Dec. 26, 1944. F. E. FINLAYSON 2,366,014

SAFETY SWITCHING ARRANGEMENT FOR ELECTRICALLY HEATED APPLIANCES

Original Filed Dec. 16, 1941

Fig. 1.

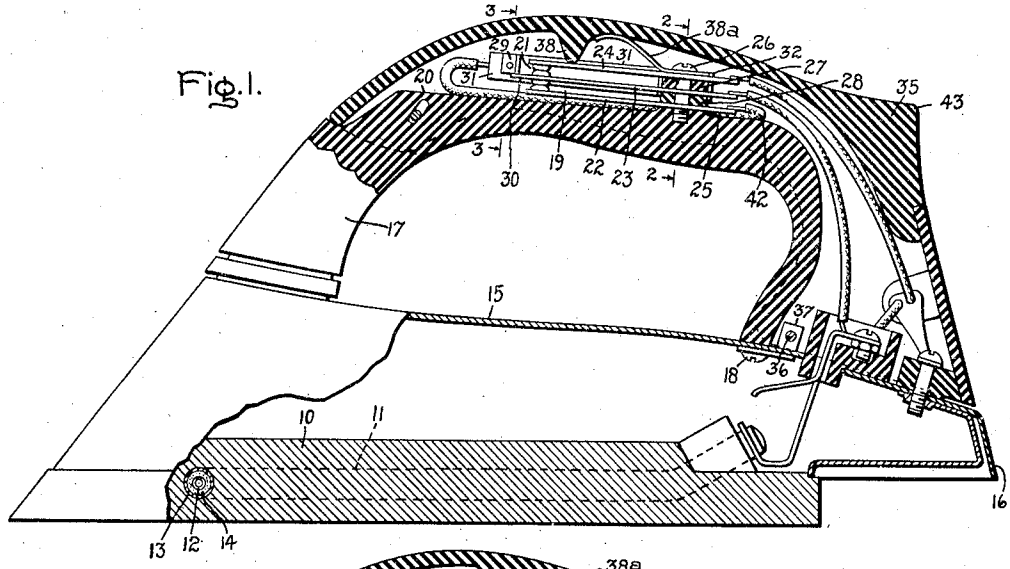


Fig. 4.

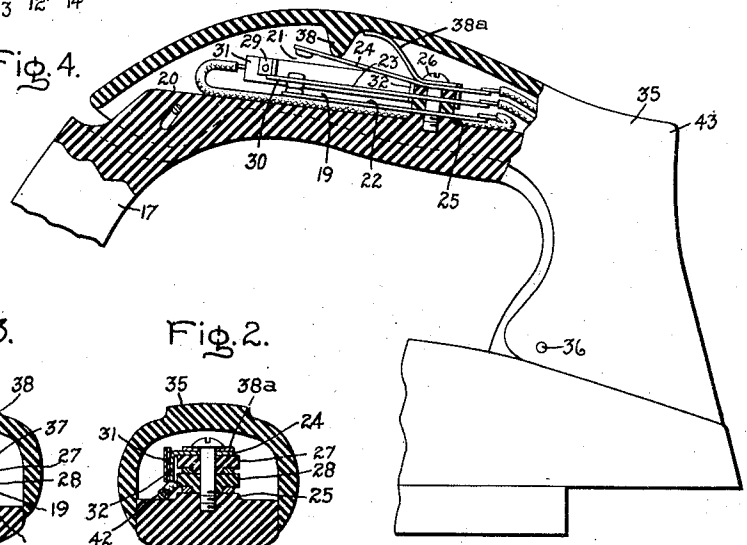


Fig. 3.

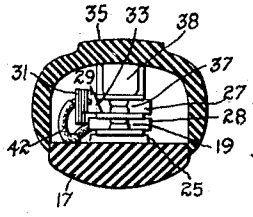


Fig. 2.

Fig. 5.

