

**Barnes, Jr. et al.**

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[57] **ABSTRACT**

### 4 Claims, 4 Drawing Figures

## UNITED STATES PATENTS

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FIG. 1

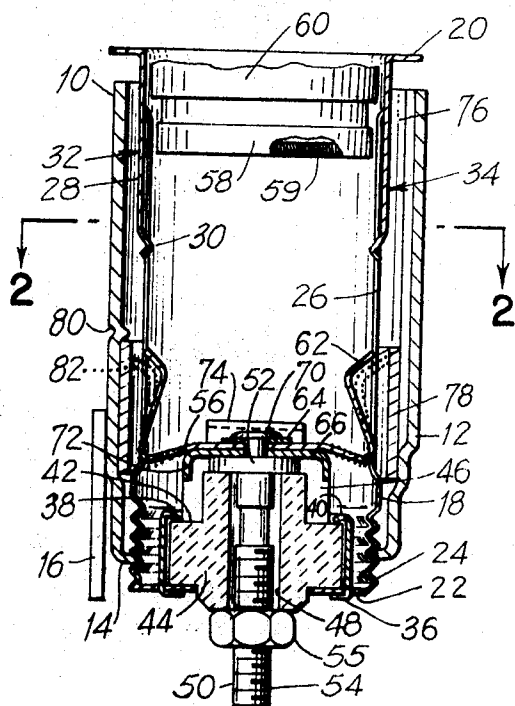


FIG. 3

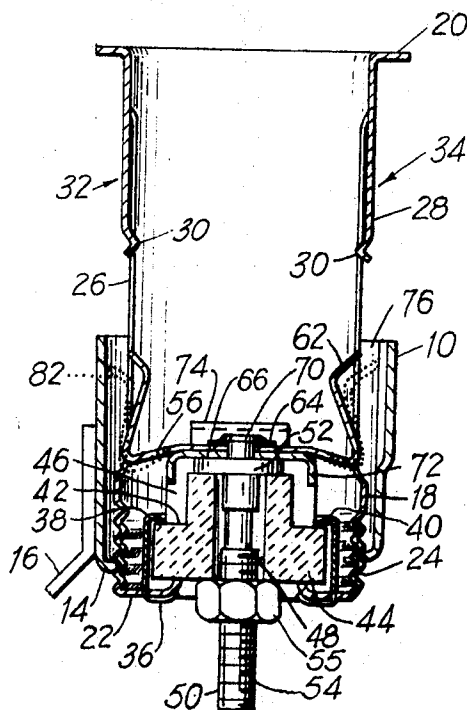


FIG. 2

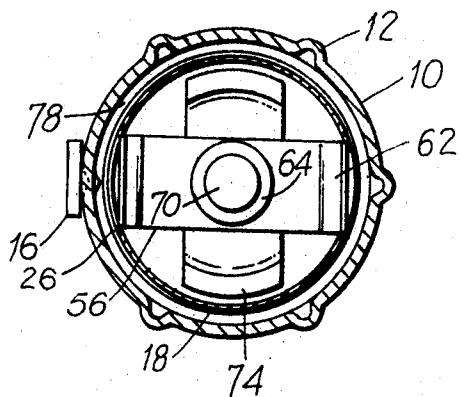
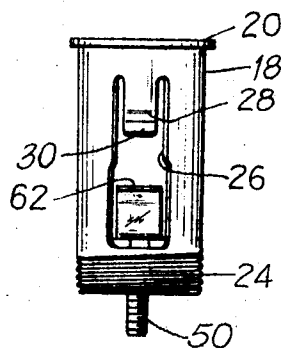


FIG. 4



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## ELECTRIC CIGAR LIGHTERS

This invention relates to electric cigar and cigarette lighters. More particularly, the invention relates to a cigar or cigarette lighter suitable for use chiefly on automobiles and similar vehicles.

Generally, electric cigar and cigarette lighters useful on automobiles and similar vehicles comprise a receptacle or socket assembly fixed on the instrument panel or other convenient part of the vehicle and include a plug member normally carried in the socket and removable therefrom for use. The plug has a heating element which is made incandescent electrically when required.

