

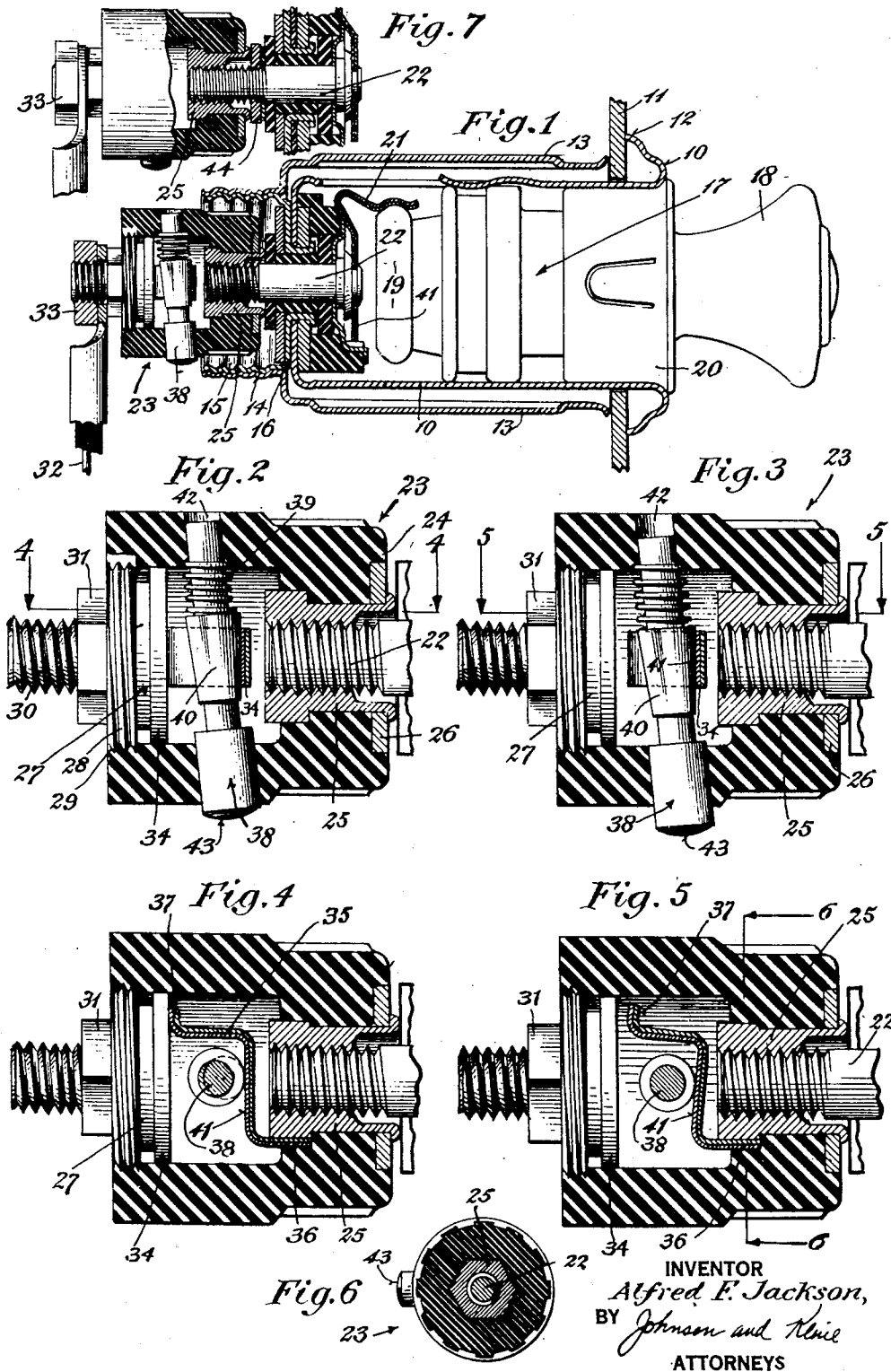
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SAFETY THERMAL CIRCUIT-BREAKER

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SAFETY THERMAL CIRCUIT BREAKER

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This invention relates to cigar lighters and more particularly to an automatic cigar lighter having an improved safety device.

