Nov. 14, 1967 TOSHIO YAI ET AL 3,352,998

ELECTRIC IRON

Filed Oct. 4, 1965 3 Sheets-Sheet 1

FIG. 1

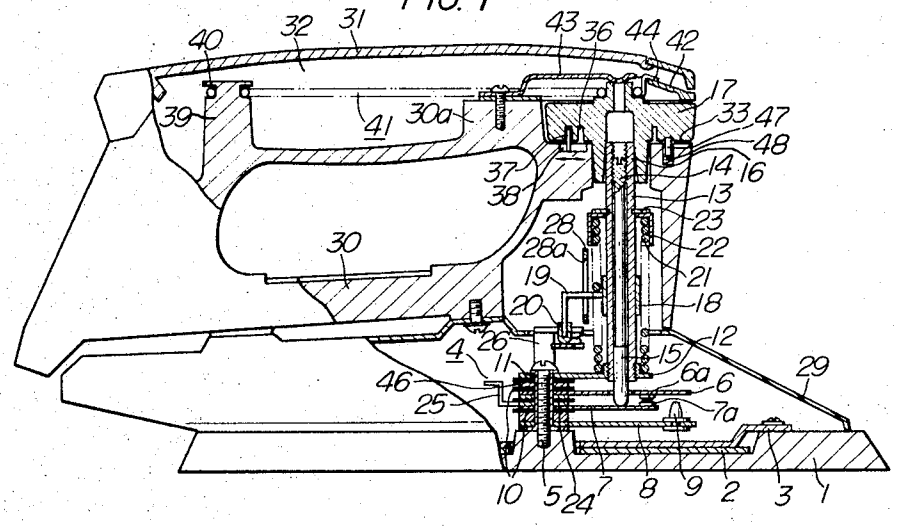
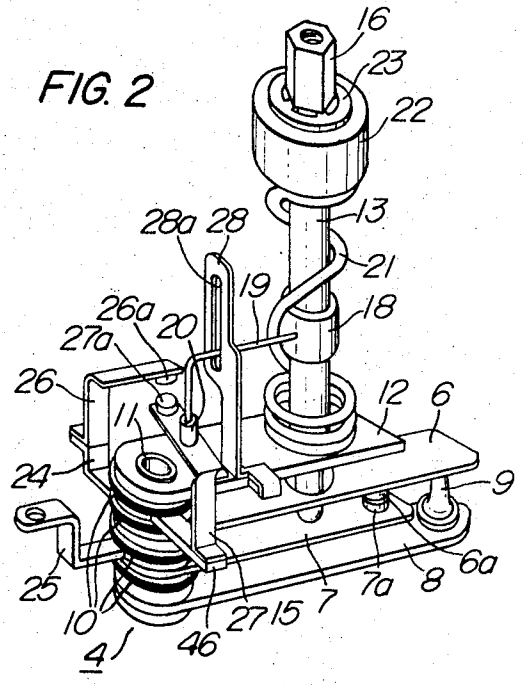


