

[54] **ELECTRIC CIGARETTE LIGHTER**

[75] Inventor: **Toshio Mase**, Aichi, Japan

[73] Assignee: **Kabushiki-Kaisha
Tokai-Rika-Denki-Seisakusho,**
Nishikasugai, Aichi, Japan

[22] Filed: **Nov. 12, 1973**

[21] Appl. No.: **415,191**

[52] U.S. Cl. **219/265, 337/103**

[51] Int. Cl. **F23q 7/24**

[58] Field of Search **219/264, 265; 337/103**

[56] **References Cited**

UNITED STATES PATENTS

2,248,402	7/1941	Conboy.....	219/265
2,256,876	9/1941	Wolfson.....	219/265
2,262,484	11/1941	Bahr	219/265
3,248,502	4/1966	Lybrook	337/103

3,462,721 8/1969 Boudreau..... 219/265 X

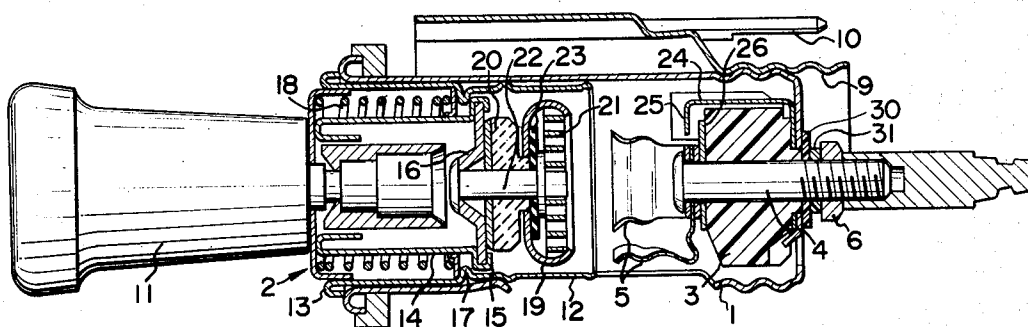
Primary Examiner—Volodymyr Y. Mayewsky
Attorney, Agent, or Firm—Elliott I. Pollock

[57]

ABSTRACT

An electric cigarette-lighter of the plug-in type particularly designed to be fixedly mounted in an automobile for example, includes a heat sensing bimetallic element disposed adjacent the bimetal contact maker with one end being permanently connected to the lighter case. The free end of the bimetallic element is adapted, through its bimetallic action, for contact with the terminal to short-circuit the main heater circuit on the side of the terminal for the prevention of any prohibitive overheating, when such overheating by the heater occurs due to working failures of the associated parts.