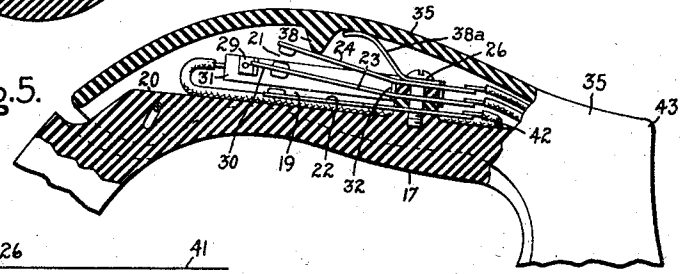
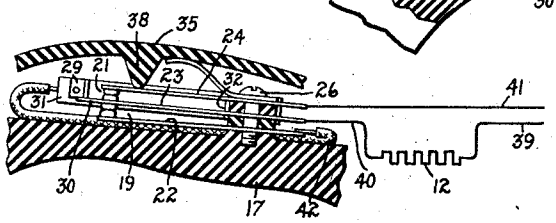


Fig. 6.



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UNITED STATES PATENT OFFICE

2,366,014

SAFETY SWITCHING ARRANGEMENT FOR ELECTRICALLY HEATED APPLIANCES

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Original application December 16, 1941, Serial No. 423,170. Divided and this application October 8, 1943, Serial No. 505,470

2 Claims. (Cl. 219—25)

This invention relates to electrically heated devices and more particularly to portable electrically heated appliances such as flatirons, and it has for its object the provision of a new and improved safety switching arrangement for automatically disconnecting such devices from the power supply in case the operator neglects to do so.

This application is a division of my copending application, Serial No. 423,170, filed December 16, 1941, and is assigned to the same assignee as that application.

This invention will be better understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 is an elevation view, partly in section, of an electric flatiron embodying safety switching means constructed and arranged in accordance with this invention; Figs. 2 and 3 are cross-sectional views of the handle taken along the line 2—2 and 3—3 respectively of Fig. 1 and looking in the direction of the associated arrows; Figs. 4 and 5 are views similar to Fig. 1 except that the safety switching means is shown in different operative positions; and Fig. 6 is a diagrammatic illustration of the circuit connections for the flatiron shown in Fig. 1.

Referring to the drawing, I have shown my invention applied in one form to an electrically heated flatiron having a sole plate 10 that is formed of any suitable material such as cast iron or aluminum. Cast within the sole plate 10 is a sheathed heating element 11 preferably of the type described and claimed in the U. S. patent to C. C. Abbott No. 1,367,341, dated February 1, 1921. As shown, this heating element comprises a helical resistance heating conductor 12 mounted in a tubular metallic sheath 13 and supported in spaced relation with reference to the sheath by a compacted layer of insulating material 14 which preferably will be powdered magnesium oxide. Heating elements of this type can be easily bent to the desired shape and the heating element is usually formed roughly in the shape of a horseshoe having its terminal at the heel of the iron and its apex at the toe of the iron.

The iron is provided with a cover 15 secured to the sole plate 10 by fastening means not shown. The cover 15 has a portion 16 extending rearwardly of the sole plate and forming a heel stand for supporting the iron in an upstanding position. The iron is also provided with a handle 17 formed of suitable heat insulating material and secured to the upper portion of the cover 15 by suitable fastening screws one of which is shown at 18.

In order to provide means for automatically disconnecting the iron from the power supply when it is left unattended in a horizontal or ironing position, I provide a safety switch indicated generally at 19 which is connected in series circuit relation with the heating element 12 of the iron. The safety switch 19 is a thermally actuated type and is mounted on an upper flattened surface 20 of the handle 17. In this position the switch 19 is spaced from the sole plate 10 at a sufficient distance so that it is substantially unaffected by the heat generated thereby. Cooperating with the safety switch 19 is a control switch 21.

As shown, the contacts of the safety switch 19 and the control switch 21 are carried on three current conducting resilient switch arms 22, 23 and 24 which are secured to a projection 25 on the surface 20 by a screw 26. The three switch arms 22, 23 and 24 are electrically insulated from each other and held in substantially parallel spaced relation by the insulating washers 27 and 28. The switch arms 23 and 24 are resilient and are stressed so that they tend to move upwardly to the position shown in Fig. 5 and open the contacts of the switches 19 and 21.

