Nov. 17, 1936. F. TAXNER 2,060,837

SWITCH FOR ELECTRIC CIRCUITS

Filed Dec. 19, 1933 2 Sheets-Sheet 1

Fig.1.

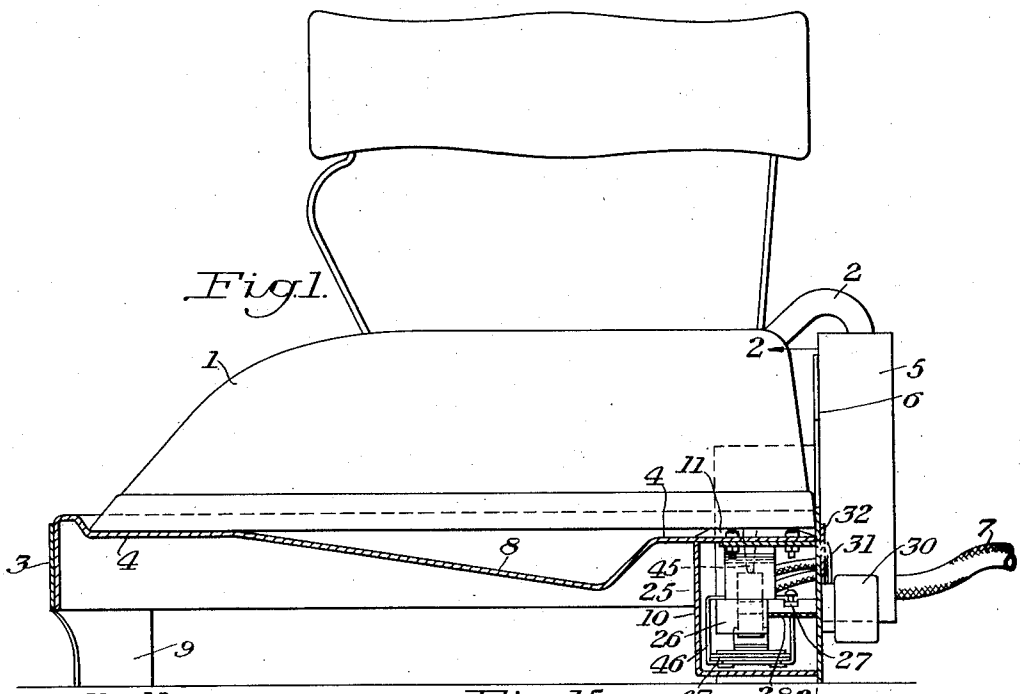


Fig.3.

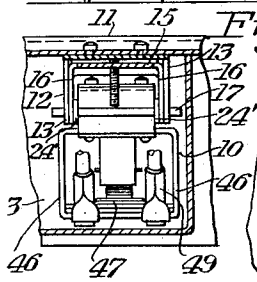


Fig.4.

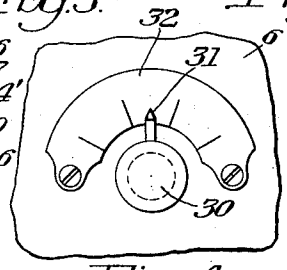


Fig.15.

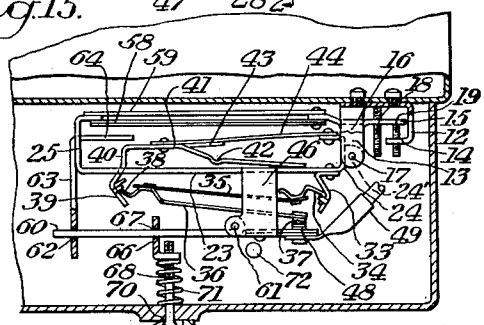


Fig.16.

