Sept. 23, 1941. S. L. WOLFSON 2,256,876

ELECTRIC CIGAR LIGHTER

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Fig. 1.

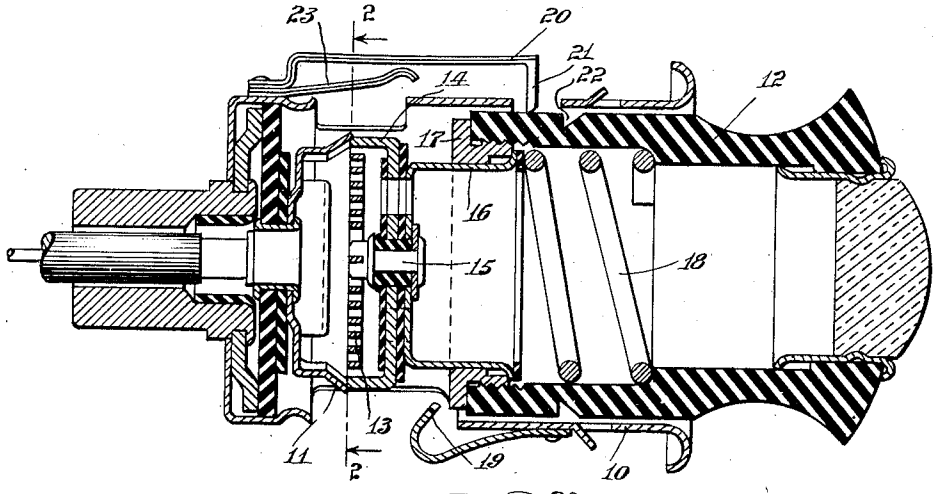


Fig. 2.

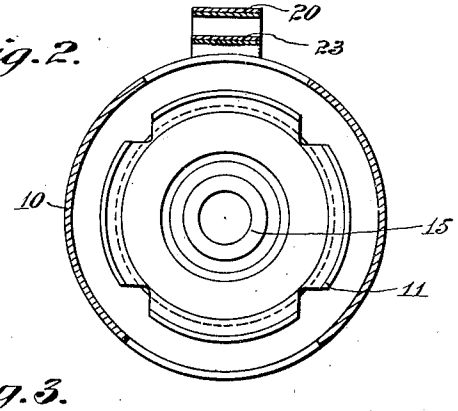
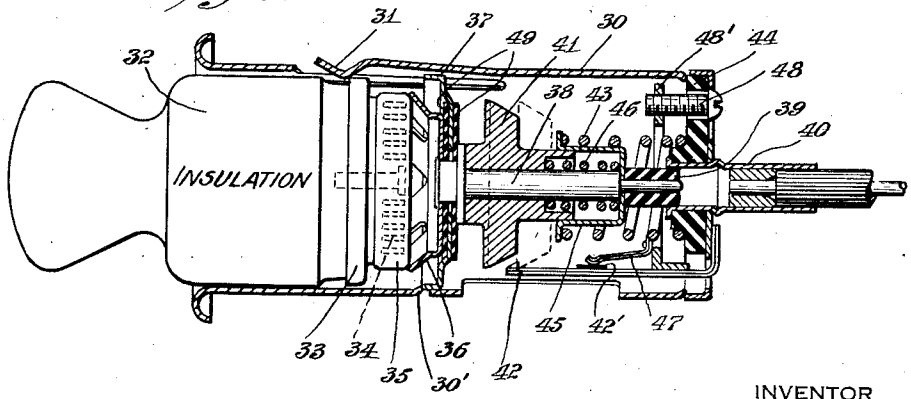


Fig. 3.



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Fig. 4.

