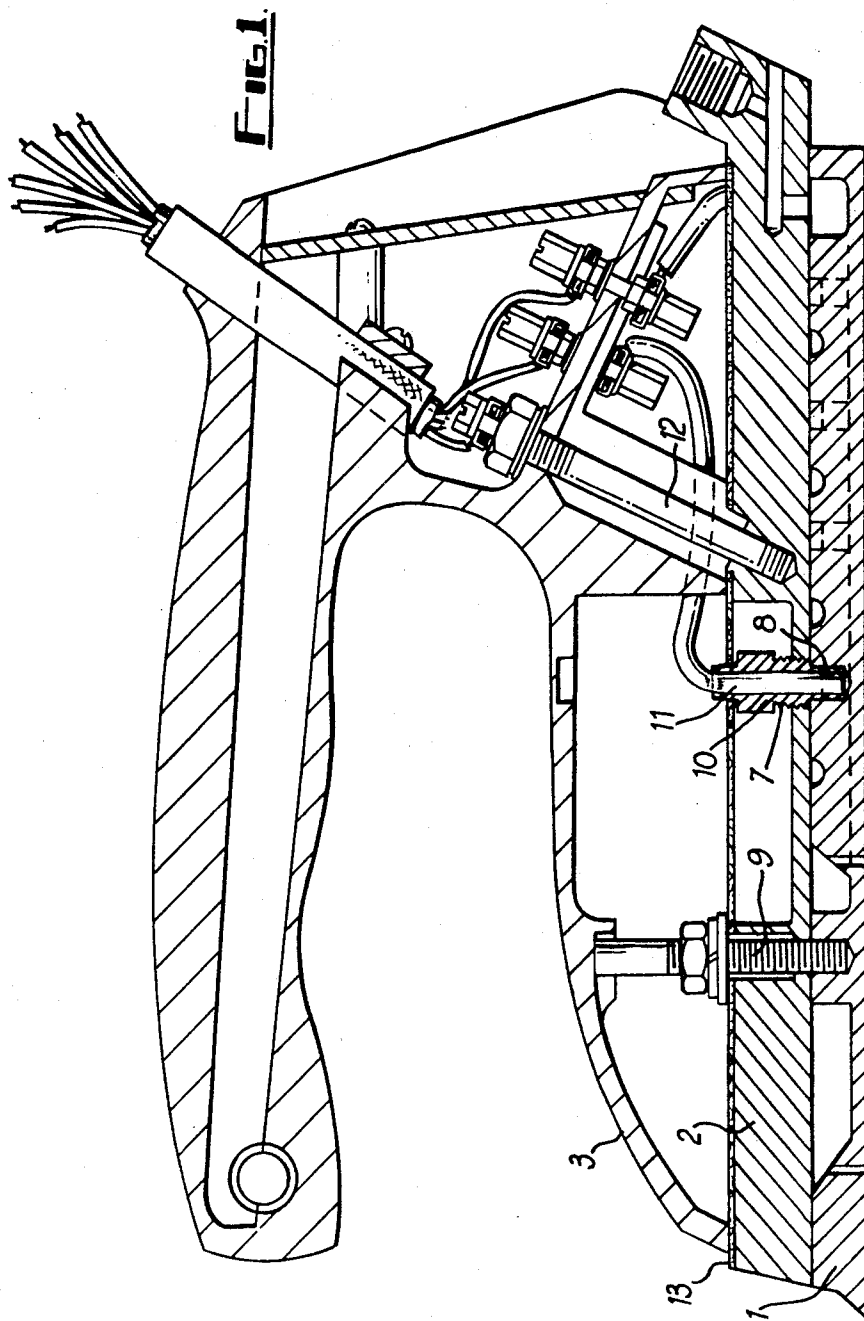
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[56] **References Cited**
UNITED STATES PATENTS
3,286,077 11/1966 Radford et al.....219/251
2,694,766 11/1954 Ireland219/254 X
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[57] **ABSTRACT**
An iron including heating means and a sole plate
wherein means for controlling the heating means is
provided in the sole plate.