FIG. 2



INVENTORS
Toshio Yai
Seiji Takashima

BY Stevens, Davis, Miller & Mosher

ATTORNEYS

Nov. 14, 1967 TOSHIO YAI ET AL 3,352,998

ELECTRIC IRON

Filed Oct. 4, 1965 3 Sheets-Sheet 2

FIG. 3

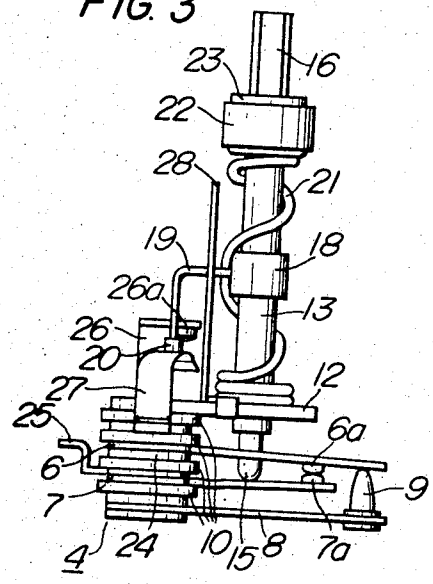


FIG. 4

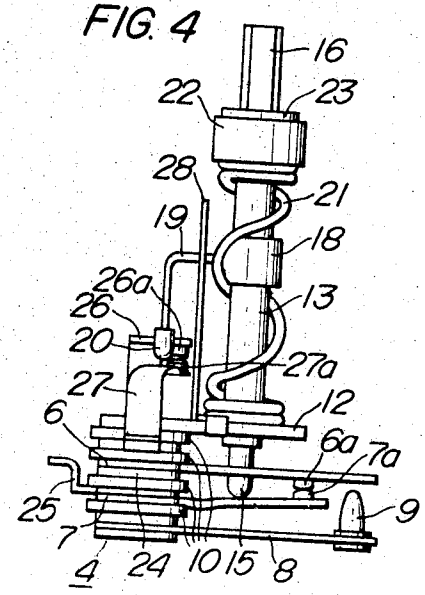


FIG. 5

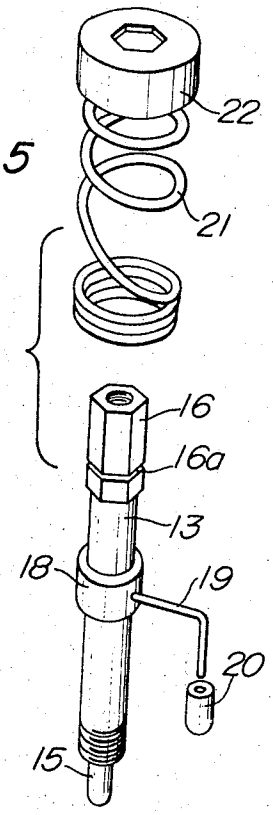
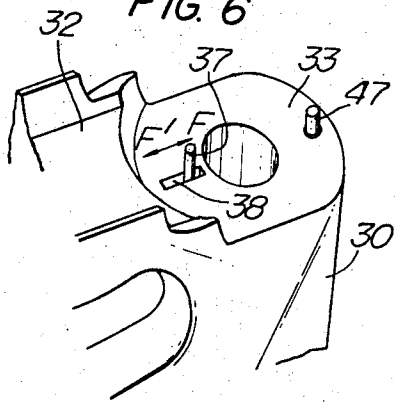