Early in the development of such lighters, the need for a device to protect them against overheating and abnormal current draw with an attendant danger to fire was recognized. This need is still important in present automotive manufacture, especially in those instances where instrument panels are made of plastic materials, since overheating may not only present a danger of fire but also may cause melting of the plastic instrument panel.

In order to meet this need for heat protective means, development resulted in a number of forms of fuses and circuit breakers mounted on or adjacent the socket and behind the mounting thereof or in the plug per se. Many of these devices have to be replaced or reset manually by working behind the mounting. While cigar lighter circuits of such vehicles are protected by fuses or circuit breakers, this protection is limited to abnormal current draw but is not responsive to overheating conditions of the lighter. Others are reset by insertion of a tool through the socket. Still others are automatically reset. Most of these devices are somewhat complex in structure, being therefore, relatively expensive to manufacture, as well as having other drawbacks. For example, where the circuit breaker is incorporated in the plug per se, no protection is afforded to the socket assembly. Insertion of a tool through the socket is disadvantageous in that there is a danger of damaging the thermostatic contact by distortion or burning through to a short. Consequently, there still exists a need for interrupting the circuit through a simplified means responsive to heat at the lighter which is easily reset and which allows the flow of current through the lighter circuit to be simply and easily restored. The present invention provides such a device.

In order to understand the present invention more fully, reference is directed to the following specification which is to be taken in conjunction with the accompanying drawing wherein:

FIG. 1 is a longitudinal center-line section of one embodiment of the cigar lighter of this invention with the plug member in normal storage position and partially in section to show the heating element and the short circuit means for subsequently interrupting the circuit shown in closed circuit position, in full lines and in circuit shorting or interrupting position in broken lines;

FIG. 2 is an end view of the cigar lighter of the invention taken through Line 2—2 of FIG. 1;

FIG. 3 is a longitudinal center-line section of another embodiment of the cigar lighter of the invention with the circuit shorting or interrupting means shown in closed circuit position in full lines and in circuit shorting interrupting position in broken lines; and

FIG. 4 is a plan view of the inner shell or socket of the cigar lighter shown in FIG. 1.

Referring now more specifically to FIG. 1, a cigar lighter according to the invention comprises an outer tubular metallic shell or clamping shell 10, having reinforcing ribs 12 and a transverse end wall 14 which partially closes one end of the shell. A metallic tab 16 suitably adapted for connection of a ground wire of a conventional lighter circuit (not shown) is fixed permanently in any convenient manner, such as by soldering or welding to the end of the shell 10 partially closed by wall 14. A second metallic tubular shell or socket 18 of somewhat smaller diameter than shell 10 having an out-turned bezel 20, a transverse end wall 22 partially closing one end

and screw threads 24 on the partially closed end is disposed within the clamping shell 10 and is threadably engaged therewith. Shell 18 has part of its surface removed to form an opening 26 and a spring tab 28, having the tip portion deformed to provide a catch 30 as shown more particularly in FIG. 4. A similar opening and tab is located opposite that illustrated and is generally designated by numerals 32 and 34 in FIG. 1.

The partially closed end, that is, lower end or inner end of shell 18 is equipped with a number of slots to accommodate tabs 36 extending down from a circular retainer 38 which has an intumed lip 40 engaging the lower shoulder 42 of a ceramic insulator 44 which is provided with slots 46. Relative rotation between the ceramic insulator and the retainer is prevented by engagement of the intumed lip 40 around the periphery of the insulator 44 which is equipped with a central opening 48 through which passes a metallic conductor bolt 50 having a radially extending shoulder 52 at one end and screw threads 54 at the other. The bolt 50, adapted to be connected to the protected or fused hot side of a conventional lighter circuit (not shown), passes through the insulator 44 and by cooperation of the shoulder 52 and nut 55 engaging the screw threads thereon is secured as shown without contacting the other metallic parts of the socket assembly. A bimetal contact 56 is shaped and adapted for engagement with the heating element cup 58 of the removable plug member 60 which is of known construction and not shown in explicit detail. The contact 56 preferably comprises a plurality of bimetallic thermostatic arms 62 adapted for conventional cooperative latching and unlatching engagement with the heating element cup 58. Contact 56 is mounted on bolt 50 and firmly secured, together with a plain washer 64 and a special washer 66 against the upper shoulder 68 of the ceramic insulator by the heading or roll over 70 with the parts being placed in the order shown in the drawing. The special washer 66 has axially extending tongues 72 which enter slots 46 of insulator 44 to prevent relative rotation of these parts. Special washer 66 also has a plurality of radially extending arms 74 and acts as a conductor functioning as a relight base as explained more fully hereinbelow.