3 Claims, 3 Drawing Figures



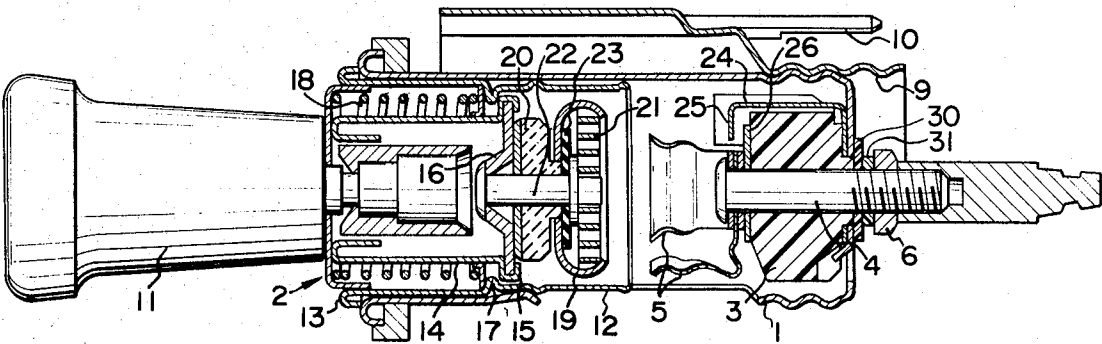


FIG. 1

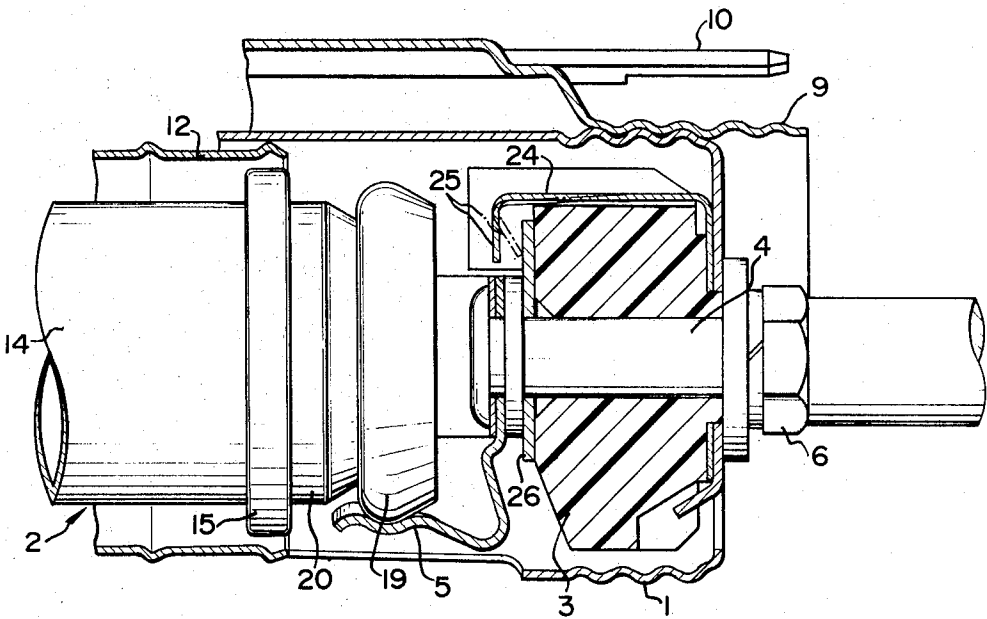


FIG. 2

ELECTRIC CIGARETTE LIGHTER

BACKGROUND OF THE INVENTION

This invention relates to an improvement on the structure of a cigarette-lighter of the plug-in type particularly designed to be mounted in vehicles such as automobiles, the improvement being directed to prevention of prohibitive overheating by the electric heater.

Generally, a battery operated cigarette-lighter of the type specified is usually fixed on the dash board for example within the user's reach. The arrangement of the cigarette-lighter is commonly such that it comprises a lighter plug carrying an electric heater case at the in-board end, and a lighter case fixed in the depth of the dash board and provided with a bimetal contact maker connected to a terminal from a power source. When the lighter plug is pushed into the lighter case from the normal rest position to bring the heater case into fit engagement with the bimetal contact maker, a heater circuit is closed to activate the heater so that heat energies being radiated from the heater increasingly heat up the bimetal contact maker. The moment the bimetal contact maker reaches a predetermined level of temperature, it starts flexing movement apart from the heater case due to the known bimetallic action, whereby the extent of engagement between the two parts is loosened while the once closed heater circuit is being opened. Hereupon, the lighter plug is restored to its normal rest position under the action of a return spring which has been compressed while pushing in the lighter plug.

It has been, therefore, assured principally in the ordinary cigarette-lighter of the type specified that no risks of overheating by the heater may occur thanks to the above automatic return of the lighter plug resulting from the bimetallic action of the contact maker.

Nevertheless, such prior art arrangement has hitherto experienced problems that the lighter plug can not attain its automatic return, or the once closed heater circuit is unable to be opened, because of possible failures in mechanical functionings of the parts such as the return spring, bimetal contact maker, lighter plug, lighter case, etc., due to wear, deformation occurring in long use of the cigarette-lighter, or of possible ingress of foreign matter between the movable parts, or because of continuous unfair or mischievous operations which result in the pushing in of the lighter plug for an unnecessarily long time. This results in prohibitive overheating by the heater and may not only damage the parts and adjacent portions of the automobile but also happen to cause fire accidents.