FIG. 6



INVENTORS

Toshio Yai

Seiji Takashima

By Stevens, Davis, Miller & Mosher

ATTORNEYS

Nov. 14, 1967 TOSHIO YAI ET AL 3,352,998

ELECTRIC IRON

Filed Oct. 4, 1965 3 Sheets-Sheet 3

FIG. 7

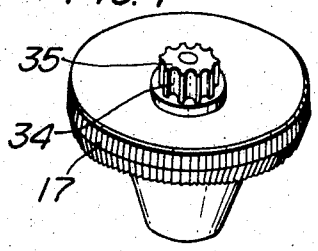


FIG. 8

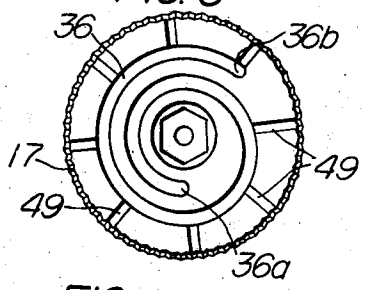


FIG. 10

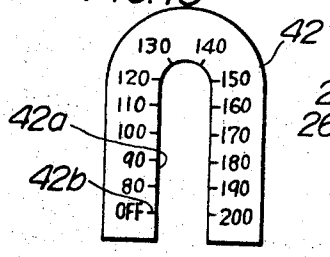


FIG. 11

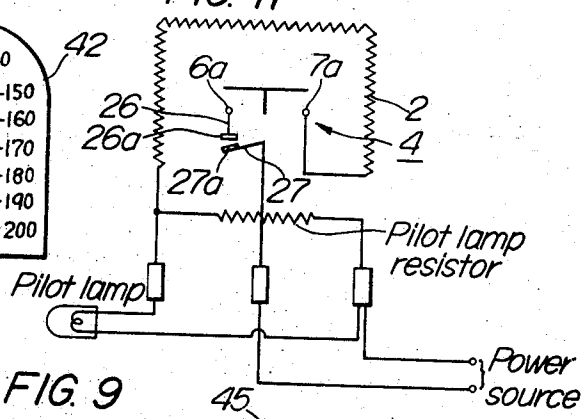
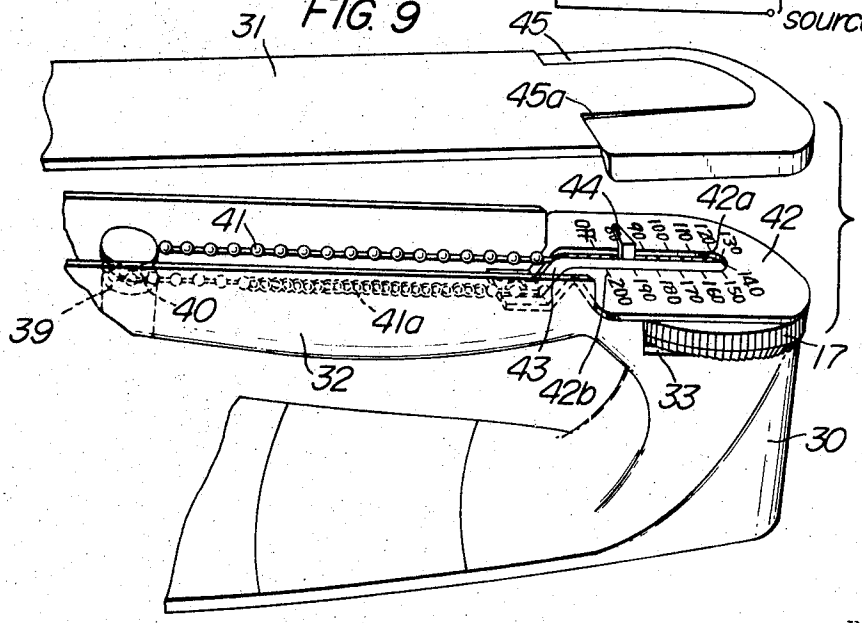


FIG. 9



INVENTORS
Toshio Yai
Seiji Takashima

BY Stevens, Davis, Miller & Mosher

ATTORNEYS

United States Patent Office 3,352,998
Patented Nov. 14, 1967

3,352,998

ELECTRIC IRON

Toshio Yai, Hirakata-shi, and Seiji Takashima, Amagasaki-shi, Japan, assignors to Matsushita Electric Industrial Co., Ltd., Osaka, Japan, a corporation of Japan

Filed Oct. 4, 1965, Ser. No. 492,622
Claims priority, application Japan, Oct. 8, 1964, 39/80,114, 39/80,115, 39/80,116; Oct. 21, 1964, 39/83,147; Nov. 11, 1964, 39/88,317
5 Claims. (Cl. 219—252)

The present invention is to provide an improved and novel electric iron provided with adjusting means capable of adjusting the sole plate surface temperature to be most suitable for various kinds of cloth.

In recent days various kinds of chemical fiber cloth are being sold under the trade names, for example, of nylon and Tetoron, and for ironing out such cloth it is necessary to suitably select an ironing temperature for the respective cloth and adjust the sole plate surface temperature of iron to that temperature beforehand. In electric irons which have been available heretofore, however, the sole plate surface temperature is adjusted by temperature adjustment indicating means which is adapted to change the temperature from "off" position to a maximum temperature within one rotation of a manually operative thermo-adjustment dial and therefore a slight temperature adjustment to a selected temperature has to depend essentially on the feeling at a finger tip, with a consequence that an error with respect to a desired temperature is much greater.

A further detailed object of the present invention is to make the amount of temperature change according to an angle of rotation of a thermo-adjustment dial smaller so that a slight temperature change may be adjusted by normal manual feeling, that is to heighten the preciseness of adjustment, by the addition of a thermostat adapted to change temperature from "off" position to a maximum temperature upon rotation of the manually operative thermo-adjustment dial more than one circle and a mechanism relative to said thermo-adjustment dial.