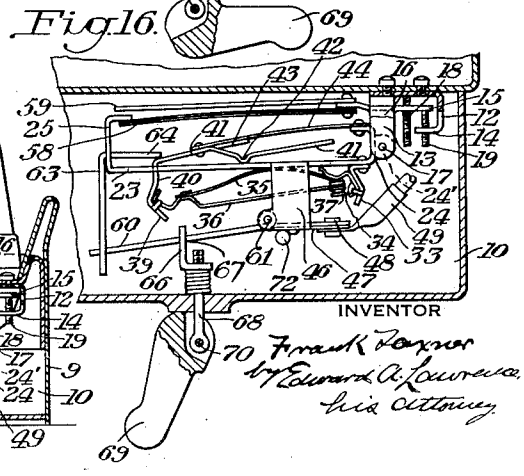
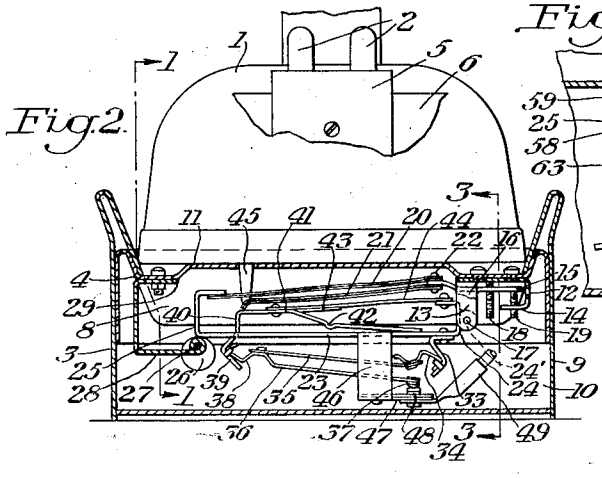


Fig.2.



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SWITCH FOR ELECTRIC CIRCUITS

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Fig.7.

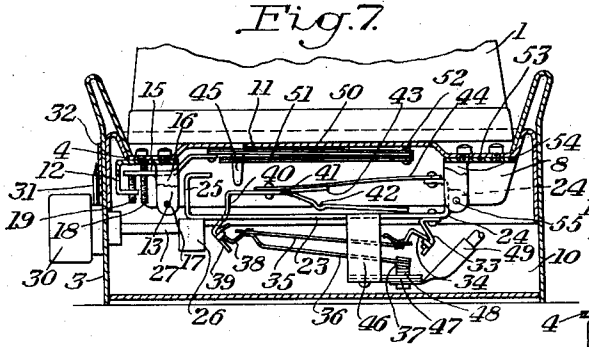


Fig.8.

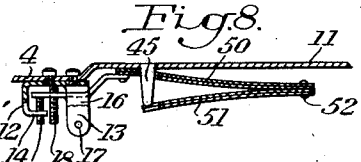


Fig.10.

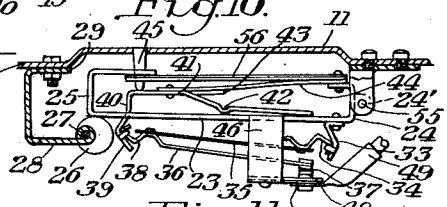


Fig.9.

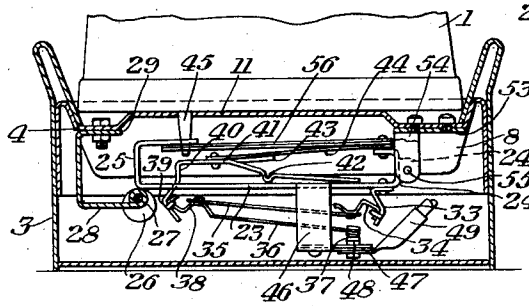


Fig.11.

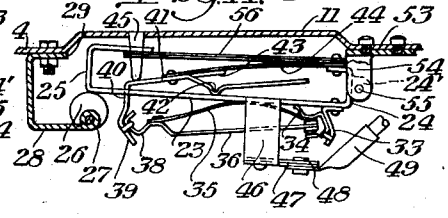


Fig.5.

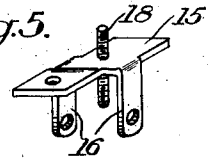


Fig.12.

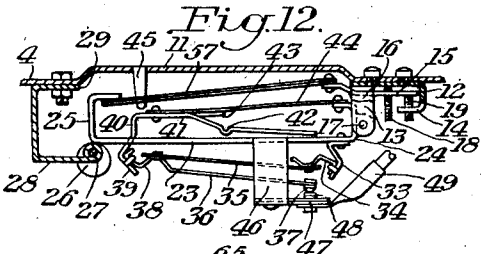


Fig.13.