The contacts of the safety switch 19 are normally held closed by a thermostatically actuated latch 29 which hooks over the free end 30 of the resilient switch arm 23. The latch 29 is carried on one end of a bimetallic strip 31 the opposite end of which is electrically connected and secured by welding to a tab 32 projecting outwardly and downwardly from the switch arm 24 adjacent the screw 26 (Fig. 2). The bimetallic strip 31 is mounted in a vertical plane as shown and is arranged so that upon being heated the free end carrying the latch 29 deflects to the left, as viewed in Fig. 3, and releases the switch arm 23 so that the safety switch 19 is opened. The latch member 29 is shaped to provide a cam surface 33 which is arranged to cooperate with the end portion 30 of the switch arm 23 so that after the latch is tripped it may be reset by simply exerting a downward force on the end of the switch arm 23. In other words, in the latch resetting operation, as the switch arm 23 is moved downwardly the portion 30 engages the cam surface 33 and pushes the latch and the bimetallic strip 31 to the left, as viewed in Fig. 3. When the contacts of the switch 19 reach the closed circuit position, the latch 29 springs back over the end portion 30 to the position shown in Fig. 3 and thus holds the con-

tacts to the switch 19 closed. The latch 29 is preferably formed of electrically insulating material to prevent a short circuit from the strip 31 to the switch arm 23 through the latch.

A handle lever 35 is pivotally mounted on the cover 15 by means of a pivot pin 36 which extends through the lever and is supported on upstanding lug member 37 secured to the cover. The lever 35 is provided with a downwardly extending projection 38 which is arranged to engage the switch arm 24 and effect a closure of the control switch 21 when the handle lever is moved from the upper position shown in Fig. 4 tc the lower position shown in Fig. 1. If, at the time the handle lever is moved downwardly from the upper position the contacts of the safety switch 19 are in the tripped or open position shown in Fig. 5, the pressure exerted on the switch arm 24 by the projection 38 not only closes the control switch 21 but also forces the switch arm 23 downwardly to a position in which the contacts of the safety switch are closed and the latch is reset. In other words, it is possible by a downward movement of the handle lever to close both the control switch 21 and the safety switch 19 and to lock the safety switch in the closed position by resetting the latch 29. The handle lever is biased upwardly by means of a spring 38a.

Electrical circuit connections for the iron are best shown in Fig. 6 of the drawing. It will be noted that one terminal of the heating element 12 is connected directly to one power supply conductor 39. The other terminal of the heating element 12 is connected by a conductor 40 to the resilient switch arm 23. The resilient switch arm 24 is connected directly to the other power supply conductor 41 so it is apparent that the contacts of the control switch 21 are connected directly in series with the energizing circuit of the heating element. It will be noted that the free end of the bimetallic strip 31 is electrically connected to the switch arm 22 by a conductor 42 and the other end is electrically connected to the switch arm 24 by means of the supporting tab 32. Thus, the power supply conductor 41 and the conductor 40 are also connected by a parallel circuit which includes the bimetallic strip 31, the conductor 42 and the contacts of the safety switch 19. The bimetallic strip is dimensioned so that it has a relatively high electrical resistance as compared with the parallel circuit path including the contacts of the control switch 21. Thus, when the contacts of the control switch are closed, very little of the heating current passes through the bimetallic strip so that it is not heated and deflected thereby and no movement of the thermostatic latch takes place. However, when the contacts of the control switch are opened, all of the heating current then necessarily passes through the bimetallic strip 31 so that after a period of time the bimetallic strip heats up and the free end moves to the left (Fig. 3) permitting the contacts of the safety switch to move to the open circuit position, whereupon the heating element 12 is deenergized.

When the iron is supported in the upstanding or non-ironing position on the heel stand 16, there is no danger from fire or scorching and it is desirable to maintain the safety switch 19 in the closed position independently of any action on the part of the operator so that the iron can be left unattended in this position during initial heating and between the ironing periods. To accomplish automatic closure of the control switch 21 so that the thermally actuated safety switch 19 will remain in the closed position when the iron is in the upstanding position, the pivotally mounted handle lever 35 is provided with an abutment 43 which is adapted to engage the supporting surface when the iron is supported in the upstanding position on the heel stand. In this position the abutment is so located relative to the pivot pin 42 that the weight of the iron causes the handle lever to pivot to the lower or closed circuit position for the control switch shown in Fig. 1. Hence the thermally actuated safety switch remains closed when the iron is in the vertical position.