Another object of the present invention is to provide an electric iron in which an improved and novel switching mechanism is provided in addition to the thermostat, said switching mechanism providing for smaller rotating operation of the thermo-adjustment dial for the temperature range from "off" position to a lower temperature of 80° C., which is practically not used and unnecessary, than that of ordinary thermo-adjustment dials. By the ordinary thermo-adjustment dials is meant such dials which are required to be rotated proportionally at a constant ratio of temperature change to rotational angle of the dial, even in the section corresponding to the temperature range (normally below about 80° C.) which is not used practically.

Further detailed objects, advantages, mechanism and method of operation of the present invention will be more apparent from an embodiment of the invention shown in the accompanying drawings, in which:

FIGURE 1 is a side elevational view showing a portion of an electric iron embodying the present invention in section;

FIGURE 2 is an enlarged perspective view of a unit consisting of the thermostat and the manually operative circuit switch shown in FIGURE 1;

FIGURES 3 and 4 are side elevational views illustrating the operation of the unit of FIGURE 2;

FIGURE 5 is an enlarged perspective view of a guide member and a thermo-adjustment shaft of the unit shown in FIGURE 2 in disassembled state;

FIGURE 6 is a perspective view of the forward portion of a lower grip of handle;

FIGURE 7 is an enlarged perspective view of a thermo-adjustment dial;

FIGURE 8 is a back view of the thermo-adjustment dial;

FIGURE 9 is an enlarged perspective view of the forward portion of an upper grip and lower grip of the handle in disassembled state;

FIGURE 10 is a plan view of a decorative cover; and

FIGURE 11 is an electric circuit diagram of the electric iron of the present invention.

In FIGURE 1, reference numeral **1** is a sole plate and **2** is a mica-insulation type plate heater fitted in a recess formed in the sole plate in such a shape that said plate heater is snugly fitted therein. A plate heater pressing plate **3** is mounted on the plate heater **2** and is secured to the sole plate **1** by such means as screws, thereby holding the heater **2** in intimate contact with the sole plate **1**. A thermostat **4** is mounted on the sole plate **1** by a screw **5** and is constructed in the manner described hereinafter. Namely, the thermostat comprises an upper contact arm **6** having a contact **6***a* at a point near the free end thereof, a lower contact arm **7** similarly having a contact **7***a* at a point near the free end thereof and a bimetal strip **8** having a bimetal insulator **9** rigidly fixed at its free end portion, said upper contact arm **6**, lower contact arm **7**, bimetal strip **8** and a terminal plate which will be described hereinafter, being disposed one on another with insulating washers **10** intervening therebetween and caulked integrally to a supporting member **12** by a rivet **11** penetrating through common holes perforated at the root each thereof. A thermo-adjustment shaft **13** is disposed vertically with the lower end screwed in a screw hole formed at the end portion of the supporting member **12**, said thermo-adjustment shaft having formed at the central portion thereof a penetrating hole extending axially, with a screw slot formed therein, in which an adjustment screw **14** for the adjustment of temperature is screwed during assembling of iron. Inserted below and in contact with the lower end of said adjustment screw **14** is an insulating element **15** made of ceramics and having the lower end tapered, which is always kept in contact with the surface of said lower contact arm **7** through a hole bored in the upper contact arm **6**. Upon rotating the thermo-adjustment shaft **13**, the adjustment screw **14** moves up and down along the lead of the screw, with the lower contact arm **7** in contact with the insulating element **15** moving vertically, whereby the space between the free end of the upper contact arm **6** and the bimetal insulator **9** is adjusted optionally for the adjustment of temperature, said bimetal insulator **9** being mounted to the bimetal strip **8** which warps upwardly upon heating.