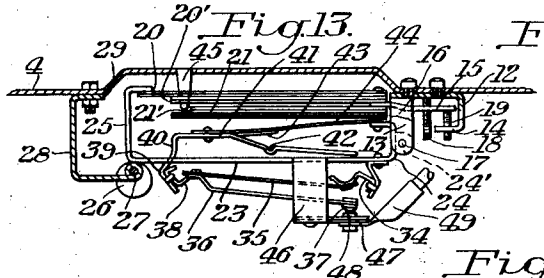


Fig.17.

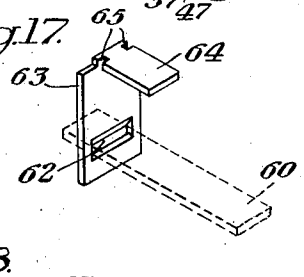


Fig.6.

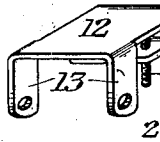


Fig.14.

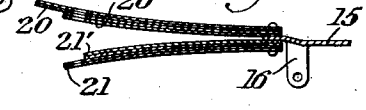
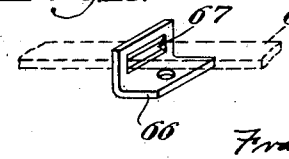


Fig.18.



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Patented Nov. 17, 1936

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UNITED STATES PATENT OFFICE

2,060,837

SWITCH FOR ELECTRIC CIRCUITS

Frank Taxner, Turtle Creek, Pa.

Application December 19, 1933, Serial No. 703,059

22 Claims. (Cl. 200—138)

My invention relates to operated switches employed to open and close electrical circuits.

One of the objects which I have in view is the provision of greater sensitivity in the operation of such switches.

I attain this purpose by improving the switch structure whereby it opens and closes in response to a smaller temperature differential.

Thus I employ a compound movement of a plurality of thermally reacting elements to obtain this improved thermal sensitivity.

Again I obtain this improved thermal sensitivity by providing a compound movement of the thermally reacting element or elements and of the switch parts.

Another object which I have in view is the provision of improved and more accurate means for adjusting the switch so that it may be arranged to operate at any selected temperature within a wide range.

For this purpose I provide means for varying the relation between the thermally reacting element or elements of the switch and heated element or substance whose temperature is to be controlled.

Again I accomplish this purpose by varying the relation between the thermally reacting element or elements and the make and break mechanism of the switch.

A novel feature of the preferred embodiment of my invention is the employment of a mechanically movable frame carrying the switch parts, the movement of the frame being used to operate and/or adjust the switch.

Other objects and means for accomplishing the same will appear from the following description.

In the accompanying drawings, wherein I have illustrated practical embodiments of the principles of my present invention, Fig. 1 is a side elevation of a cordless electric flat iron resting upon a stand which is in section along the line 1—1 in Fig. 2 and the thermally operated switch which is installed in the stand being shown in end elevation.

Fig. 2 is an end view of the flat iron shown in Fig. 1, the upper portion of the flat iron being broken away and the stand being in section along the line 2—2 in Fig. 1 to show the switch in side elevation.

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary rear end view of the stand.

Fig. 5 is an enlarged perspective of the saddle member which supports the thermally reacting element or elements.

Fig. 6 is an enlarged perspective showing the bracket which supports the saddle member.

Fig. 7 is a view similar to Fig. 2 but showing a modified switch structure.

Fig. 8 is a broken sectional view showing the flexing of the thermally reacting members which are shown unflexed in Fig. 7.

Fig. 9 is a view similar to Fig. 7 but showing the type of thermally operated switch which is disclosed in my pending patent application Serial Number 668,355, filed April 28, 1933, with the principles of my present invention applied thereto.

Figs. 10 and 11 are fragmentary views similar to Fig. 9 showing the operation of the manual control employed to selectively adjust the switch or to render it inoperative.

Figs. 12 and 13 are side elevations of the switch structure showing other arrangements of thermally reacting elements.

Fig. 14 is a sectional view of the thermally reacting elements of Fig. 13 shown in their flexed state.

Fig. 15 is a view similar to Fig. 2 but showing a modified form of manual control mechanism, the switch being shown in its closed or operative state.

Fig. 16 is a similar view but showing the switch opened.

Figs. 17 and 18 are perspective views showing elements of the structure of Figs. 15 and 16.

