Nov. 19, 1963 P. J. KIRCHER 3,110,975

STEAM IRON WITH DUAL HEATING MEANS

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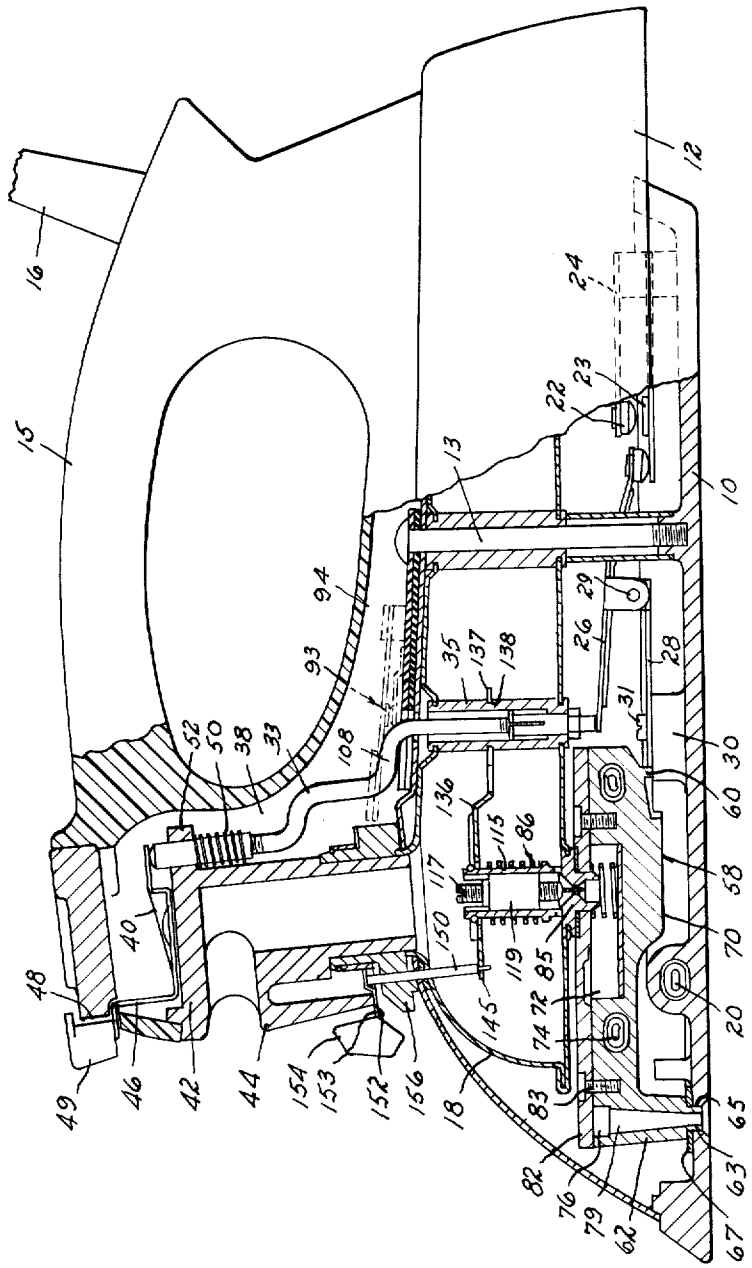