In some instances, cigar lighters have been destroyed by overheating of the igniting unit caused by a short-circuit or other functional defect, or by inadvertently maintaining the cigar lighter in energizing position by manual or other pressure, for instance, by resting the foldable front seat of a vehicle against the knob of the cigar lighter.

An object of the present invention is to provide an inexpensive, easily manufactured device to be attached to an automatic cigar lighter which will permanently open the circuit if the heating element of the cigar lighter should attain some dangerous heat from any cause, and which device is not self-destructive upon operating but may be reconditioned for use by manual operation. The device preferably has means whereby the break in the circuit to the heating element of the cigar lighter may be sensually ascertained without disassembling the device and by which means the circuit may be manually reset when the cause for this overheating has been removed.

This has been accomplished, according to the present invention in the form at present preferred, by attaching to the holding device of an automatic cigar lighter a safety device which forms a part of the circuit of the heating element and includes a bimetallic circuit-carrying switch so located in heat-receiving relation to the holding device and igniting element that should the latter attain a dangerous heat, the action of the bimetallic element results in the circuit being opened and remaining open until the switch is again closed by a deliberate manual operation.

In the specific form of the invention illustrated herein as exemplary thereof, the device comprises a body attached to the rear of the holding device and having slidable in apertured walls thereof a block having resilient means urging it outwardly. The block is maintained in inoperative position against the action of the resilient means by the circuit-carrying bimetallic strip. Upon overheating, the excessive heat transmitted to the bimetallic strip causes the latter to deflect and breaks the circuit, releasing the sliding block for movement by the resilient means to a position in which the bimetallic strip is prevented from again closing the circuit. This also causes a button on the block to project from the body and this indicates that the circuit has been broken by the safety device. Upon removal of the cause for overheating and consequent cooling

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of the bimetallic strip, the latter tends to return to its normal contacting position but is restrained by the extended block. By simply urging the said block back into the bearing, the strip is allowed to reestablish the circuit and again maintain the sliding block in its inoperative position.

Other features and advantages will hereinafter appear.

In the accompanying drawing which illustrates one form of this invention, that at present preferred—

Figure 1 is a longitudinal sectional view of an automatic cigar lighter showing the device of this invention attached thereto.

Fig. 2 is a longitudinal sectional view showing the heat-responsive element in its normal closed-circuit position.

Fig. 3 is a similar view showing the various elements of the device assembly in open-circuit position.

Fig. 4 is a longitudinal sectional view taken along lines 4—4 of Fig. 2, showing the parts in closed-circuit position.

Fig. 5 is a similar view taken along lines 5—5 of Fig. 3, showing the parts in open-circuit position.

Fig. 6 is a transverse sectional view taken along lines 6—6 of Fig. 5.

Fig. 7 is a section of the rear end of the cigar lighter showing a modified form of securing means.

In the particular lighter illustrated in Fig. 1, the holding device comprises a well or socket 10 adapted to be mounted in an aperture in an instrument board 11 of an automobile or the like with a flange 12 of the socket in engagement with the front face of the instrument board. The well is secured in place by a tubular shell 13 having a nipple 14 threaded over a boss 15 carried by a transverse wall 16 of the socket 10. The igniting unit 17 may be a generally cylindrical member having a sliding seat within the cylindrical shell 10.

In the form of the invention as herein shown, the igniting unit comprises a body portion and a knob member 18. The inner end of the igniting unit is provided with a heating element 19. The igniting unit is adapted to be held in shallow open-circuit position by resilient means housed in the sleeve 20, the outer end of which engages the flange 12 of the holding device.

To complete a circuit to the heating element, the igniting unit is moved to a deep position in the holding device, causing the cup of the heating element 19 to engage live contact fingers 21 and

thus cause the heating element to glow. The fingers 21 are made of resilient bimetal and are shaped as detents or latches, so that they grip and retain the igniting unit against return movement until the heating element has been brought to a predetermined temperature for use.

When the heating element has reached the desired temperature, the heat therefrom is conducted to the fingers 21 causing them to flex and release the igniting unit 17 for return to the shallow inoperative position, breaking the circuit to the heating element. The igniting unit may then be removed and used.