In operation, when the handle of the iron is grasped by the operator or when the iron is placed in an upstanding position on the heel rest, the handle lever 35 occupies the lower position shown in Fig. 1. The contacts of the safety switch 19 and those of the switch 21 are therefore closed and substantially all of the current flows through the circuit including the control switch 21. Thus, the heating means for the thermostatic latch is effectively disabled and the latch remains in the latched position.

If now when the iron is in its pressing position the operator releases the handle, the handle lever 35 immediately moves to the upper position shown in Fig. 4. This permits the control switch 21 to open and break the shunting circuit so that the heating current flows through the parallel path including the bimetallic strip 31 and the safety switch 19. If the operator fails to depress the handle lever 35 before the bimetallic strip becomes heated sufficiently to trip the latch 29, the safety switch 19 springs open to the position shown in Fig. 5 and breaks the heating circuit so that the iron is shut off. Then the bimetallic strip 31 cools as a result of the heating current interruption, the latch 29 moves back to its initial position and the end portion 30 of the arm 23 rides above the cam surface 33.

When the handle lever 35 is again moved to the lower position, the switches 21 and 19 are reclosed and the latch 29 reset as described above so that the iron is again in condition for normal operation. If the operator again releases the handle, the above described operation is repeated.

While I have shown and described a particular embodiment of my invention, it will occur to those skilled in the art that various changes and modifications may be made without departing from my invention and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an electrically heated portable appliance having a handle and a heating element, a thermally actuated safety switch comprising three substantially parallel switch arms having corresponding ends fixed and their other ends free to move, a first pair of cooperating contacts on the free ends of the first and second switch arms, a second pair of cooperating contacts on the free ends of said second and third switch arms, the second switch arm biasing said second pair of contacts to separate, a thermostatic latch for holding said second and third switch arms in position to hold said second pair of contacts closed, an energizing circuit for said heating element established when all of said contacts are closed which includes said first and second switch arms to the exclusion of said thermostatic latch, and

a second energizing circuit for said heating element established when said second pair of contacts only are closed, which circuit includes said thermostatic latch and said second and third switch arms, the thermostatic latch being heated by the passage of current through it when said second circuit is established to move to open said second pair of contacts, and manually operated means associated with said handle arranged to close both of said pairs of contacts when said handle is grasped by an operator of said appliance.

2. In an electrically heated portable appliance having a handle and a heating element, a thermally actuated safety switch comprising three substantially parallel switch arms having corresponding ends fixed and their other ends free to move, a first pair of cooperating contacts on the free ends of the first and second switch arms, a second pair of cooperating contacts on the free ends of said second and third switch arms, means biasing said second switch arm to separate said second and third switch arms, an elongated bimetallic thermostatic latch extending lengthwise of the assembly of said three switch arms and having one end connected to the fixed end of said first switch arm and its other end free to move and normally engaging said second switch arm to hold said second pair of contacts closed, a pair of electrical supply terminals, electrical connections between one of said terminals and the fixed end of said first switch arm and between the other of said terminals and one end of said heating element, an electrical connection between the other end of said heating element and the fixed end of said second switch arm and an electrical connection between the fixed end of said third switch arm and the free end of said bimetallic latch, whereby when both pairs of contacts are closed an energizing circuit is completed for said heating element from said terminals which includes said first and second switch arms and excludes the third switch arm and said thermostatic latch, and when said first pair of contacts are opened an energizing circuit is established between said terminals and said heating element which includes said thermostatic latch and said second and third switch arms, the thermostatic latch when included being heated by the passage of current through it to move to release said second switch arm to permit said second pair of contacts to open to deenergize the heating element, means biasing said first switch arm to separate the first pair of switch contacts, and manually operated means associated with said handle and arranged to move said switch arms to close both of said pairs of contacts when said handle is grasped by an operator of said appliance.

FRANK E. FINLAYSON.