FIG. 1

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FIG. 2

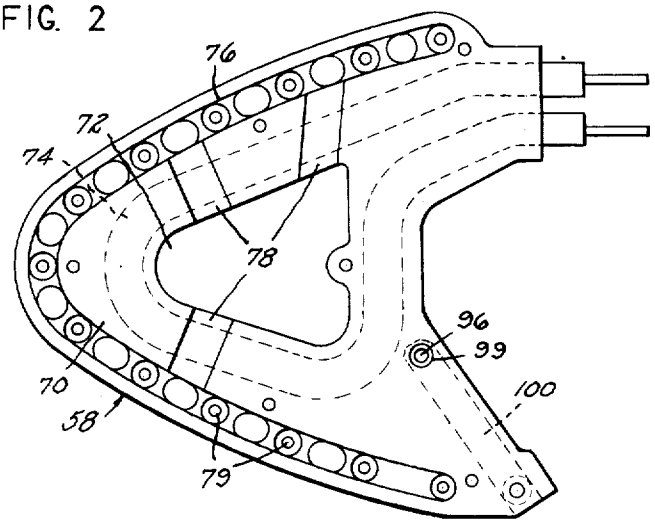


FIG. 3

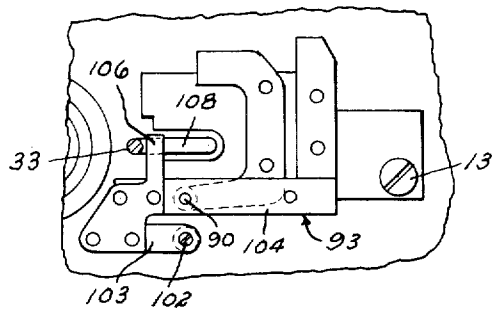
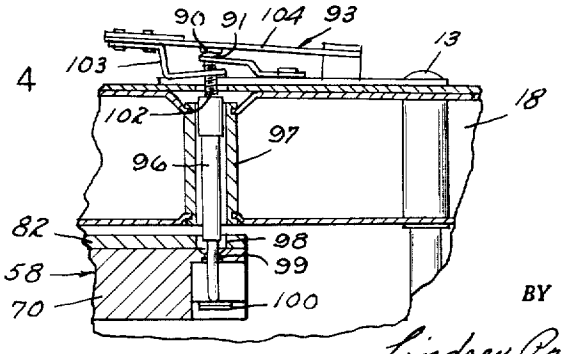