6 Claims, 2 Drawing Figures





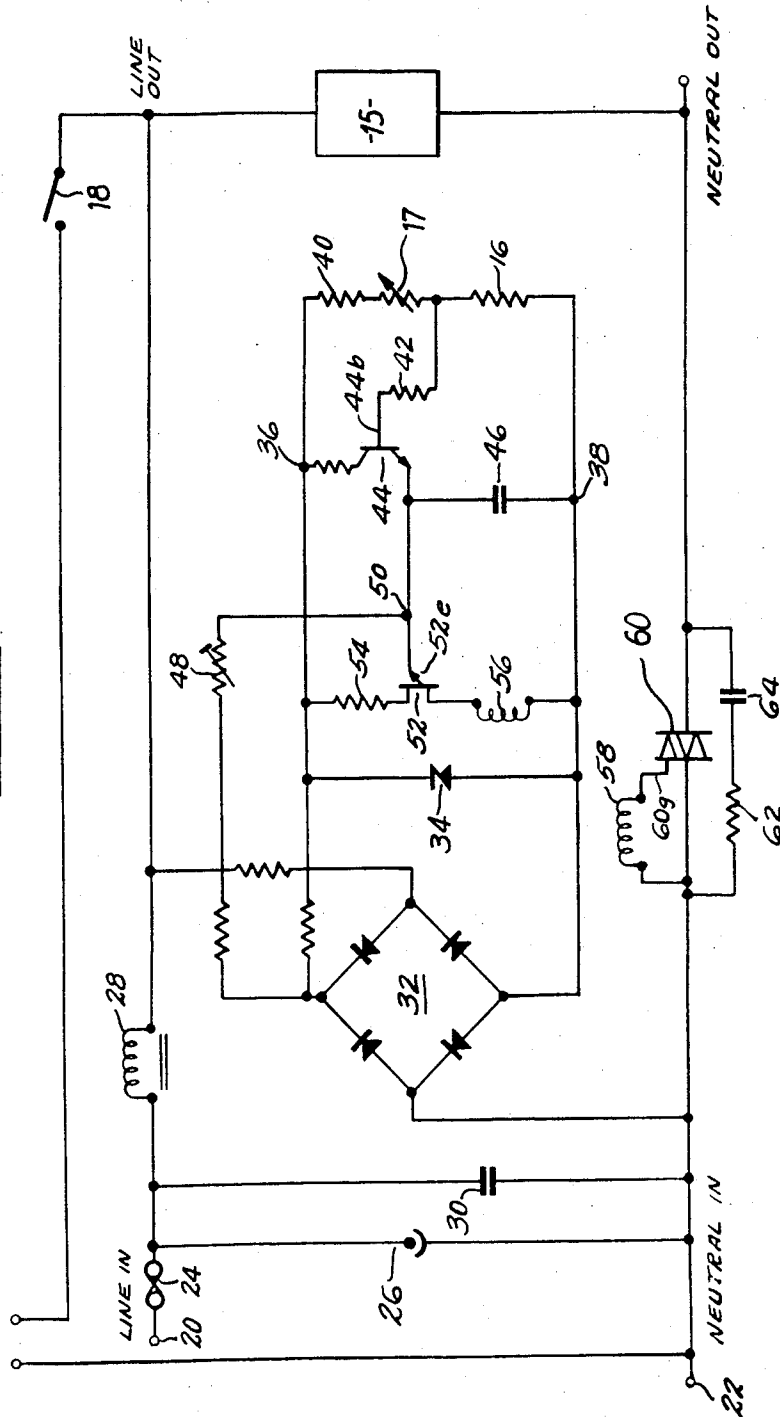
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FIG. 2



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IRON

This invention relates to an iron and more particularly to an iron, the temperature of which is controllable.