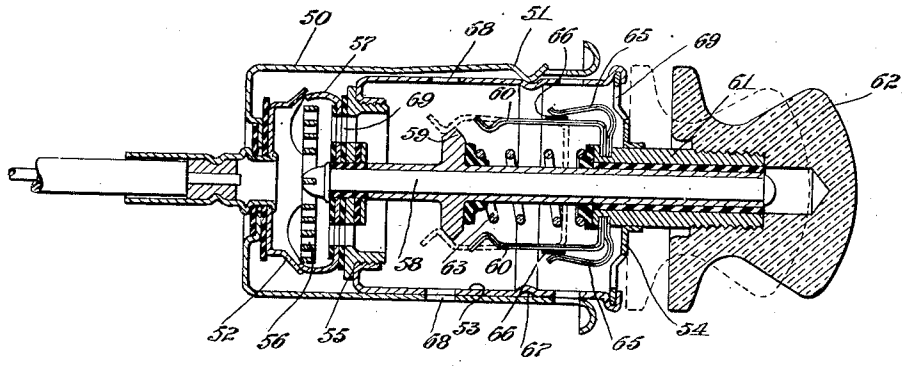


Fig. 5.

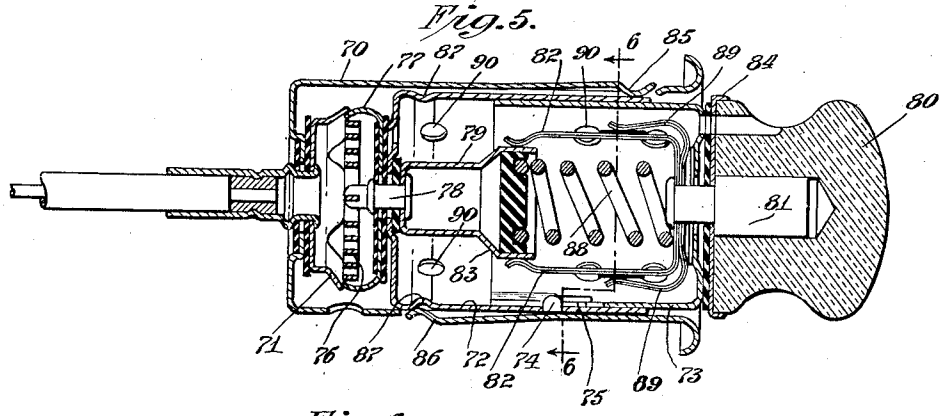
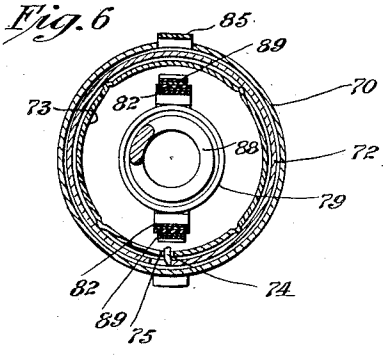


Fig. 6



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2,256,876

ELECTRIC CIGAR LIGHTER

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5 Claims. (Cl. 219—32)

My invention relates to electric cigar lighters particularly those of the so-called cordless type in which a thermostatic time control switch is employed to govern the time duration of the passage of E. M. F. through the heating unit.

In such devices a socket is usually provided which is suitably mounted upon a support and this socket detachably or removably supports the lighter element or plug. The circuit is closed by means of a button or by pressing the entire plug into the socket and the circuit is held closed by a suitable latch for a predetermined period during which the igniter attains a suitable temperature. The circuit is then automatically opened so as to prevent overheating.

Such lighters when installed for instance in automobiles may be required to operate at ambient temperatures varying from 40° F. below zero to even as high as 125° or 130° F. in various places and at various seasons. Where the controlling means is thermostatic this wide variation in ambient temperature may so effect the timing of the thermostatic element as to render the device inoperative or impracticable under such extremes in temperature.

I have sought therefore to provide in a thermostatically controlled switch, means for compensating for these wide variations in ambient temperature. Broadly speaking the invention contemplates the employment of a bimetallic thermostatic latch for holding the parts in the closed circuit position and a compensating bimetallic element in opposed relation to the latch or control element and proportioned so as to maintain the time period of circuit closure within close limits irrespective of normal variations in ambient temperature.

In this way the effect of the changes in ambient temperature can be substantially neutralized and the automatic control means will operate in a substantially uniform manner throughout the entire range likely to be encountered in service. The invention is applicable to various forms of cigar lighters and the compensating element may be mounted either externally of the controlling means so as to reenforce it on a rise of ambient temperature or internally so as to oppose it on a falling ambient temperature. In further references to the compensator its location will be noted as "internal" or "external" in accordance with the foregoing explanation. It may be desirable to use two compensating elements, one internal and the other external so as to obtain positive action under both conditions.