Referring first to Figs. 1 to 6, inclusive, of the drawings, 1 represents a conventional cordless electric flat iron provided with the usual internal heating element, not shown, and with the exterior contact means 2 connected therewith. 3 represents the stand having a horizontal platform portion 4 on which the iron is rested for heating, the contact means 2 engaging the switch 5 which is mounted on the upward extension of the back wall 6 of the stand. In the present practice the electrical conductors contained in the cord 7 are connected directly with the switch 5 but in the case of my invention a thermally operated switch is interposed in one of said conductors.

The stand is also provided with a sunken inclined surface 8 upon which the iron may be rested with its contact means out of engagement with the switch 5 when it is not desired to heat the iron.

The stand is supported by the legs 9 and at the rear of the stand and beneath the platform 4 is

the boxing or inclosure 10 in which the thermally operated switch is housed.

At its rear the platform 4 is provided with a transversely disposed, upwardly bowed portion 11. At one end of said portion, the right in Fig. 2, a depending bracket 12, see Fig. 6, is attached to the underside of the platform 4, said bracket being provided with a pair of spaced apart depending legs 13 which are provided with alined holes. At its outer end the bracket 12 is provided with a flange 14 which extends downwardly and then horizontally toward the legs 13.

15 represents a saddle, see Fig. 5, which comprises a flat plate portion and two depending spaced apart legs 16, which when the saddle is assembled with the bracket 12, as shown in Figs. 2 and 3 fit inside the legs of the bracket. The legs 16 are provided with holes alined with the holes in the legs 13. 17 represents a pivot rod extending through all four holes, thus securing the saddle to the bracket. The body of the saddle extends above the flange 14 of the bracket. 18 represents an abutment screw extending through a threaded hole in the saddle and impinging on the face of the bracket from below, and 19 represents a similar screw extending through a threaded hole in the flange 14 and impinging against the saddle from below. By properly adjusting said abutment screws the angular relation of the saddle to the bracket may be regulated.

20 and 21 represent thermally reacting members, such as bimetal strips, which have their ends secured to the inner end of the saddle 15, one above and the other below the latter, as by means of the rivets 22. The members 20 and 21 are arranged to flex upwardly and downwardly respectively.

23 represents a frame which may be formed by bending up a strip of metal to provide a straight intermediate portion and two end portions 24 and 25, which are bent upwardly and then inwardly as shown. The end portion 24, which preferably is of less height than the end portion 25, is provided with rearwardly bent ears 24' at either side, which ears are pierced with alined holes to receive the pivot rod 17, the ears fitting between the legs 16 of the saddle 15. Thus the frame 23 is pivotally supported at one end. The inturned extremity of the other end portion 25 of the frame is engaged from beneath by the end of the thermally reacting member 20.

The other end of the frame 23 is supported by a cam roller 26 which is mounted on a shaft 27 journaled in a sleeve bearing 28 formed by turning up the end of a bracket 29 which is secured to and depends from the underside of the platform 4. The shaft extends outwardly through the rear wall 6 of the stand and is provided with a hand knob 30 and a pointer 31 which works over a dial 32 on the wall 6. The dial may consist of suitable temperature indicia, such as the words "Off", "Warm", "Medium", and "Hot", or, if desired, temperature degrees.

It is evident that the frame 23 may be raised or lowered by the proper rotation of the cam roller.

33 represents an angular bearing socket member attached to and depending from the frame 23 adjacent the pivoted end of the latter, and in said bearing is engaged the pivoted member 34 to which is connected one end of a jack spring 35 whose other end is connected to the spring arm 36 which at its free end carries the bridging contact plate 37. The other end of the arm 36 is provided with a V-shaped pivoted head 38 engaging the angular socket 39 formed on the lower end of the angular lever 40. The lever 40 extends up through a slotted opening in the frame 23 and has a leg 41 which extends over the frame and is provided with a transversely disposed rounded shoulder 42 which bears from above on the frame. The free end of the leg 41 acts as a stop engaging the frame 23 to limit the downward movement of the lever 40. The lever 40 is also provided with a cut-out tongue 43 extending above the leg 41. 44 represents a leaf spring, one end of which is attached to the leg 41 and the other end of which is attached to the inturned extremity of the end portion 24 of the frame 23.

45 represents a stud depending from the platform 4, the bimetal strips 20 and 21 being slotted to provide clearance therefor, so that the lower end of said stud acts as a stop to limit the upward movement of the lever 40.

46 represents brackets depending from either side of the frame 23 and carrying a block 47 upon which are mounted the insulated binding posts 48 to which the leads 49 are connected and which are provided with contact buttons which are engaged by the bridge contact 37 when the switch is closed.