SUMMARY OF THE INVENTION

The invention, therefore, has an object to eliminate the above drawbacks in the prior art cigarette-lighter of the type specified by providing an improvement on the ordinary structure of cigarette-lighter for prevention of such prohibitive overheating by the electric heater, the improvement being attainable in a simple manner, at reduced cost, and without the necessity of major modifications to the ordinary structure of the cigarette-lighter.

According to the invention, there is provided a cigarette-lighter of the type specified including a heat sensing bimetallic element which is disposed adjacent the bimetal contact maker with one end being in perma-

nent connection to the lighter case, characterized in that the other free end of said bimetallic element is adapted to bend into contact with the terminal under the influence of a predetermined level of heat radiation by the heater, thereby making a short circuit from the terminal to the lighter case for prevention of any prohibitive overheating in the cigarette-lighter.

BRIEF DESCRIPTION OF THE DRAWING

The invention will now be described with reference to the accompanying drawings, wherein;

FIG. 1 is a longitudinal sectional side view of a cigarette-lighter constructed according to one embodiment of the invention;

FIG. 2 is a longitudinal sectional side view of a part of FIG. 1 in enlargement showing how the complete heater circuit is made.

FIG. 3 is a longitudinal sectional side view of a second embodiment of the invention.

DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENT

As shown in FIG. 1, the cigarette-lighter of the type specified has a cylindrical lighter case 1 which, as is conventional, is to be secured in the dash board, etc., and a lighter plug 2 adapted to be slidably inserted into and removed from the lighter case 1 through the front opening of the case. The lighter case contains around its inner bottom an insulator 3 through which an input terminal rod 4 extends with a bimetal contact maker 5 being connected at the outer end. The terminal rod 4 is insulated from the lighter case 1 by a washer 30 and a spring washer 31 made of insulating material and is secured to the insulator 3 by means of a fastening nut 6. Numeral 9 is an outer jacket which fittingly engages a portion of the outer surfaces of the lighter case and carries a ground terminal 10.

The lighter plug 2 includes; a knob 11 a cylindrical ash guard 12 having a flange 13 stopped by the opening edge of the case 1; a slidable member 14 having an in-turned flange 15 receiving ground plate 16, the in-turned flange 15 being normally kept in resilient contact with an inwardly directed flange 17 formed on the ash guard 12 by means of a return spring 18; a heater case 19 connected to the earth plate through an insulator 20; a heater element 21 in the form of a spiral heating wire with one end connected to the heater case 19; and a terminal shaft 22 secured centrally of the lighter case 19 through an insulating plate 23, said terminal shaft connecting the other end of the spiral heating wire 21 and extending through the insulator 20 to be connected to the ground plate 16.

With the above ordinary arrangement, when the lighter plug 2 is pushed in so that the heater case 19 is engaged with and captured by the bimetal contact maker 5 for electrical connection therebetween, as shown in FIG. 2 a complete heater circuit is made through the terminal rod 4, bimetal contact maker 5, heater case 19, heater element 21, terminal shaft 22, ground plate 16, slidable member 14, return spring 18, lighter case 1, and then to the ground terminal 10. This causes increasing heating-up of the heater element 21 and as soon as a predetermined level of heating is reached, the bimetal contact maker 5 begins to flex or bend outwardly under the known bimetallic action so that the engagement between the heater case 19 and the bimetal contact maker 5 is loosened. The lighter plug 2

is then returned to its original rest position by the biasing force of the return spring 18.

According to the invention, there is provided in the above ordinary structure a heat sensing bimetallic element 24 disposed and extending between the insulator 3 and the lighter case 1, with one end being securely connected to the lighter case 1 while the other bend end 25 faces a short circuit plate 26 mounted on the terminal rod 4.

With this arrangement, therefore, if the once depressed lighter plug does not achieve the aforementioned automatic return because of various reasons described previously such as undesirable wearing, deformation of the parts including the return spring, lighter case, bimetal contact maker, etc., or ingress of foreign matter between the movable parts, continuous or mischievous or unfair handling of the lighter plug which result in the pushing in the knob of the lighter plug for an unnecessarily long time, the free end 25 of the heat sensing bimetallic element 24 will be bent through the known bimetallic action to come in contact with the short circuit plate 26, so that the complete heater circuit is short-circuited from the terminal rod 4 directly to the ground terminal 10 via the plate 26, bimetallic element 24 and lighter case 1.