FIG. 4



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FIG. 5

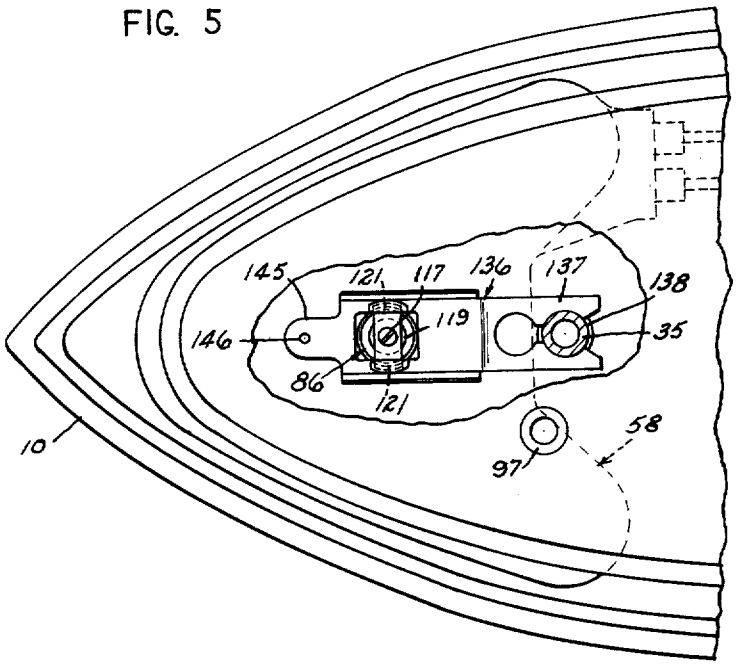


FIG. 6

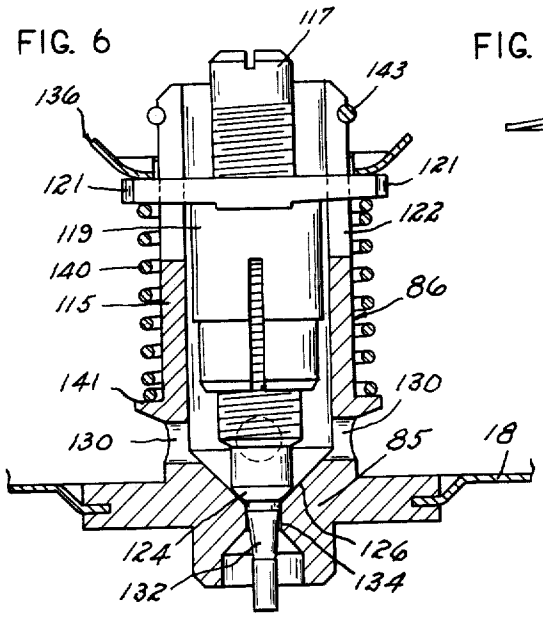
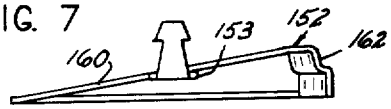


FIG. 7



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STEAM IRON WITH DUAL HEATING MEANS

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7 Claims. (Cl. 38—77)

This invention generally relates to pressing devices and is more particularly directed to an improved pressing device such as an iron which can be used both as a dry iron and also as one wherein steam is generated and distributed through the iron sole plate to facilitate accomplishing a wide variety of pressing and steaming operations.

It is a primary object of this invention to provide a steam and dry iron that provides easy adjustment of the characteristics of the steam generated therein for use during pressing and steaming operations.

It is a further object of this invention to provide an improved iron which is capable of pressing and steaming synthetic fiber materials without subjecting these materials to damage caused by excessive temperatures.

It is another object of this invention to provide an iron having an improved sole plate that is exceptionally light in weight while being substantially devoid of hot spots that are likely to cause damage to the fabric being ironed.

It is an additional object of this invention to provide an improved steam and dry iron which generates and distributes steam along the pressing surface of the sole plate while, at the same time, providing low sole plate temperatures that preclude damage to synthetic fiber materials.

It is a further object of this invention to provide a steam iron having exceptional ease of control and flexibility of operation while being durable, economical and reliable to operate.

Other objects will be in part obvious, and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a side elevation view partially in cross section showing a preferred embodiment of this invention;

FIG. 2 is a top plan view of the steam generator with the cover plate removed;

FIG. 3 is a fragmentary top plan view with the handle of the iron removed and showing the control switch for the steam generator;

FIG. 4 is a fragmentary cross section view showing the temperature control structure for the steam generator;

FIG. 5 is a partial top plan view showing the details of the steam control valve;

FIG. 6 is an enlarged partial cross section view of the steam control valve; and

FIG. 7 is an enlarged side elevation view of the steam valve control cam.

Turning now to the illustrated preferred embodiment shown in FIG. 1, it is seen that this improved steam and dry iron generally comprises a sole plate **10**, a body shell **12** secured thereto by bolt **13** (one of which is shown in FIG. 1), a handle **15** secured to the body shell by conventional fasteners (not illustrated) and a power cord **16** extending from the rear portion of the handle. A water tank or reservoir **18** is supported within body shell **12** and above sole plate **10** in any convenient manner.