As is shown in FIGURES 1 through 5, the upper end **16** of the thermo-adjustment shaft **13** has a thermo-adjustment dial **17** (or a knob) fitted therein and is formed in the shape of a prism, such as, for example, a hexagonal prism. A slide ring **18** is fitted on the thermo-adjustment shaft **13** for vertical sliding along therewith and has one end of an L-shaped slide pin **19** welded to the side thereof. At the other end of the slide pin **19** extending downwardly, there is an insulating cap **20** securely fitted on the end extremity, said insulating cap being made of heat-resistant insulating materials, such as heat-resistant rubber. These slide ring **18**, slide pin **19** and insulating cap **20** are provided separately from the contact of said thermostat for the purpose of rendering the rotational operation of the thermo-adjustment dial **17** small when temperature is changed from "off" position to "80° C." (lower temperature or from "80° C." to the "off" position, that is the temperature range below 80° C. which is unnecessary from the standpoint of practical use. Numeral **21** indicates a spiral guide member which rotates together with the thermo-adjustment shaft **13** and forms

a lead for the vertical movement of the slide ring **18** to depress a movable contact arm **27** to be explained later, the upper end of said guide member being inserted and welded in a hole formed in a ring cap **22**, the shape of said hole conforming to the cross section at the upper end portion **16** of the thermo-adjustment shaft **13**. As is shown in the drawings, said guide member **21** has an irregular pitch and this is for the purpose of achieving the object of present invention previously described. While the guide member **21** is shown in the form of a spiral wire in the embodiment, it is only an example and the same purpose may be attained by a spiral groove formed in the outer periphery of a cylinder. The combination of said guide member **21** and ring cap **22** is fitted on the thermo-adjustment shaft **13** along with the slide ring **18** before the thermo-adjustment shaft **13** is screwed in the supporting member **12**. Since, in this instance, the hole formed in the ring cap **22** conforms in shape to the cross section at the upper end portion **16** of the thermo-adjustment shaft **13**, the ring cap snugly fits on the upper end portion **16**. After the ring cap **22** is fitted on the upper portion **16**, a stopper ring **23** is engaged with a groove **16***a* formed in the thermo-adjustment shaft **13** so that said ring cap **22** does not come off upwardly. Numerals **24** and **25** are terminal plates fixed intimately to the upper contact arm **6** and lower contact arm **7** respectively in electrically conductive contact therewith, while numeral **26** is a contact arm for fixing the manually operative circuit switch and numeral **27** a movable contact arm for said manually operative circuit switch. The fixing contact arm **26** has its one end fixed by means of welding to a projecting end of the terminal plate **24** of upper contact arm **6** and the other end provided with a fixed contact **26***a*. The movable contact arm **27** is formed of a spring material and one end thereof is fixed by welding to an outwardly projecting end of a terminal plate **46** which is caulked together with the upper contact arm **6**, lower contact arm **7**, bimetal strip **8** and the supporting member **12** as being insulated by the insulating washers, while the other free end is provided with a movable contact **27***a*. FIGURE 11 shows the electric circuit of the thermostat **4** and manually operative switch.

A guide plate **28** extending upwardly from the side end of the supporting member **12** serves to prevent rotational movement of the vertically slidable slide pin **19** along with the rotation of the guide member **21** and simultaneously to define the range within which said slide pin **19** slides vertically. It is means for changing a rotational movement to a vertical movement and the lower end of said guide plate is welded to the supporting member **12**, while at the upper portion there is formed an elongate hole **28***a* through which the axial portion of the slide pin **19** extends loosely for vertical movement.

A cover shell **29** is mounted on and fixed to the sole plate **1** by such suitable means as screws to cover the aforementioned thermostat and the upper opening of a lower grip **30** which is mounted on and fixed to the cover shell by such means as screws is covered by an upper grip **31**, said lower grip and upper grip together forming a handle. In the upper opening of said lower grip **30**, there is provided a hollow **32** for the accommodation of an adjustment indicating means, which will be described hereinafter, and a shoulder **33** is formed near the forward end portion of said hollow successively at such location as to ease the operation of the thermo-adjustment dial **17** to be mounted at the upper end portion **16** of the thermo-adjustment shaft **13**. At the center on the upper end portion **16** of the thermo-adjustment dial **17**, there is provided a gear portion **35** having dents **34** arranged concentrically with the thermo-adjustment dial **17** in equally spaced relation for the engagement with a bead chain **41** carrying a needle as will be explained later, while on the back side there is provided a volute guide groove **36** (see FIGURES 7 and 8).