The proximity of the bimetal strips 20 and 21 to the under surface of the platform 4 is regulated by adjusting the abutment screws 18 and 19 which controls the angular relation of the saddle 15 to the bracket 12. The heat is conducted to said platform from the iron and thus the thermal response of the bimetal strips may be regulated by moving them nearer to or farther away from the platform 4. It is obvious that a higher temperature in said platform would be required to operatively flex the strips when the latter are moved farther away from the platform than would be required when the strips are nearer the platform. Thus by the adjustment of the abutment screws 18 and 19 the temperature at which the strips will flex to open the thermally operated switch may be regulated.

The flexing of the strips 20 and 21 operate as follows to open the switch. The strip 20 flexing upwardly lifts the free end of the frame 23, thereby moving the frame off the cam roller 26 and elevating the angular lever 40 toward the strip 21, which strip flexing downwardly engages the lever 40 causing the latter to be forced downwardly relative to the free end of the frame 23. Thus relative movement between the frame 23 and the lever 40 causes the jack spring 35 to be bowed upwardly, thus shortening its effective length and pulling the free end of the spring arm 36 upwardly so as to break the contact of the bridge member 37 with the contact buttons of the binding posts 48, thus opening the switch and interrupting the supply of current to the heating element of the iron.

When the switch is opened, the iron 1 and the platform 4 cool and thus the strips 20 and 21 straighten out, permitting the frame 23 to drop and the lever 40 to rise relative thereto. The relative elevation of the lever 40 causes the jack spring 35 to straighten and spring-press the bridge piece 37 down into contact relation with the contact buttons, thus restoring the circuit.

When the thermally operating switch is closed, the removal of the iron 1 from the stand 4 will have the same effect of closing the switch, so that when the iron is replaced with its contact means 2 engaging the switch 5 the reheating of the iron

is at once resumed. However if the iron is hotter than the predetermined temperature for opening the switch, the heat of the iron will cause the switch to reopen.

It is to be noted that by the use of two oppositely acting thermally reacting elements, such as two oppositely flexing bimetal strips I utilize the sum of two movements and thus am enabled to open the switch more quickly in response to the same temperature than if I employed but one bimetal strip as in the case of the structure illustrated in Fig. 1 of the drawings of my pending patent application Serial Number 668,355. Again, by the use of two bimetal strips arranged to flex in opposite directions or otherwise employing a compound movement, I reduce the temperature differential required to open and close the switch. This differential is less than that required in the case of a switch provided with a single bimetal strip.

Since the free end of the frame **23** is supported on the cam roller **26**, the frame may be raised or lowered by the rotation of the cam. If the frame be raised, a part or all of the initial load is taken off the end of the bimetal strip **20** and thus less movement of the said strip when flexed is required to elevate the frame. Again, raising the frame by means of the cam roller **26** brings the lever **40** nearer the bimetal strip **21** and this strip requires less flexing to force the lever downwardly and open the switch. Therefore the temperature at which the switch opens may be regulated by rotating the knob **30**, the cam being turned to raise the frame **23** to reduce the opening temperature and to lower the frame to raise the opening temperature.

Again, if the cam be rotated into position to elevate the frame **23** to its highest position the lever **40** impinges against the stop **45**, thus forcing the lever downwardly relative to the frame and causing the switch to open and to be held open as long as the cam remains in said position. Thus the switch may be thrown out of and into operation by means of the knob **30**. The pointer **31** working in relation to the dial **32** enables the operator to set the switch to open and close at any predetermined temperature, and to throw the switch into and out of operation.

Referring now to Figs. 7 and 8, which illustrate a modification of my thermally operated switch. In this form the two bimetal strips **50** and **51** are joined together as by the rivet **52** at the free end of the strip **50**. The other end of the strip **50** is fixed to the saddle **15** which is adjustably mounted, as already described in connection with the previous figures, in the bracket **12**, which bracket in this instance is attached to the platform at the opposite side of the platform than that in Fig. 2. The frame **23** is pivotally supported at the other side of the switch structure by means of a bracket **53** depending from the platform **4** and provided with legs **54** to which the pierced ears **24'** of the frame **23** are connected by the pivot rod **55**.

Further the cam **26** and its supporting shaft **27** are disposed at right angles to their position in Fig. 2, the knob **30** being at the side of the stand instead of its rear.