In the accompanying drawings are shown examples of both "internal" and "external" compensators; both types are effective and the factors governing their choice are chiefly details of construction such as clearances from adjacent parts and ease of assembly but the "internal" type is generally preferable as it gives closer regulation due to the fact that it offers no obstruction to the movement of the thermostat arm when it attains sufficient heat to warp away from its cooperating latch member.

In the drawings I have illustrated the invention as applied to four different constructions.

Fig. 1 is a longitudinal sectional view of one form of device in which the circuit is closed by pushing inwardly a part of the plug which carries the igniter unit, and the thermostatic latch and compensator are mounted outside of the socket tube.

Fig. 2 is a cross section on the plane of the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal sectional view of a device in which the switch member and the latch and compensator are mounted in the socket.

Fig. 4 is a longitudinal sectional view of a form of device in which the switch, latch and compensator are mounted within the plug.

Fig. 5 is a longitudinal sectional view in which the switching action occurs between a part of the plug and the socket, and the latch and compensator are mounted within the plug.

Fig. 6 is a transverse sectional view on the plane of the line 6—6 of Fig. 5.

The compensators shown in Figs. 1 and 3 are of the "internal" type and the compensators shown in Figs. 4 and 5 are of the "external" type.

In the form of device shown in Fig. 1 the socket 10 is intended to be grounded to one side of the circuit and contains a circuit terminal 11 connected to the other side of the circuit and suitably insulated from the socket. The plug has a body portion 12 and an igniter element consisting of the coil 13 whose outer end is connected to the cup 14 and the inner end connected to the central stud 15. The igniter element is carried by a sleeve 16 which slides within a ring 17 which in turn is screwed into or otherwise secured in the inner end of the insulating body 12. A spring 18 is interposed between the body 12 and the sleeve 16 so as to bias the sleeve 16 against the inner edge of the ring 17. A spring contact 19 is carried by the socket 10 and adapted to be engaged by the ring 17 when the body 12 of the plug and the ring 17 are pushed

inwardly and the spring 18 compressed. In this inwardly pressed position of the body of the plug and the contact 17 the circuit is completed from the grounded socket through the contact 19 to ring 17, sleeve 16, stud 15, igniter coil 13, cup 14 to circuit terminal 11.

A latch 20 formed of thermostatic bimetal has one end secured to the base of the socket and the other end formed into a hook 21 to engage in a notch or groove 22 when the plug body is pushed into the circuit closed position. The characteristics of this latch are designed so that the latch when heated by the igniter element to a predetermined degree will warp and retract the hook 21 from the groove 22 and allow the spring 18 to move the body of the plug 12 with the contact ring 17 outwardly and break the circuit by separating the ring 17 from the contact 19. This latch 20 is located outside of the socket in a position where it can be readily reached for bending it for adjustment.

The compensation for ambient temperature is effected by a thermostatic bimetal strip 23 which is designed to exert pressure against the inside of the bimetal arm of the latch 20 and forming an "internal" compensator, the operation of which is hereinbefore described.

In the construction shown in Fig. 3 the socket 30 is supposed to be grounded and has a spring finger 31 constituting a terminal for pressing against the plug member 32 and electrically engaging the ring 33 carried by the plug member. The igniter coil 34 is mounted within the cup member 35 and has its inner end electrically connected to the ring 33.

Within the socket is mounted a terminal 36 adapted to be engaged by the rim of the cup 35. This terminal 36 is carried by but insulated from a disc 37 which is mounted on a spindle 38 and slides freely inside the socket. Spindle 38 is insulated from disc 37 but is in contact with terminal 36 and serves as a rivet to secure the assembly of 36, 37 and insulators 49. At its other end is an insulating bushing 39 which is guided in the terminal sleeve 40. A switch member 41 is mounted to slide on the spindle 38 and is adapted to interlock with a thermostatic latch 42 when the switch member is moved into the position shown in dotted lines. A spring 43 is interposed between an insulating disc 44 in the socket and a cup-like member 45 which is carried by the spindle 38 so that the spring 43 tends to push the spindle and the terminal 36 carried by it outwardly.