Referring first to the features and construction of the sole plate **10**, it is noted that an electrical resistance heating element **20** is embedded in sole plate **10** and extends therethrough only to the extent necessary to provide even sole plate temperature distribution as determined by so-called "dry" ironing conditions. Electrical connection to heating element **20** is established through contacts **22** and **23** secured to flexible arms of switch **24** which is mounted within body shell **12** and connected to power cord **16**. The controlled actuation of switch **24** to establish the desired sole plate temperature is accomplished through the movement of switch actuator arm **26** pivotally mounted on bi-metal **28** at point **29**. Bi-metal **28** is secured to abutment **30** of sole plate **10** by fastener **31** and the desired temperature position of actuator arm **26** is controlled by the location of push rod **33** that extends through bushing **35** in reservoir **18** and through passageway **38** in handle **15** to engage cam **40** that is rotatably mounted on shelf **42** of reservoir fill pedestal **44**. A lever **46** is bent upwardly from cam **40** and extends out through slot **48** in the front of handle **15**. A control knob **49** is attached to the outboard end of this lever and cooperates with indicia distributed about the margins of slot **48** to indicate the desired temperature setting. A tension spring **50** is secured to push rod **33** adjacent the upper end thereof and to the rear ledge **52** so as to urge push rod **33** upwardly into engagement with cam **40**. Rotation of cam **40** raises and/or lowers push rod **33** to vary the position of switch actuator **26** thereby to establish the desired temperature setting of sole plate switch contacts. For purposes of the present description, it is noted for completeness that the temperature of the sole plate as determined by the energization of the resistance heating element through the thermostatic switch structure is closely controlled in the desired manner by the switch therein disclosed and claimed. Of course, other types of thermostatic switching devices can be utilized in this improved iron.

The iron thus far described is capable of functioning as a conventional dry iron with the substantial advantage that the location of the resistance heating element in the sole plate is determined only by the requirement of even sole plate temperature distribution without any reference to the necessity of providing sufficient heat in a particular location to generate steam. Additionally, it is noted the sole plate can be substantially reduced in cross section thickness because the localized heat from the steam generating portion of a conventional sole plate is not present to be distributed thereby permitting substantial cost reduction as well as substantial weight reduction without sacrificing the operational ease and efficiency of the iron.

In order to provide for the generation of steam and its distribution in a desired pattern across the sole plate surface, the present invention includes a steam generating vessel or chamber generally designated **58** that is supported in heat insulating and spaced relationship to sole plate **10**. As most clearly seen in FIG. 1, steam generating vessel **58** is supported at its rear surface by minimum area contact of heel projection **60** with abutment **30** and at its front and sides by a downwardly projecting series of abutments generally designated **62** whose lower ends **63** are reduced in cross section dimension and project into complementary shaped apertures **65** in sole plate **10**. Each depending abutment **62** is insulated by asbestos or other suitable material as at **67** so that there is minimum heat transfer between steam generating vessel **58** and sole plate **10**. Additionally it is noted that the apertures **65** have flaired openings to assist the distribution of steam and that reduced portions **63** of abutments **62** terminate short of the sole plate ironing surface. Minimum area contact is thereby established between vessel **58** and sole plate **10** so as to minimize heat transfer therebetween.

Steam generating vessel **58** is generally comprised of a base or container portion **70** which, as best seen in FIG. 2,

is provided with a central recess 72 about which there extends the electric resistance heating element 74, conveniently embedded in base 70 during fabrication thereof. Adjacent the outer peripheral edge of base 70 there is provided a groove 76 that communicates with recess 72 through the passageways 78. Abutments 62 extend downwardly in alignment with groove 76 and passageways 79 extend downwardly therethrough to communicate with the sole plate ironing surface. Recess 72, groove 76 and passageways 78 are closed at their upper surfaces by top plate 82 secured to base 70 by a plurality of fasteners 83.

In order to permit the passage of water from reservoir 18 into steam generator 58 cover 82 is apertured above recess 72 and receives therein the lower end 85 of valve assembly 86 mounted in the bottom wall of reservoir 18, as best seen in FIGS. 1 and 6. As hereinafter pointed out in greater detail valve assembly 86 is constructed and arranged in preferred embodiment to be continuously adjustable between fully open and fully closed positions so as to provide operator control over the quantity and wetness of steam distributed across the ironing surface of sole plate 10.