The upper bimetal strip **50** is arranged to flex upwardly while strip **51** flexes downwardly and thus engages the angular lever **40** and forces it down and opens the switch. It is obvious that the total flexing movement of the two strips is realized at the free end of the strip **51**. In this modification no movement of the frame **23** is required in thermally opening and closing the switch, but such movement of the frame is employed for setting the switch to open at any predetermined temperature and for manually throwing the switch into and out of operation.

Referring now to the modification illustrated in Figs. 9, 10, and 11, I show the use of but one bimetal strip **56**, one of whose ends is secured to the end portion **24** of the frame **23** to which the end of the leaf spring **44** is also secured. In this case the bimetal strip **56** is arranged to flex downwardly to engage and depress the angular lever **40** and open the switch. The action of the cam roller **26** in regulating the position of the frame **23** is illustrated. In Fig. 9 the roller is turned to its lowest position and the maximum temperature and flexing of the bimetal strip is required to open the switch. In Fig. 10 the cam roller is partially rotated and the temperature required to open the switch is correspondingly reduced. In Fig. 11 I illustrate the cam roller turned into its position wherein the switch is mechanically opened and held open.

In Fig. 12 I show another modification in which a single bimetal strip **57** is employed, supported as is the upper strip **20** in Fig. 2 and arranged to flex upwardly, thus lifting the frame **23**. The angular lever rises with the frame until it impinges on the depending stop **45**, thus causing the lever **40** to move downwardly relative to the frame and thus open the switch. In effect this is the same as the structure of Fig. 2 with the second bimetal strip **21** omitted.

In Figs. 15 to 18, inclusive, I illustrate a modification wherein but one bimetal strip is employed but the arrangement is such that a compound or multiplied movement is obtained when the switch is thermally operated. In this modification I illustrate another form of manual operation and adjustment.

The single bimetal strip **58** is attached to the under side of the saddle **15** while a leaf spring **59** is attached to the upper side of the saddle. The bimetal strip engages the under side of the end portion **25** of the frame **23** and thus when flexed urges the same in one direction while the leaf spring engages the upper side of said end portion and is arranged to urge the raised frame in the opposite direction when the bimetal strip straightens, and thus the switch may be reversed from its shown position and still operate.

In Figs. 13 and 14 I illustrate a modification wherein the bimetal strips **20** and **21** of the structure shown in Fig. 2 are respectively reinforced by shorter but heavier bimetal strips **20'** and **21'**. In the case of this modification the strips **20** and **21** are made lighter and thus more sensitive than the corresponding strip in Fig. 2. The function of the heavier strips **20'** and **21'** is to carry the greater portion of the load in opening the switch. When the temperature falls and allows the switch to close the lighter strips **20'** and **21'** return more quickly toward their straightened positions and thus hasten the deflexing of the heavier strips **20'** and **21'**. This action reduces the temperature differential required to operate the switch over that required in the structure illustrated in Fig. 2.

60 represents a lever pivotally connected as at **61** to the brackets **46** of the frame **23**. The free end of the lever **60** is slidably engaged in a slot **62** formed in the lower end of an angular bracket **63**, the top and bottom walls of the slot being bevelled to permit free movement of the lever **60** relative to the bracket. The bent upper end **64** of the bracket **63** is slidable vertically in a vertically elongated opening in the end portion **25** of the frame **23**. The sides of the portion **64** are

notched as at 65 to guide the bracket in its movement relative to the frame. The inner end of the portion 64 overhangs the angular lever 40 so that a movement, downward in Fig. 15, of the bracket 63, will depress the lever 40 and thus open the switch.

66 represents an angular link provided with a slot opening 67 through which the lever 60 extends. The edges of the slot are bevelled so that there may be free relative movement between the lever and the link. The lower bent end of the link is provided with a threaded hole in which is screwed the upper end of the eye-bolt 68 whose lower end extends through a clearance hole in the floor of the housing 10 and extends into a slot in the head of a handle-lever 69, a cross pin 70 pivotally securing the eye-bolt to the handle-lever. A helical spring 71 on the bolt 68 is interposed between the housing 10 and the link 66, thus tending to force the link 66 upwardly or toward the switch structure.

The handle-lever 69 is provided with a cam-shape head so that by rotating the handle-lever with the wrist pin 70 as an axis the lever 60 may be moved toward or away from its position shown in Fig. 15 and from or towards its position shown in Fig. 16.