Due to abuse, such as excessive improper use or natural fatigue of parts after having been used over a long period of time, there is a possibility that the fingers 21 will fail to flex. If such a failure should occur, the heating element would reach a dangerous heat, which can cause the destruction of the entire device. Such a dangerous heat might also be attained if the unit were inadvertently held in energizing position by manual or other pressure, such as pressure provided by the resting of the folding front seat of the vehicle against the knob 18. To prevent destruction of the entire device by overheating, should the bimetallic fingers 21 fail to respond properly and release the igniting unit, or for any other reason, the present invention provides a means which will permanently open the circuit should the cigar lighter become overheated, and yet which will not be destroyed after one operation but may be repeatedly used indefinitely.

The invention also provides means by which breaking of the circuit by the improved means may be sensually ascertained and for manually closing the open circuit. In the form of the invention as herein illustrated, the means for preventing the cigar lighter from reaching a dangerous heat, for sensually ascertaining that the circuit has been broken and for manually resetting the circuit, comprises an assembly which is made a part of an electric cigar lighter and which is carried by the stud 22, which clamps the contact assembly in the socket 10.

The assembly comprises a housing or body 23 preferably made of molded insulating material, having an end 24 provided with an aperture carrying a threaded sleeve or bushing 25 spun over a washer 26 on the outside of the body. As shown in Fig. 1, this sleeve 25 is threaded on the stud 22 so that it engages the insulating washer 26 and thus holds the contact assembly, including the bimetal fingers 21 securely in position in the end wall of the socket 10.

At the other end of the body 23 and spaced from the end of the sleeve 25 there is a plug 27 having screw threads 28 engaging a threaded hole 29 in the body. The plug 27 has a threaded stud 30 which carries a nut 31 by means of which the plug is tightened in the body and which receives a terminal lug of a current-supplied wire 32 and a binding nut 33. Within the body, the plug 27 has a contact disk 34 forming one side of the gap in the circuit which is automatically controlled according to the present invention. The other side of the gap is formed by the bushing 25, which is electrically connected to the contact fingers 21, as above pointed out. So long as this gap is open, no current can flow from the supply wire 32 to the contact fingers 21.

To automatically control this gap in the circuit so that it remains closed so long the the cigar lighter is functioning properly, the present invention provides within the housing 23 a heat-

responsive switch, preferably in the form of a bimetallic switch arm 35. One end of the switch 36 is secured to the bushing 25 while the other end 37 due to the shape and resiliency of the switch arm normally engages the contact disk 34.

When the cigar lighter becomes overheated, heat is conducted through the bushing 25 to the switch arm 35 and because of its bimetallic or thermostatic construction, the latter is bent or flexed so as to raise the end 37 thereof off the disk 34 to open the circuit. This interruption of the circuit would immediately deenergize the latter and thus prevent continued overheating, which would be dangerous, for the bimetallic switch is so selected or adjusted as to open the circuit before a dangerous heat condition is reached.

As the parts cool off, due to heat dissipation, the bimetallic switch 35 tends to return to its circuit-closing position and should this occur before the condition causing the overheating were removed or corrected, it would continue opening and closing indefinitely, thus permitting unnecessary draining of the battery.

According to the present invention in its preferred form, however, the automatic reclosing of the circuit by the switch 35 is prevented until a deliberate and intentional manual operation has been performed, thereby avoiding draining of the battery and calling the users attention to the fact that the device has not functioned properly.

To accomplish this, the present invention provides within the housing an automatically set and manually reset lock-out device for blocking return of the switch arm 35 to circuit-closing position after the circuit has been opened thereby.

As shown in the accompanying drawing, this lock-out device comprises a pin 38, one end of which has a sliding mounting in one side of the housing and the other end of which projects through a hole in the other side of the housing.

The pin 38 extends across the space between the contact disk 34 and the bushing 25 and adjacent the path of the switch arm 35 which is bent substantially Z-shaped.

The pin 38 is normally urged outwardly of the body 23 by a spring 39, and the pin has an enlargement 40 which normally engages a portion 41 of the switch and limits the outward movement of the pin.

In the form of the invention herein shown as exemplary thereof, the enlargement 40 is in the form of a frustum of a cone so that it will operate in all angular positions of the pin in the body, and the pin is set at an angle in the body so that the surface of the frustoconical enlargement 40 adjacent the portion 41 of the switch 35 is parallel to that portion of the switch.