Referring now to FIGS. 3 and 4 in conjunction with FIGS. 1 and 2, it is noted that the energization of resistance heating element 74 embedded in steam generator 58 is controlled by contacts 90 and 91 mounted on switch arms of switch assembly 93 that is secured to the upper surface of body shell 12 and located in a recess generally designated 94 in handle 15. Contacts 90 and 91 are electrically connected to power cord 16 by conventional wiring (not shown). Movable contact 90 is controlled in position by push rod 96 that extends through bushing 97 in reservoir 18 and through aligned apertures 98 and 99 in cover plate 82 and base 70 in steam generator 58 to engage steam chamber temperature control bi-metal 100 that is secured in good heat conducting relationship with the surface of base 70. The upper end of push rod 96 engages adjusting screw 102 carried by arm 103 to move flexible switch arm 104 in accordance with the temperature of the steam generating vessel thereby to open and close contacts 90 and 91.

In order to provide ease of common control between the energization of sole plate heating element 20 and steam chamber heating element 74, switch arm 104 of switch 93 is provided with a laterally projecting tab or arm 106 that passes over and is engageable with bent portion 108 of sole plate temperature control push rod 33. Cam 40 is provided with a relatively steep step at a position comparable to the off position of sole plate switch 24, so that push rod 33 will move upwardly a sufficient amount to engage arm 106 and raise contact 90 to a position wherein it cannot engage fixed contact 91. Thus, the sole plate heating element and the steam generating chamber heating element are simultaneously de-energized by turning cam 40 to the "off" position. The desired operating temperature of steam chamber 58 can be established, as in the preferred embodiment, as a substantially constant temperature that is controlled by the characteristics of bi-metal 100 and the positioning of temperature adjustment screw 102. Without substantial modification it is also noted that this temperature can be made an adjustable quantity with a handle control such as is provided for sole plate temperature.

Turning now to the details of construction of valve assembly 86 and its cooperation with steam chamber 58 and reservoir 18, it is noted that, in the preferred embodiment, valve assembly 86 includes a unitary valve housing 115 having a lower portion 85 secured to reservoir 18 and projecting downwardly into tight sealing engagement with top plate 82 of the steam generator. Valve member or operator 117 is threadably secured to carrier 119 which, in turn, is provided with a pair of outwardly extending guide projections 121 that extend through opposed slots 122 formed in the side wall of member 115. Valve member 117 is provided with a tapered end portion 124 that engages complementary tapered side walls or valve seat 126 and a tapered stem portion 132 that passes into aperture 134. Water is admitted to the interior of the valve through a plurality of side apertures 130 so that, as valve 117 is moved away from valve seat 126, water is admitted into recess 72 of steam generator 58 in a quantity determined by the net opening described between the tapered stem side walls 132 and the side walls of aperture 134.

In order to mount valve member 117 for controlled movement there is provided the spring lever 136 having one end 137 fixedly secured to bushing 35 in any desired manner such as by the cooperation of split spring pressed arms engaged in an annular groove 138 in bushing 35. Arm 136 is apertured intermediate its ends so as to fit over and around member 115 to engage arms 121 of valve member carrier 119. A spring 140 is trapped between peripheral abutment 141 adjacent the lower end of member 115 and arms 121 thereby to urge valve member 117 to the upward or open position, such upward movement being limited by O-ring 143. Free or movable end 145 of arm 136 is apertured at 146 to receive the lower end of push rod 150 which extends upwardly therefrom through apertures in reservoir 18, body shell 12 and pedestal 44 to engage steam control cam 152 which is mounted for rotation about fill pedestal 44. Cam 152 is provided with an outwardly extending control arm 153 to which is attached a control knob 154 that cooperates with steam wetness indicia disposed about the periphery of pedestal ledge 156. As best seen in FIG. 7, cam 152 is provided with a generally sloping portion 160 and a rapid fall or step portion 162. Assuming push rod 150 to be in engagement with the lower portion of step 162, it is noted that push rod 150 will be fully depressed so as to deflect arm 136 downwardly and urge valve member 117 into sealing engagement with valve seat 126, thereby closing the valve. The initial stage of rotation of cam 160 permits push rod 152 to rise slightly under the influence of spring 140 thereby slightly opening the valve and permitting water to be slowly discharged into the steam chamber to be converted into steam and distributed through the passageways to the sole plate ironing surface. Continued rotation of the steam control cam 152 permits the valve to open even farther to a maximum point wherein a maximum predetermined quantity of water can enter the steam chamber. As is immediately apparent, the quantity of water entering the steam chamber which is at a substantially fixed temperature will determine the wetness of the steam that is discharged adjacent the sole plate ironing surface. If desired, this valve opening can be preadjusted to permit discharging droplets of water onto the sole plate so as to effect a "sprinkling" operation. Limited opening of the valve insures that only "dry" steam will be dispensed to the sole plate ironing surface. Of course, the valve can be closed and the iron operated as a "dry" iron.