As mentioned above, shell or socket 18 is of somewhat smaller diameter than clamping shell 10. Consequently, there is a space 76 between the shells. Disposed in space 76 between the shells is a metallic sleeve or ring 78. The sleeve or ring 78 is simply pressed into place and further secured by pressing a dimple 80 into the clamping shell 10 as shown. Sleeve or ring 78 can be made out of a wide variety of materials, such as brass, aluminum, galvanized steel or the like. The latter, however, is preferable. Moreover, the sleeve or ring 78 can be of varying thickness, thereby permitting timing of the circuit to be varied since it is this element with which the bimetallic arms of contact 56 come into contact as shown by broken lines 82 upon overheating and passing through the slots 26 and 32 of tubular shell or socket 18 to create a short which causes interruption of the lighter circuit, as explained in greater detail below.

In FIG. 3 of the drawing, a variation of the embodiment of the structure of FIG. 1 is illustrated. More specifically, as shown in FIG. 3, the metallic ring or sleeve 78 is eliminated and the bimetallic arms 62 pass through the slots 26 and 32 of the tubular shell or socket 18 and come into contact with the clamping shell 10. In such a construction, the diameter of the clamping shell 10 can be varied slightly in order to vary the timing of the circuit. Generally, however, the diameter of the clamping shell 10 in this embodiment is preferably somewhat smaller than in the embodiment wherein the sleeve or ring 78 is employed.

It is to be noted, moreover, that in accordance with the present invention slots 26 and 32 can be made smaller in size or even eliminated so that the bimetallic arms 62 upon overheating simply expand radially to come into contact with tubular shell or socket 18, rather than passing through the slots and thereby causing a short to interrupt the lighter circuit.

In assembling the various elements of the device of this invention, the insulator 44 is fixed in the socket or metallic tubular shell 18 so that the slots 46 and in the insulator are in register with the openings or slots 26 and 32 of shell 18. Likewise, in fixing the contact 56 and the special washer 66 on the metallic conductor bolt 50, the contact 56 and special washer 66 are aligned so that the bimetallic arms 62 of contact 56 are directly above axially extending tongues 72 of the special washer. In this manner, when the assemblage of the contact 56, special washer 66 and bolt 50 is inserted into shell 18, the axially extending tongues 72 are set into slots 46 of the insulator and the thermostatic arms 62 of the contact will be in register with the openings 26 and 32 of the metallic tubular shell or socket 18. In final assembly in an automobile or similar vehicle, the cigar lighter of the invention is located in a suitable opening in the instrument panel and bolt 50 is attached in any convenient manner to a lead wire from a current source. Likewise, metallic tab 16 is connected in a convenient manner to a ground lead. In use the lighter of this invention operates as follows.

Upon insertion of the plug 60 into the socket or tubular shell 18 to its furthest depth electric current flows through bolt 50 and into special washer 66 and contact 56 through contact arms 62, which have become latched to the lighter cup 58 and thence through the heating element 59. The heating element 59 is thus brought to incandescence and the current passes through the various turns of the heating element in the known manner to the center of the plug 60, through the metallic tubular socket 18 to the clamping shell 10 and thence to ground through metallic tab 16. In the event excess heating or overheating, the bimetallic arms 62 move outwardly through slots or openings 26 and 32 and come into contact with sleeve or ring 78 and thereby creating a short to subsequently break or interrupt the protected lighter circuit. In those cases where sleeve or ring 78 is not employed, the bimetallic arms move outwardly until they come in contact with clamping shell 10 with like result, that is, interrupting the lighter circuit by creating a short. On the other hand, where slots 26 and 32 are made smaller or even eliminated, expansion of metallic arms 62 create a short by coming in direct contact with shell or socket 18. In all cases mentioned overloading of the circuit takes place and a fuse is blown. Upon cooling, the bimetallic arms retract to their normal position automatically and upon replacement of the fuse in the lighter circuit the lighter is ready for use once again. As mentioned hereinbefore, the thickness of sleeve or ring 78, the diameter of the clamping shell 10 or the diameter of the metallic tubular shell or socket 18 can be varied in order to adjust the timing of the circuit. Under conditions of normal use the size of these elements is adjusted so that upon energization of the heating element 59 of the plug 60 to a given temperature, bimetallic arms 62 expand to permit retraction of the plug 60 but with such expansion being insufficient to bring the arms 62 into contact with either the clamping shell 10, metallic sleeve or ring 78 or the shell 18. Consequently, the lighter circuit in such a situation will not be interrupted as the result of a short and the lighter is ready for normal reuse upon cooling of the bimetallic arms 62 which then retract to their normal latching position. However, even in this case the lighter may still be employed to reenergize the heating element by reinsertion of the plug and completion of the circuit through the arms 74 of special washer 66 which functions as a relight base. It is apparent that in operation the necessary timing variations can be readily achieved by manufacturing the elements such as the clamping shell 10, the sleeve or ring 78 and the metallic tubular socket 18, as well as the size of the arms 62 of the contact 56 in such a manner that they achieve the required timing without causing circuit interruption under normal use.