A fuse is usually provided in series connection with the cigarette-lighter to break the heater circuit thereby to prevent prohibitive overheatings by the melting of the fuse. When the heater circuit is effectively short-circuited or shunted by the heat sensing bimetallic element 24, the short-circuit current will flow through the fuse and the fuse will instantaneously be melted to break the heater circuit, so that the overheating of the heater element 21 is prevented at this first stage. More particularly, before the heater element of the lighter is thermally broken, the fuse will melt to break the heater circuit. The broken fuse is replaced by a new fuse to return the circuit to its normal state. Whenever such prohibitive overheating tends to occur, the heat sensing bimetallic element 24 immediately acts to complete the short circuit so as to avoid all the possibilities of dangerous heating in and around the heater case 19.

As thus described, the invention may attain its object simply by the additional provision of a short circuiting member in the form of a heat sensing bimetallic element without the necessity of any major alterations in the ordinary cigarette-lighter of the type specified.

It is to be noted that although the heat sensing bimetallic element has been described as having one end connected permanently to the lighter case in the above embodiment of the invention, it may alternatively be in permanent connection to the terminal side. FIG. 3 shows this modified embodiment of the cigarette-lighter according to the present invention. This second embodiment is generally similar in construction to the first embodiment, and like parts are accordingly designated by the same numerals with a detailed description of such parts not being given herein.

Referring to FIG. 3, a heat sensing bimetallic element 124 is provided adjacent the bimetal contact maker 5 and is securely mounted on the insulator 3, with one end being electrically connected to the terminal rod 4 through the short circuit plate 26 while the other bent

end 125 faces the lighter case 1. In this modified embodiment, the prevention against overheating and its effects occurs in a manner similar to the first embodiment, so that a detailed description thereof will not be given herein. Further modifications and alterations that will readily occur to those skilled in the art are deemed to be included within the scope of the invention.

I claim:

1. An electric cigarette-lighter comprising a lighter case, a terminal disposed in and electrically insulated from said lighter case, a fuse electrically connected to the lighter case, a bimetal contact maker located within said lighter case and electrically connected to the terminal, a removable lighter plug carrying a heater unit at its inner end, said lighter plug being adapted for slidable insertion into the lighter case to cause the heater unit to be fit engaged by the bimetal contact maker to complete an electrical circuit to said heater unit, resilient means urging said lighter plug away from said bimetal contact maker when said heater unit is engaged by said contact maker, said bimetal contact maker being responsive to the temperature of said heater unit and being operative to flex away from said heater unit when said heater unit reaches a predetermined temperature to permit said resilient means to return the lighter plug to a rest position and thereby break said circuit, and means for protecting said lighter against overheating comprising a heat sensing bimetallic element located adjacent the bimetal contact maker, one end of said element being in permanent electrical connection with said lighter case, the other end of said element being free to flex and being normally located in spaced relation to said terminal, said free end being positioned to contact said terminal when said element is flexed by an overheat temperature from said heater unit.

2. The electric cigarette-lighter of claim 1, in which said terminal comprises an input terminal rod, and a short circuit plate mounted on said rod, said heat sensing bimetallic element having a bent end which is disposed in facing relation to the short circuit plate.

3. An electric cigarette-lighter comprising a lighter case, a terminal disposed in and electrically insulated from said lighter case, a fuse electrically connected to the lighter case, a bimetal contact maker connected to the terminal, and a lighter plug carrying a heater case at its inner end, said lighter plug being adapted for slidable insertion into the lighter case to move the heater case into fit engagement with the bimetal contact maker to complete an energization circuit to the heater element in the heater case, resilient means for returning said lighter plug to its rest position when said fit engagement is released by movement of said bimetal contact maker away from said heater case in response to a predetermined increase in the temperature of said heater case, and means for preventing overheating of said heater case comprising a heat sensing bimetallic element located adjacent said bimetal contact maker, one end of said heat sensing element being in permanent electrical connection with the terminal, the other end of said heat sensing element being free to bend and being located to contact the lighter case when the heat sensing element is overheated by the heater element.

* * * * *