A spring 46 is interposed between the bottom of the cup member 45 and the switch member 41 so as to press the switch member toward the position shown in full lines in Fig. 3. When the plug body 32 is pressed inwardly it moves with it the terminal 36, the disc 37, the spindle 38 and the switch member 41 until the switch member interlocks with the latch 42. When pressure on the plug member 32 is released the spring 43 presses the spindle and attached parts outwardly until the disc 37 engages the stop 30' and the contact ring 33 on the plug engages the terminal finger 31 on the socket but the switch member 41 is left in the dotted position interlocked with the latch 42 so that the circuit is closed from the socket 30 through the finger 31, ring 33, igniter element, terminal 36, spindle 38, switch member 41, latch 42 and circuit terminal 40.

Inside the socket is mounted the internal compensating thermostatic bimetal strip 47 which presses outwardly against the latch 42 but is suitably insulated therefrom. The initial position of the latch member 42 may be adjusted by means of the screw 48 which engages the arm 48' connected to the latch member 42. In this case it will be noted that the thermostatic latch and the compensating member are both mounted within the socket but in a position such that they are substantially unaffected by the temperature of the igniter element, insulating discs 49 being interposed between the base of the terminal 36 and the switch member. The heat necessary to actuate the latch 42 is generated by its resistance to the passage of current. The compensator 47 is insulated at 42' from latch 42 and is therefore unaffected by the current passing through the latter.

In the form shown in Fig. 4 the socket 50 has a spring contact finger 51. Inside the socket is mounted a terminal 52 which is insulated from the socket in a suitable manner. The plug member in this case has a hollow tubular body 53 which has an outer end disc 54 and an inner ring 55. The igniter coil 56 has its outer end secured to the rim of the cup 57 and its inner end secured to the spindle 58. The outer end of the spindle is guided indirectly in the disc 54 but insulated from it.

The switch in this case has a relatively stationary beveled portion 59 which is mounted on the spindle 58 and electrically connected to the center of the igniter element. The other part of the switch includes two thermostatic bimetal fingers or arm 60 mounted on a sleeve 61 and adapted at their free ends to engage the beveled rim of the switch member 59.

A knob 62 is mounted on the sleeve 61 for handling the plug and actuating the switch. The sleeve 61 is mounted to slide upon but is insulated from the spindle 58. A spring 63 is interposed between the switch member 59 and the inner end of the sleeve 61 so as to bias the parts of the switch to the open circuit position as shown in full lines in Fig. 4. The spring, however, is preferably insulated from the switch member or from the latch member or both.

In this case the external compensating member 65 presses inwardly against the arms of the latch 60 which is actuated by heat generated by its electrical resistance so that when the ambient temperature varies sufficiently it counteracts the effect of such ambient temperature upon the latch finger 60. This compensator is also preferably insulated suitably by members 66 from the latch member 60. In this case the body of the plug member is provided with a groove 67 which receives the correspondingly shaped portion of the terminal finger 51 to hold the plug member in position. It will be understood that the socket and plug member may be provided with ventilating openings 68, 68 and also that sight openings 69 may be provided if desired.

In the form shown in Figs. 5 and 6 the socket 70 contains the terminal 71 which is insulated from it. The plug member consists of two cup-like portions 72 and 73, one of which slides within the other having limits determined by a lug 74 which extends into a slot 75, the lug and slot being carried by their respective members.

The inner end of the cup member 72 carries the igniter coil 76 which is mounted in the cup terminal 77 and connected to the central stud 78 which is insulated from the member 72 but electrically connected with a sleeve 79 constituting

one of the latch members. A knob 80 is secured to the outer end of the other cup member 73. A stud 81 is carried by the knob 80 and cup member 73 and forms a support for the member 82 which constitutes one part of a bimetal thermostatic latch whose tip coacts with the inclined shoulder 83 of the latch member 79 to hold the parts in a closed circuit position when the knob 80 is pressed inwardly and the contact disc 84 engages the inner wall of the socket 70 to complete the circuit.