Numeral **37** indicates a stopper which defines the rotational limit of the thermo-adjustment dial **17** and the lower end portion of which is loosely received in a sliding groove **38** formed in the upper surface of the shoulder **33** formed at the upper portion of lower grip **30**, while the upper end portion thereof is loosely received in the volute guide groove **36** formed in the back side of said thermo-adjustment dial **17**. As the thermo-adjustment dial **17** is rotated, the upper end of said stopper **37** in engagement with said guide groove **36** does not move in the rotational direction of said dial but moves only in the directions of arrows shown in FIGURE 6, so that the rotation of the thermo-adjustment dial **17** is stopped when the stopper **37** hits either one of groove ends **36***a* and **36***b* of said guide groove **36**. A support stud **39** is provided within the hollow **32** at the rear portion of lower grip **30** in opposed relation to the gear portion **35** on the thermo-adjustment dial **17** for the engagement with the bead chain **41** of adjustment indicating means, said support stud **39** having formed therein an engagement groove **40** for preventing disengagement of said bead chain **41** therefrom. The bead chain **41** constitutes the adjustment indicating means and has both ends connected by a spring **41***a* to form an annular shape and mounted over the gear portion **35** of the thermo-adjustment dial **17** and the engagement groove **40** of the support stud **39** in an oval shape under tensed condition. This bead chain **41** is arranged such that, as the thermo-adjustment dial **17** is rotated, a section of beads is carried in the rotational direction of the dial by the dents **34**, with the other section of the beads sliding also in the rotational direction in engagement with the engagement groove **40**. Numeral **42** is a U-shaped scale plate provided above the forward portion of the thermo-adjustment dial **17** and the bead chain **41** mounted thereon in such manner as to cover the same and is secured by a leaf spring **43** together with the thermo-adjustment dial **17**, said leaf spring being fixed by a screw to a shoulder **30***a* of the lower grip **30** adjacent to the rear end portion of said scale plate for depressing the thermo-adjustment dial **17**. A U-shaped slot is formed in the interior of said scale plate **42** such that when said plate is mounted, the edge **42***a* of the slot is aligned to the configuration of the forward portion of the bead chain **41** as being mounted in the manner previously described. The needle **44** has one end welded to a specific one of a number of beads forming the bead chain **41**, with the other end extending upwardly beyond the U-shaped slot **42***a* in the scale plate **42** with the tip flexed over said scale plate to indicate a scale **42***b*. The scale plate **42** is covered by a transparent U-shaped decorative cover **45** which is fitted in a protruding edge formed at the forward portion of upper grip **31** and has formed therein a U-shaped slot **45***a* conforming to the U-shaped slot **42***a* of the scale plate **42**.

When the needle **44** indicates the "off" position on the scale plate **42**, the upper end of the stopper **37** is located at the inner groove end **36***a* of the guide groove **36** in the thermo-adjustment dial **17**. Upon rotating the thermo-adjustment dial 45 degrees from this position, the needle **44** indicates the number "80" of the scale **42***b* on the scale plate **42**, and further rotation of the dial by 45 degrees brings the needle **44** to indicate the number "90." As such, a temperature change of 10° C. may be obtained by every rotation of the dial by 45 degrees. When the needle indicates "200" which is the scale for the maximum temperature, the upper end of stopper **37** comes in contact with the outer groove end **36***b* of the guide groove **36** in the thermo-adjustment dial **17** with the lower end moving within the slide groove **38** in the direction of F', whereby the rotation of thermo-adjustment dial **17** is stopped. It should also be noted that click stoppers may be provided for every 45 degree rotation (corresponding to a temperature change of 10° C.) of the thermo-adjustment dial **17**, said clock stopper

consisting of a click stopper **47** and a spring **48** shown in FIGURE 1 and engaging in abutting relation with radial click stop grooves **49** formed on the back side of the thermo-adjustment dial **17** as shown in FIGURE 8.