From the foregoing description of the structure and operation of this improved steam iron, it is noted that sole plate temperature and steam generation are mutually independent (except for a common "off" in the preferred embodiment) so that steam can be generated and distributed about the sole plate ironing surface even though that surface is at an extremely low temperature thereby permitting the ironing of synthetic fiber fabrics or the use of the iron to steam seams, hats, or even carpets and shoes to permit cleaning and reconditioning thereof. Additionally, the characteristics of the steam are variable from a small quantity of "dry" steam to wet steam and even to droplets of water if desired.

Of course utilization of this iron as a conventional steam iron at any desired sole plate ironing surface temperature is easily obtained and it is noted that, because the steam generator is removed from and heat insulated from the sole plate, there is less likelihood of any sole plate hot spots developing thereby insuring even and substantially constant sole plate temperatures.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. A steam iron comprising: a sole plate having a pressing surface, a steam generating vessel, means mounting said steam generating vessel in poor heat transfer relationship with said sole plate, steam passage means leading from said steam generating vessel to said pressing surface, a water reservoir disposed above said steam generating vessel and having a port therein communicating with said steam generating vessel, a valve disposed in said port, said valve being continuously variable from a fully closed position to a fully opened position to vary the amount of water admitted to said steam generating vessel, first electric heating means embedded in said sole plate, second electric heating means embedded in said steam generator, a first thermostatic switch having its heat sensing element in good heat conducting relationship with said sole plate and having its contacts arranged to control energization of said first electric heating means, a second thermostatic switch having its heat sensing element in good heat conducting relationship with said steam generating vessel and having its contacts arranged to control the energization of said second heating means.

2. A steam iron comprising: a sole plate having a pressing surface, a steam generating vessel, means mounting said steam generating vessel in poor heat transfer relationship with said sole plate, steam passage means leading from said steam generating vessel to said pressing surface, a water reservoir disposed above said steam generating vessel and having a port therein communicating with said vessel, valve means in said port for controlling the flow of water therethrough, first heating means embedded in said sole plate, second heating means embedded in said steam generating vessel, switch means controlling the energization of said first and said second heating means, the means mounting said steam generating vessel comprises a plurality of integrally formed projections on said steam generating vessel and supported by the sole plate and wherein said steam passage means are passageways formed in said projections.

3. A steam iron comprising: a sole plate having a pressing surface on one side thereof, a body shell secured to the other side of said sole plate, a handle disposed above said body shell and fixedly positioned relative thereto, a steam generating vessel, means mounting said steam generating vessel in poor heat transfer relationship with said sole plate, steam passage means leading from said steam generating vessel to said pressing surface, a water reservoir disposed within said shell and above said steam generating vessel, said water reservoir having a port therein communicating with said steam generating vessel, a valve disposed in the port in said reservoir, said valve being continuously variable from a fully closed position to a fully opened position, first electric heating means embedded in said sole plate, second electric heating means embedded in said steam generating vessel, a first thermostatic switch having its heat sensing element mounted in good heat conducting relationship with said sole plate and having its contacts arranged to control energization of said first electric heating means, a second thermostatic switch having its heat sensing element in good heat conducting relationship with said steam generating vessel and having its contacts arranged to control energization of said second heating means, a first rotatable control cam disposed in the front of said handle adjacent the top thereof, means interconnecting said first control cam with said first thermostatic switch to control the temperature setting thereof, a second rotatable cam disposed in the front of said handle adjacent said body shell, and means interconnecting said second rotatable cam and said valve means to control the rate at which water enters said steam generating vessel from said reservoir.