According to the invention there is provided an iron including heating means and sole plate wherein means for controlling the heating means is provided in the sole plate.

Preferably, the means for controlling the heating means comprises a thermistor and the heating means comprises one or more electrical heating elements located in the sole plate.

The iron may be of the "all electric" type or what is termed a "steam electric iron" in which steam is sprayed from perforations in the sole plate.

The circuitry by which the thermistor controls the element may be of any suitable design. It is preferred that the circuitry be designed to maintain the iron at any desired temperature preferably from 90° to 260° C.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 is a section through an iron; and

FIG. 2 is a circuit diagram of a preferred control circuit.

Referring to FIG. 1, the iron comprises a sole plate 1 which is preferably made of bronze with a chrome finish, and which is secured to an element plate 2, made for example of aluminum, by studs of which one 9 is shown. A bore 7 is formed through the element plate and a bore 8 is formed in the sole plate such that when the element and sole plates are secured together the bores are co-axial. The bore 8 extends from the face of the sole plate adjacent the element plate to a point close to the face of the sole plate remote from the element plate, but as shown in FIG. 1 does not extend completely through the sole plate.

A thermistor holder 10 is provided in the bores 7 and 8 and a thermistor 11 is located in the holder. The thermistor is coupled into a control circuit as shown in FIG. 2 via a terminal 6, the control circuit in the present embodiment being located externally of the iron. The thermistor is an inert or solid state device.

A moulded handle and cover 3, which may for example be made of plastics material is secured to the element plate by studs, one of which 12 is shown. An asbestos sheet 13 is interposed between the cover and the element plate.

The invention is not restricted to the above-described embodiment many variations, such as would readily occur to one skilled in the art falling within the scope thereof. Thus the control circuit may be provided within the casing instead of externally thereof.

A suitable control circuit for the iron just described is shown in FIG. 2. The temperature of an iron 15 is controlled by means of a thermistor 16 the thermistor itself being controllable by means of a variable resistance 17. When the heating element is connected to the current supply by means of switch 18 the iron will heat up and as it does so the resistance of the thermistor will decrease. This has the effect of reducing the current drawn by the iron heater elements so that the heat of the iron can be limited to a value determined by the variable resistor. As the iron starts to cool down the resistance of the thermistor will rise so that

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the heater elements again draw sufficient current to heat the iron. It will be appreciated that with this arrangement very close control of iron temperature can be maintained. As FIG. 2 shows, power for iron 15 is applied at terminals 20 and 22, and after passing through a short-circuit protection fuse 24, a 'MAINS ON' indication is provided by a neon lamp 26. Surge and radio interference protection is provided by a series choke 28 and a shunt capacitor 30 at this point in the circuit.

A portion of the alternating current across terminals 20 and 22 is rectified by a bridge rectifier 32 and produces across a zener diode 34 a series of flat-topped waves recurring every half cycle of the AC frequency. Across the points 36 and 38 is connected the series combination of a 120 ohm resistor 40, 'SET TEMP.' variable resistor 17, and thermistor 16, the latter being embedded in brass probe 10 in the iron sole plate 1. This combination behaves as two arms of a Wheatstone bridge, the potential at the connecting point of a 1K ohm resistor 42 in series with the base 44b of a 2N 3391 transistor 44 being inversely proportion to the thermistor (and hence the iron sole plate) temperature. The effect of transistor 44 is to quickly charge a 0.47 uF capacitor 46 in the emitter circuit to the potential on the base terminal of transistor 44. During the remainder of the flat-topped wave period, capacitor 46 is further charged from bridge rectifier 32 through a 1M ohm variable resistor 48. Thus the potential at a point 50 during one of the periods is a quick step to a level inversely proportional to iron sole plate temperature followed by a gradual linear rise dependent only upon the setting of the 1M ohm variable resistor 48. This potential is applied to the emitter 52e of a 2N 2646 unijunction transistor. The 'firing' potential of transistor 52 is determined purely by the voltage at points 36 and 38 and the ratio of series resistors 54 and 56 in both base leads and is, therefore, constant. These two base resistors (comprising 1K ohm 54 from point 36 and the P.T. primary winding 56 from point 38), together with the inherent internal resistance of the base leads, constitute the two other arms of the Wheatstone bridge referred to earlier.