When the switch arm 35 is in circuit-closing position as shown in Figs. 2 and 4, the engagement of the enlargement 40 with the switch arm prevents outward movement of the pin 38 because the spring 39 is not strong enough to overcome the resiliency of the switch arm 35. When, however, the switch arm flexes upon the cigar lighter being overheated, the portion 37 of the switch arm moves to the right as shown in Figs. 2 and 4, and this permits the pin 38 to advance under the influence of spring 39 and take up a position under the portion 41 of the switch arm as shown in Figs. 3 and 5. In this position, the frustoconical wedge or obstruction 40 on the pin 38 blocks the return of the bimetallic switch arm

35 to circuit-closing position because the angle at which the pin is disposed does not permit the pressure of the switch arm to return it to position.

The arrangement herein disclosed of the frustoconical obstruction is particularly advantageous, since it does not require the use of any trips or latches, the slight wearing of which might affect the successful operation of the device.

With the frustoconical obstruction 40, the pin begins to move under the portion 41 of the switch arm 35 as soon as the switch arm moves even slightly, and the amount of movement which the pin 38 and its obstruction 41 may have depends upon how far the contacting end 37 of the switch arm moves away from the contact disk 34; in other words, the amount of overheating. This is so because there are no limiting stops for the pin and its obstruction other than the switch arm itself.

Another advantage of the blocking device 38 of the present invention is that the enlarged end of the frustoconical locking member 40 need not be any larger than the outer end of the pin 38. Therefore, the pin 38 may be assembled by merely projecting it longitudinally through its mounting holes 42 in the body 23.

As stated above, another feature of this invention is the provision of means for sensually indicating that the circuit has been opened by the safety device. This is accomplished by causing the end of the pin 43 to project sufficiently beyond the body 23 when the switch arm 35 has moved to open-circuit position, such, for instance, as shown in Figs. 3 and 5, to indicate either by observation or by feeling whether or not it has been projected.

After the cigar lighter has become overheated and the fault or difficulty has been obviated, it is merely necessary for the user or the mechanic making the repair to push inwardly on the button-like end 43 of the pin 38 so as to restore it to its Figs. 2 and 4 position. It is not necessary to disassemble the safety device or make any mechanical or electrical adjustments—it is merely necessary to restore the pin.

As shown in Fig. 1, the device of the present invention constitutes the means for holding the stud 22 and contact finger assembly, in the well of the cigar lighter, and thus the device can be removed without danger of the cigar lighter becoming disassembled. If it should be desired to attach the device to an existing cigar lighter or to make it so that it may be attached or removed, it is merely necessary to place a locking nut 44 on the end of the stud 22 to secure the contact assembly in place before the housing is screwed onto the end of the stud.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. A safety device comprising a housing; con-

ducting means disposed in one end of the housing forming a connecting means; conducting means mounted in the other end of the housing for connection to a source of electrical energy; a bimetallic strip in the housing normally maintaining a circuit-closing position between both said conducting means; and a wedge slidably carried by said housing being engaged and maintained in inoperative position by said bimetallic strip in closed-circuit position, said bimetallic strip flexing and moving in response to a predetermined heat to break the circuit at the initiation of its movement, said wedge being released and moving to a position in which a portion of the wedge projects from the housing, and the enlarged portion of the wedge engages said bimetallic strip and prevents the strip from returning to closed-circuit position, the projecting portion of said wedge being manually moved into the housing whereby said bimetallic strip may return to circuit-closing position.

2. A safety device comprising a housing having apertured walls forming bearings; conducting means disposed in one end of the housing forming a connection means; conducting means mounted in the other end of the housing for connection to a source of electrical energy; a bimetallic strip in the housing normally connecting both said conducting means; a wedge-type blocking member having a button slidably carried by said bearings, resilient means for urging the blocking member outwardly, said blocking member being maintained in inoperative position against the action of the resilient means by said bimetallic strip when in closed-circuit position, said bimetallic strip flexing and moving in response to a predetermined heat to break the circuit at the initiation of its movement and release said blocking member for gradual movement as controlled by the flexing of the strip to a position in which the button on said blocking member projects from said bearings, said blocking member engaging the bimetallic member in open-circuit position and being prevented thereby from further movement and said bimetallic strip being prevented from returning to circuit-closing position by the blocking member, the projecting button upon being moved within said apertured wall causing the blocking member to release the bimetallic strip for return to normal circuit-closed position wherein said bimetallic strip again maintains the blocking member in inoperative position against the action of the resilient means.

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