4. A steam iron comprising: a sole plate having a pressing surface on one side thereof, a body shell secured to the other side of said sole plate, a handle disposed above said body shell and fixedly positioned relative thereto, a steam generating vessel, means mounting said steam generating vessel in poor heat transfer relationship with said sole plate, steam passage means extending from said steam generating vessel to said pressing surface, a water reservoir disposed within said shell and above said steam generating vessel, a reservoir fill tube extending upwardly from said reservoir and into said handle, means communicating between said vessel and said reservoir, said last-named means including a valve having a valve member slidably movable therein to continuously vary the rate at which water is admitted to said vessel, spring means continuously urging said valve member to the open position, a cam mounted for rotation about said fill tube, a push rod mounted externally of said fill tube interconnecting said valve member and said cam whereby rotation of said cam about said fill tube adjusts the position of said valve member, first electric heating means embedded in said sole plate, second electric heating means embedded in said steam generating vessel, a first thermostatic switch having its heat sensing element mounted in good heat conducting relationship with said sole plate and having its contacts arranged to control energization of said first electric heating means, a second thermostatic switch having its heat sensing element mounted in good heat conducting relationship with said steam generator and having its contacts mounted on said body shell and arranged to control energization of said second heating means, the heat sensing element of said second thermostatic switch being operatively connected to one of the contacts of said second thermostatic switch by a push rod passing through said reservoir, a first rotatable control cam disposed in the front of said handle adjacent the top thereof, means interconnecting said first control cam with said first thermostatic switch to control the temperature setting thereof, a second rotatable cam disposed in the front of said handle adjacent said body shell, and means interconnecting said second rotatable cam and said valve means to control the rate at which water enters said steam generating vessel from said reservoir.

5. The steam iron as set forth in claim 3 wherein said valve includes a valve member slidably mounted therein and movable to continuously vary the rate at which water is admitted to said vessel, a spring continuously urging said valve member to the open position and wherein said means operatively interconnecting said second cam and said valve means comprises a push rod operatively interconnecting said slidable valve member and said cam.

6. The steam iron as set forth in claim 3 wherein the means mounting said steam generating vessel on said sole plate comprises a plurality of integrally formed projections on said steam generating vessel and said steam passage means are passageways formed in said projections.

7. A steam iron comprising: a sole plate having a pressing surface, a steam generating vessel, means mounting said steam generating vessel in poor heat transfer relationship with said sole plate, steam passage means leading from said steam generating vessel to said pressing surface, a water reservoir disposed above said steam generating vessel and having a port therein communicating with said steam generating vessel, a valve disposed in said port, said valve being continuously variable from a fully closed position to a fully opened position to vary the amount of water admitted to said steam generating vessel, first electric heating means embedded in said sole plate, second electric heating means embedded in said steam generating vessel, a first thermostatic switch having its heat sensing element in good heat conducting relationship with said sole plate and having its contacts arranged

to control energization of said first electric heating means, a second thermostatic switch having its heat sensing element in good heat conducting relationship with said steam generating vessel and having its contacts arranged to control the energization of said second heating means, a first push rod extending through the reservoir and connecting the heat sensing element of said second thermostatic switch with one of the contacts of said second thermostatic switch, a rotatable control cam, a second push rod operatively connecting said control cam with said first thermostatic switch to control the temperature setting of said switch in accordance with the position of said control cam, and means carried by said second thermostatic

switch and engageable by said second push rod to effect simultaneous de-energization of said first and second electric heating means.

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