The socket 70 is provided with spring fingers 85 and 86 which press against portions of the plug member to frictionally hold it in place. The plug may be provided with a groove such as 87 to receive the tip of one of these contact fingers and frictionally hold the plug in the socket. When the plug knob and the latch members 82, 82 are pressed inwardly the circuit is closed from the socket 70 through the disc 84, stud 81, latch members 82 to 79, stud 78, igniter coil 76, cup 77 to circuit terminal 71.

A spring 88 is interposed between the latch members 79 and 82 tending to move the outer end of the plug and the latch member 82 to the position shown in Fig. 5 so as to open the circuit.

When the plug knob is pushed inwardly the tips of the latch fingers 82 engage over the shoulder 83 to hold the parts in the closed circuit position. When the temperature of the fingers 82 due to the passage of current therethrough rises to a predetermined degree the fingers 82 are warped ouwardly and are released from the shoulder 83 so that the switch spring 88 moves the parts to the open circuit position.

The external compensator in this case consists of a pair of thermostatic bimetal fingers 89 which press against the outer surfaces of the latch fingers 82 but are suitably insulated therefrom. In this form of construction it will also be seen that the thermostatic latch and compensating members are influenced only by the ambient temperature and by the temperature produced by the passage of the current through the latch members 82 and substantially uninfluenced by the temperature of the igniter element. The plug member may be provided with suitable ventilating openings 90, and also with sight openings so that the condition of the igniter coil may be noted when the plug is in place.

In the case of a non-compensated thermostat the latch on the thermostat is positioned so that at the setting or "normal" temperature the time period between contact being made and the disengagement of the cooperating latch parts is suitable for the igniting unit employed and if, later, the ambient were raised the thermostat would warp toward the disengaging point, or if the ambient were lowered the thermostat would warp away from the disengaging point to deeper engagement. The first condition shortens the time period and the latter increases it.

When an "internal" compensator is employed the thermostat is given a bias that if not corrected would cause the latch engagement to be so deep as to give an undesirably long closed circuit period. This condition is corrected by biasing the compensator in opposition to the thermostat so that the latch engagement is suitable for the purpose under consideration. When the ambient is raised above normal the thermostat and compensator tend to warp away from each other releasing, to an extent depending on the temperature change, the stresses imposed by one member on the other; when the ambient is decreased below normal the members tend to warp toward each other increasing the mutually imposed stresses. The net result in each case is however that the depth of the latch engagement remains substantially constant. This action is somewhat analogous to that of two opposing springs equally stressed in which the stresses may be equally varied without moving the locus of their contact point.

When an "external" compensator is employed the thermostat is given a bias that if not corrected would cause the latching engagement to be so shallow as to give an undesirably short closed circuit position or even to prevent engagement. This condition is corrected by biasing the compensator in opposition to the thermostat so that a suitable latch engagement is provided. When the ambient is raised above normal the thermostat and compensator tend to warp toward each other and increase their mutually imposed stresses and when the ambient is decreased they tend to warp away from each other reducing the stresses maintaining the depth of latch engagement. The spring analogy given in the previous paragraph is also applicable to this construction.

It will be understood that the general design of the latch will govern the design of the thermostat and the number of arms and compensating fingers employed. If a multi-arm thermostat is used, the compensator should preferably affect all of the arms equally otherwise the uncompensated arm may have an action on the latch which will vary to some extent with the ambient temperature.

In case the sliding switch member and the thermostatic latch are self-centering and the compensator requires say twice the warping effect per degree of change as that of the thermostatic member, a one arm compensator might be employed. In case the engaging members are not self-centering the latch might be held closed by the uncompensated arm after the compensated arm has been released.

In these thermostatic cigar lighters after a single use there is a certain amount of heat stored up in the metal parts of the lighter so that a certain interval of time is required before this heat is dissipated and the lighter is in the same condition and in balance with the ambient temperature. If the lighter is used several times in succession at close intervals, the accumulation of heat in the metal parts of the lighter is sufficient to materially influence the action of the thermostat unless some form of compensation is provided.

The effect in this case is in the nature of the production of an artificial ambient. With the compensator controlled device, however, the compensator as well as the thermostat itself may be designed to respond to this artificial ambient and supply a correcting factor which operates to maintain the lighter in a normal operating condition even after several closely repeated operations and when the temperature of the cigar lighter socket tube has been elevated to a point where it is too hot to be grasped.