This movement of the handle-lever 69 draws the lever 60 toward the bottom of the box 10. The lever 60 being hingedly secured to the frame 23 tends to pull it along with it. To check this counterclockwise movement of the frame 23 I provide the stop pin 72 which is secured to the box 10 and is arranged to engage the frame preventing further movement thereof, as shown in Fig. 16. The movement of the handle-lever 69 away from the box 10 thus is almost entirely employed in drawing the bracket 63 into engagement with the angular lever 40 for opening the switch.

The handle-lever 69 may also be turned to rotate the eye-bolt 68, thus screwing the bolt 68 farther into the threaded hole in the link 66 or unscrewing the bolt therein. If the bolt be screwed up in said hole the lever 60 is swung away from the switch structure, while unscrewing the eye-bolt has the opposite effect.

The link 66 engages the lever 60 at approximately the center of the latter so that any motion imparted to the lever by the link 66 is approximately doubled in the corresponding movement of the bracket 63.

When the bimetal strip 58 is flexed by the predetermined rise in temperature, it moves the frame in a clockwise direction on the pivot pin 17. Assuming that the link 66 remains stationary, the movement of the frame 23 causes the pivoted end of the lever 60 to move with the frame, thus swinging the lever 60 with the link 66 as a fulcrum in a counterclockwise direction which results in the end 64 of the bracket 63 engaging the angular lever 40 and swinging in a direction opposite to that of the movement imparted to the frame 23 by the flexing of the bimetal strip 58. This relative movement of the lever 40 opens the switch.

Thus in opening the switch I employ the movement in opposite directions of the lever 60 and the frame 23. Again prior to the engagement of the bracket 63 with the angular lever 40 these two elements are approaching one another, and thus the action is quickened. Moreover the compound movement above described of the bracket 63 and frame 23 greatly multiplies the flexing movement of the bimetal strip 58 which supplies the sole actuating force. Thus I obtain an operation of the switch through the flexing of a single strip with a very low temperature differential.

The handle-lever 69 may be used by rotating it with the wrist pin 70 as an axis to throw the switch into or out of operation. By rotating the handle in such a manner to screw the eye-bolt 68 farther into or unscrew it in the link 60 I change the position of the bracket 63 relative to the angular lever 40 and thus regulate the temperature at which the switch is set to open.

While I have described my invention as embodied in a cordless iron structure it is obvious that my improved thermally operated switch is applicable to all uses wherein such instrumentalities may be advantageously employed.

I claim:—

1. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of electrical contact means arranged to complete the circuit of said element, thermally actuated means arranged when actuated to operate said contact means and means to vary the proximity of the thermally actuated means with respect to the element to regulate the temperature at which said element will be controlled.

2. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of electrical contact means arranged to complete the circuit of said element, a frame adjustably mounted with respect to said element and arranged to carry the contact means, thermally actuated means arranged when actuated to operate said contact means, and means to vary the proximity of the thermally actuated means with respect to the element independently of the movement of said frame to regulate the temperature at which said element will be controlled.

3. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, electrical contact means mounted on the frame and arranged to complete the circuit, thermally actuated means carried by the frame and arranged when actuated by the heat of the element to open the contact means, and means for manually moving the frame to hold the contact means open.

4. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, electrical contact means mounted on the frame and arranged to complete the circuit, thermally actuated means carried by the frame and arranged when actuated by the heat of the element to open the contact means, and means comprising the movement of the frame whereby to regulate the temperature of the element at which the thermally actuated means will open the contact means.

5. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, electrical contact means all mounted on the frame and arranged to complete the circuit, said contact means being arranged to be opened by the movement of the frame, and a pair of members arranged to be thermally actuated in opposite directions by the heat of the element, said

members by the sum of their actuations moving the frame and opening the contact means.

6. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, electrical contact means all mounted on the frame and arranged to complete the circuit, said contact means being arranged to be opened by the movement of the frame, and a pair of bimetallic members arranged to be flexed in opposite directions by the heat of the element, the compound movement of the members moving the frame and opening the contact means.

7. The combination of a contact member, a jack spring arranged to operate the contact member, said jack spring arranged to hold the contact member in one position when unflexed and to hold the contact member in the opposite position when flexed, and a pair of thermal actuating members secured together at one end to provide for their collective action, the free end of one member being arranged to flex said spring for operating said contact member.