Whenever the potential of point 50 exceeds the firing potential of unijunction transistor 52 the stored energy of 0.47 uF capacitor 46 is immediately delivered to the primary winding 36 of the pulse transformer P.T. and thence via the secondary winding 58 into the gate terminal 60g of a triac 60. This causes triac 60 to turn on, connecting the load (the iron 15) to terminals 20 and 22 for the remainder of the half cycle. Following this power pulse into iron 15 the firing procedure must be re-initiated.

Thus, with iron 15 cool the thermistor 16 resistance will be high and the potential at point 50 will be high at an early point in the half cycle and rises higher thereafter. The initial potential at point 50 will be sufficient to cause unijunction transistor 52 to fire and thus triac 60 will deliver almost a full half cycle pulse to the element of iron 15 during each half cycle. When iron 15 achieves the desired temperature, the thermistor 16 resistance will be lower and the initial quick rise of potential at point 50 will be insufficient to fire unijunction transistor 52, this then occurring later in the half cycle during the linear ramp, the amount of delay de-

pending on the precise temperature of the thermistor and the slope setting, determined by 1 u ohm variable resistor 48. The power pulses to the element of iron 15 are thus shortened and stability is reached when the average power has been reduced until it is just sufficient to maintain sole plate 1 at the desired temperature. As more power is required when iron 15 is put to work, the temperature must drop slightly in order to allow the ramp at point 50 to increase its initial potential and thus fire unijunction transistor 52 earlier in each half cycle. Conversely, a rise in temperature causes the ramp to start from a lower point and thus fire unijunction transistor 52 later. The limits of operation between full-on and full-off are determined by the slope of the ramp (and hence by the setting of 1M ohm variable resistor 48) and the control for this slope is, therefore, termed the 'Proportional Band'.

The triac 60 is further protected from transient voltage surges across terminals 20 and 22 by a diverting network comprising a 1K ohm resistor 62 and a 0.047 uF capacitor 64. Thus, any surges by-pass triac 60 and are dissipated harmlessly in the 64 element of iron 15.

I claim:

1. In combination: an iron having electrical heating means energizable from an electric current source and adapted to heat a sole plate, and a control circuit for said iron comprising,

a temperature sensitive element responsive to the temperature of said sole plate to exhibit a change in an electrical value thereof,

a capacitor,

means responsive to a change in the electrical value of said element to effect charging of said capacitor,

first switching means actuatable in response to discharge of said capacitor,
and second switching means actuatable in response to actuation of said first switching means to connect said heating means for energization from said source.

2. A control circuit according to claim 1 including adjustable variable resistance means to regulate the rate of charge of said capacitor.

3. A control circuit according to claim 1 wherein said capacitor is repeatedly charged and discharged in response to a change in the resistance of said element and wherein said second switching means is actuatable repeatedly in response thereto to provide repeated connection of said heating means to said source whereby power pulses are supplied to said heating means from said source.

4. A control circuit according to claim 3 wherein said means responsive to a change in the resistance of said element to effect charging of said capacitor comprises a transistor; wherein said first switching means comprises a unijunction transistor; and wherein said second switching means comprises a triac type solid state device.

5. A control circuit according to claim 4 wherein said unijunction transistor is coupled to said triac type device by pulse transformer means.

6. A control circuit according to claim 5 including rectifying means energizable from said electric current source, and wherein said temperature sensitive resistance element, said capacitor, said transistor and said unijunction transistor are in circuit with said rectifying means.

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