It is preferable to insulate the compensator in such a manner as to prevent current passing through it so that it will be influenced not by the current but only by the ambient temperature. Such compensation is very desirable where the ambient temperature range is large compared to the "cold" to "hot" temperature range of the thermostatic latch. The smaller the temperature

differential, the greater the need for compensation. If we assume a "cold" to "hot" range of say 500° F. for one thermostat, a change of ambient temperature of 100° F. would either add or subtract one-fifth ⅕ to the lighter's time period. This would not be very serious but if the thermostat had only a 200° range from cold to hot then a similar ambient temperature change would either add or subtract one-half (½) to the lighter's time period which in the case of a ten (10) second unit would equal plus or minus five (5) seconds. This would be a serious variation. By the use of a compensating device of designs herein set forth it is possible to maintain uniformity of operation over very wide ranges of ambient temperature.

I claim:

1. A cigar lighter comprising a socket having contact portions, a plug insertable into said socket and having an igniter member to engage one contact and a switch member to engage the other contact and a spring to bias one member away from its contact, a bimetal latch carried by the socket and heated by the igniter member when it is inserted in the socket and adapted to interlock with a part of the plug member when the spring is compressed and a compensating bimetal member carried by the socket and subject to the control of the temperature of the ambient atmosphere as well as that of the igniter member and coacting with the bimetal latch to regulate its action under extreme variations of ambient temperature.

2. A cigar lighter plug formed of two telescoping parts with a spring between them for biasing one part away from the other, an igniter unit carried by the inner end of one part, a knob carried by the other part by means of which a portion of one part can be forced into the other, a bimetallic latch carried by one part and interlocking with the other part when the knob-carried part is pushed part way into the other part, said bimetallic latch having a characteristic such that it will release when the igniter unit has reached a predetermined igniting temperature and a secondary bimetallic finger coacting with the bimetallic latch to compensate for extraordinary changes in ambient temperature.

3. An electric cigar lighter of the class described comprising a socket member having two terminals in insulated relationship, a removable member normally carried by said socket and having a heater unit, a spring tending to separate said members, terminals on said removable member adapted to cooperate with said socket terminals, a thermostatic control element controlling and locking together said two members against the action of said spring and carried at least in part by one of said members and closable by manual manipulation of said removable member and adapted to release said interlocked members when said heater has attained a predetermined heated condition, said control element including a bimetallic portion adapted to maintain said members in electrical contact and locked together during the time required to heat said heater and a second bimetallic portion physically pressing upon and in opposed thermal warping relationship to said first mentioned bimetallic portion to compensate the warping effect produced therein by changes in the ambient temperature, said compensation being characterized by its ability to maintain a desired uniformity of heating said heater member when said lighter is used within a range of ambient temperatures normally encountered in the operation of an automobile.

4. In a cigar lighter, a holding member, an igniter plug member removably mounted therein and having an igniter element, a switch closable by movement of at least a part of the plug member with respect to the holding member, a latch for holding the parts in closed circuit position, a thermostat controlling the opening of said latch and means for compensating for excessive changes in ambient temperature independently of the temperature of the igniter element, said last means comprising a second thermostat and means whereby it exerts pressure upon said first thermostat in a direction opposite to that in which strain is set up therein by the ambient temperature.

5. An electric heating device including two relatively movable elements, one of said elements including an electrical heating coil and a second element including means for completing an electric circuit so as to energize said coil, means normally holding said two elements physically separated whereby said circuit is incomplete, means for moving said two elements into physical and electrical contact whereby said circuit is completed, latching means maintaining said physical contact when once established, thermostatic means acting to disconnect said latching means, responsive primarily to heat generated by the flow of current through said circuit and responsive secondarily to circumambient temperature, other discrete thermostatic means responsive solely to circumambient temperature, and means physically coupling said two discrete thermostatic means, whereby the secondary effects of circumambient temperature upon said first thermostatic means are mechanically neutralized by the response of said second thermostatic means to circumambient temperature so that said first thermostatic means will effectively respond substantially solely to the heat generated by the flow of current through said circuit.

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