8. The combination of a contact member, a jack spring arranged to operate the contact member, said jack spring arranged to hold the contact member in one position when unflexed and to hold the contact member in the opposite position when flexed, a pair of thermal actuating members secured together at one end to provide for their collective action, the free end of one member being arranged to flex said spring for operating said contact member, and means for adjusting the proximity of the members with respect to said spring.

9. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, contact means arranged to complete the circuit, a leaf spring arranged when in one position to hold the contact means in closed position but when bowed to open the contact means, one end of the leaf spring being connected to the frame, and a pair of members arranged to be thermally actuated in opposite directions by the heat of the element, one of the members when actuated moving the frame and the other member when actuated moving the other end of the leaf spring whereby to bow the latter and open the contact means.

10. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, contact means arranged to complete the circuit, a leaf spring arranged when in one position to hold the contact means in closed position but when bowed to open the contact means, one end of the leaf spring being connected to the frame, and a pair of bimetallic members arranged to be flexed by the heat of the element, one of the members when flexed moving the frame and the other member when flexed moving the other end of the leaf spring whereby to bow the latter and open the contact means.

11. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a movably supported frame arranged to carry the entire switch structure, a bimetallic member arranged when flexed by the heat of the element to move the frame in one direction, said frame moving in the opposite direction when the member cools, and means brought into operation by the movement of the frame to open and close the switch.

12. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a movably supported frame arranged to carry the entire switch structure, a bimetallic member arranged when flexed by the heat of the element to move the frame in one direction, said frame moving in the opposite direction when the member cools, and means brought into operation by the movement of the frame to operate the switch, said means being arranged to move relative to the frame to open and close the switch or regulate the heat differential of the element requisite to operate the switch.

13. In a switch for an electric circuit, the combination of a support, a frame pivotally mounted on said support, switch parts including the stationary and movable electrical contacts carried by the frame, and means to move the frame to operate the switch.

14. In a switch for an electric circuit, the combination of a support, a frame pivotally mounted on said support, switch parts including the stationary and movable electrical contacts carried by the frame, and manually operated means to move the frame and operate the switch.

15. In a switch for an electric circuit, the combination of a support, a frame pivotally connected to said support, switch parts including the stationary and movable electrical contacts carried by the frame, a rotary cam supporting said frame, and means to rotate the cam to operate the switch.

16. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on the support, electrical contact means mounted on the frame and arranged to complete the circuit, said contact means being arranged to be opened by the movement of the frame, and a pair of members arranged to be thermally actuated in opposite directions by the heat of the element, one of said members moving the contact means in one direction to open the switch and the other member moving the frame in the opposite direction whereby to expedite the opening of the switch.

17. In a thermally operated switch to be interposed in an electrical circuit to control the temperature of an element, the combination of a support, a frame movably mounted on a support, a switch mechanism, including the stationary and movable contact members, carried by the frame and arranged to complete the circuit, thermally actuated means arranged to move the frame when actuated by the heat of the element, and means for preventing the movable contact means from movement in unison with the frame whereby to open the switch.

18. The combination with a switch arranged to control the temperature of an element, of thermal means movably mounted with respect to said element and arranged when actuated to operate said switch, and means for adjusting the thermal means toward and away from the element for regulating the effective temperature at which the switch will operate.

19. The combination with a switch arranged to control the temperature of an element, of a pivotally supported frame arranged to carry said switch, thermal means pivotally supported in-

dependently of said frame and arranged when actuated to operate said switch through the movement of said frame, and means for adjusting the thermal means toward and away from the element to determine the effective temperature at which the switch will operate.

20. The combination of a contact member, a jack spring normally unflexed and arranged to control the operation of said contact member when flexed, a movable frame for supporting said contact member and said spring, and a thermal member arranged when operated to flex said spring against the movement of said frame.

21. The combination of a contact member, a jack spring normally unflexed and arranged to control the operation of said contact member when flexed, a movable frame for supporting said contact member and said spring, a pair of members independently mounted with respect to said frame and arranged to be thermally actuated in opposite directions, said members being arranged by the sum of their actuations to move said frame and flex said spring.

22. The combination of a contact member, a jack spring normally unflexed and arranged to control the operation of said contact member when flexed, a movable frame for supporting said contact member and said spring, a thermal member arranged when operated to flex said spring against the movement of said frame, and means for adjusting the thermal means independently of said frame.

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