What is claimed is:

1. An electric iron comprising a sole plate to be heated by a plate heater, a thermostat thermally conductively mounted on said sole plate, a cover shell for covering said thermostat and mounted to the sole plate and a handle mounted to said cover shell, said thermostat consisting of upper and lower contact arms each having a contact provided in opposed relation to another for engagement and disengagement, a bimetal strip provided at its free end with a bimetal insulator provided in opposed relation to the free end of said upper contact arm, a supporting member to which said upper and lower contact arms and said bimetal strip are integrally secured by caulking at their root portions in juxtaposed relation with insulating layers intervening therebetween and a thermo-adjustment shaft for adjusting the space between the free end of said upper contact arm and said bimetallic insulator, said thermostat being provided with a slide ring fitted on said thermo-adjustment shaft and having a slide pin mounted to the side thereof, a guide member formed into a spiral lead which is adapted to rotate integrally with said thermo-adjustment shaft more than one circle to cause a vertical movement of the slide ring, a manually operative circuit switch consisting of a fixed contact arm extending from a terminal plate electrically conductively connected to said upper contact arm and having a fixed contact and a movable contact arm assembled integrally with said thermostat, while being electrically insulated therefrom, having a movable contact thereon and made of a flexible material, and a guide plate disposed between said thermo-adjustment shaft and said manually operative circuit switch and adapted to change the movement of said slide pin caused by the rotation of said guide member into a vertical movement so as to have said pin slide vertically within a controlled range, said slide pin opening said manually operative circuit switch when it reaches the lowermost position.

2. An electric iron according to claim **1**, which is provided with a thermo-adjustment dial mounted integrally to the upper end of thermo-adjustment shaft of said thermostat and having on the back side thereof a volute guide groove, and a retractable stopper elastically and loosely received in a slide groove formed in a handle portion opposite to the back side of said thermo-adjustment dial in such a manner that its top end always projects above the slide groove, and adapted to control the rotational range of the thermo-adjustment dial by engagement with said volute guide groove.

3. An electric iron according to claim **1**, which is provided with adjustment indicating means comprising a gear portion disposed at the center on the upper surface of a thermo-adjustment dial mounted integrally to the upper

end of thermo-adjustment shaft of said thermostat and having on its peripheral side dents arranged concentrically with said thermo-adjustment dial in equally spaced relation, a supporting stud projecting within a hollow at the rear portion of a handle in opposed relation to said gear portion and having an engagement groove, a bead chain mounted over the dents in said gear portion and the engagement groove in said support element under tension, a U-shaped scale plate provided above the forward portion of said thermo-adjustment dial and the bead chain mounted thereon so as to cover the same and a needle fixed to said bead chain and adapted to move along the edge of a U-shaped slot formed in the interior of said scale plate together with said bead chain to thereby indicate a scale.

4. An electric iron according to claim **3**, which is provided with a transparent decorative cover mounted to the forward portion of the handle to cover said scale plate and having formed therein a U-shaped slot conforming to the U-shaped slot of said scale plate.

5. An electric iron according to claim **1**, which is provided with a thermo-adjustment dial mounted integrally to the upper end of thermo-adjustment shaft of said thermostat and having on the back side thereof a volute guide groove, a retractable stopper elastically and loosely received in a slide groove formed in a handle portion opposite to the back side of said thermo-adjustment dial in such a manner that its top end always projects above the slide groove and adapted to control the rotational range of the thermo-adjustment dial by engagement with said volute guide groove, and adjustment indicating means comprising a gear portion disposed at the center on the upper surface of the thermo-adjustment dial mounted integrally to the upper end of thermo-adjustment shaft of said thermostat and having on its peripheral side dents arranged concentrically with said thermo-adjustment dial in equally spaced relation, a supporting element projecting within a hollow at the rear portion of the handle in opposed relation to said gear and having an engagement groove, a bead chain mounted over the dents in said gear portion and the engagement groove in said support element under tension, a U-shaped scale plate provided above the forward portion of said thermo-adjustment dial and the bead chain mounted thereon so as to cover the same and a needle fixed to said bead chain and adapted to move along the edge of a U-shaped slot formed in the interior of said scale plate together with said bead chain to thereby indicate a scale.

References Cited

UNITED STATES PATENTS

2,668,378	2/1954	Vance	38—77
3,038,269	6/1962	Knapp	38—77

ANTHONY BARTIS, *Primary Examiner.*

C. L. ALBRITTON, *Assistant Examiner.*