The lighter of this invention presents many advantages. For example, it is of relatively simple construction containing relatively few movable parts and such parts may be made in large quantities upon presently known manufacturing machinery. Moreover, the various elements can be assembled in a rela-

tively simple manner and manual resetting of the lighter by either removal thereof from the instrument panel or the insertion of a tool through the interior of the lighter to reset it is eliminated. Numerous other advantages of the lighter of this invention will be readily apparent to those skilled in the art. While the embodiments of the present invention as herein disclosed constitute preferred forms thereof, it is to be understood that numerous modifications thereof may be made without departing from the spirit and scope of this invention. Consequently, it is to be understood that the invention is not limited to the disclosed embodiments except as defined in the appended claims.

What is claimed is:

1. In an electric cigar lighter, the combination comprising tubular metallic socket means being open at one end for reception of a removable plug and adapted for connection to one side of a protected DC electric circuit; an electrical insulator with a central opening therethrough being connected to and at least partially closing the other end of said socket means; metallic conductor means supported in the central opening and being adapted for connection to the other side of the protected circuit; a plug member insertable into said socket means and having an element to be heated substantially to incandescence by current from the protected DC electric circuit to which the lighter is connected; said metallic conductor means including a bimetallic current carrying latching contact member with a plurality of axially extending arms engaging and retaining said plug while said element thereof is being heated, and moving away from and releasing said plug for removal from said socket means when said element has been sufficiently heated for use; and said arms in response to excessive heat moving further from said plug and into contact with said socket means thereby creating a short causing interruption of the protected DC electric circuit and termination of current therefrom to said lighter.
2. In an electric cigar lighter, the combination in accordance with claim 1, and said socket means including a tubular metallic shell and a tubular metallic socket disposed within said shell; said shell and socket being connected to each other at the end of said socket means opposite from the open end thereof; and said arms of said bimetallic current carrying latching contact member moving into contact with said socket member in response to excessive heat thereby creating a short causing interruption of the protected circuit to which said lighter is connected.
3. In an electric cigar lighter, the combination in accordance with claim 10, and said socket means including a tubular metallic shell and a tubular metallic socket disposed within said shell and connected thereto at the end of said socket means opposite from the open end thereof; said socket having a plurality of slots each located in register with a different one of said arms of said bimetallic current carrying contact member; means including said electrical insulator for preventing relative movement between said socket and conductor means to retain said arms and slots in register; and said arms moving through said slots and into contact with said shell in response to excessive heat thereby creating a short causing interruption of the protected circuit to which said lighter is connected.
4. In an electric cigar lighter, the combination in accordance with claim 1, and said socket means including a tubular metallic shell and a tubular metallic socket disposed within said shell and connected thereto at the end of said socket means opposite from the open end thereof;

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said socket having a plurality of slots each located in register with a different one of said arms of said bimetallic current carrying contact member;  
said shell being provided with a metallic sleeve encircling said slots and being spaced outwardly from said socket;  
means including said electrical insulator for preventing relative movement between said socket and conductor means

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to retain said arms and slots in register; and  
said arms moving through said slots and into contact with said sleeve in response to excessive heat thereby creating a short causing interruption of the protected circuit to which said lighter is connected.

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