

March 15, 1955

C. H. JORGENSEN ET AL

2,704,318

CIGAR LIGHTER

Filed Oct. 26, 1949

2 Sheets-Sheet 1

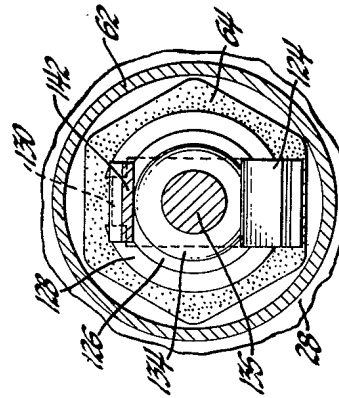
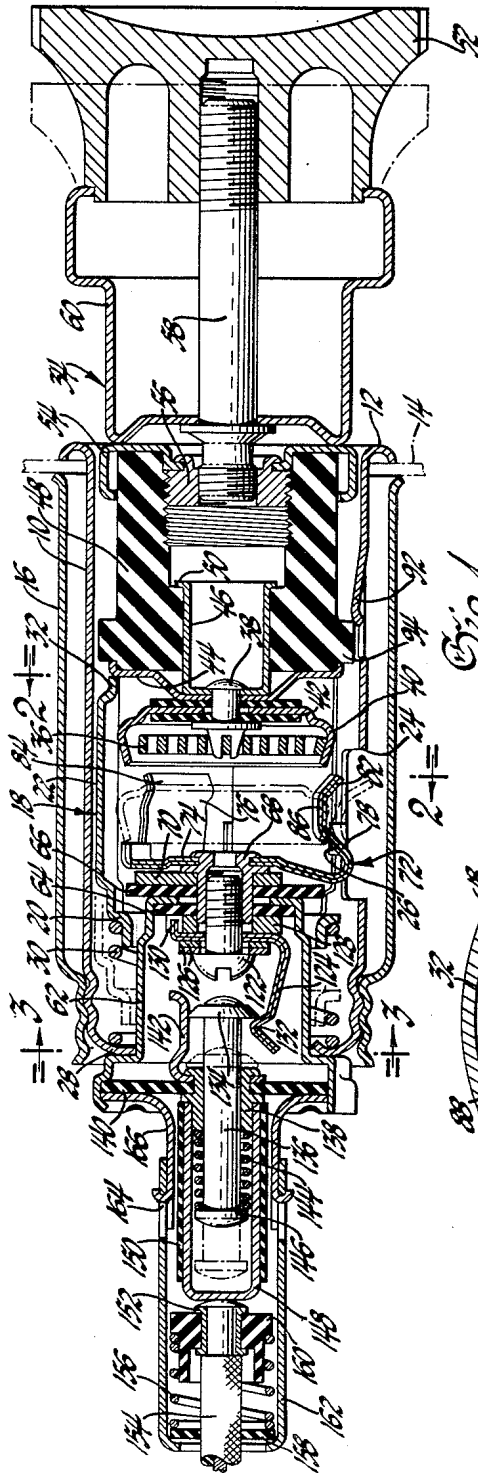
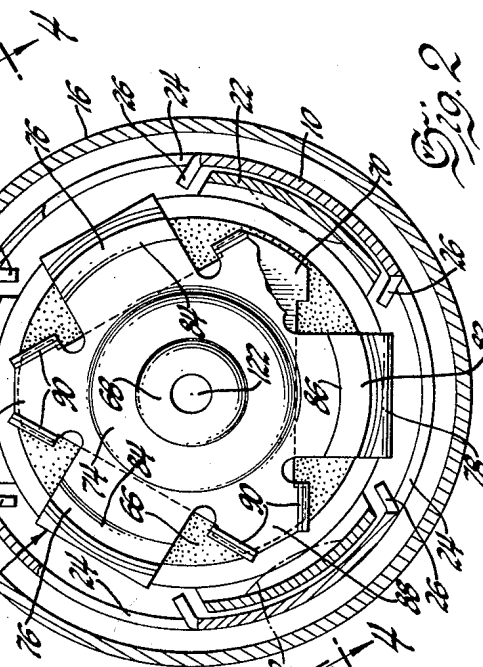


Fig. 1

Fig. 3

Fig. 2

Fig. 2



Inventors
Clarence H. Jorgensen &
Lawrence C. Desmond
Willis Helwig & Bailie
Attorneys

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2 Sheets-Sheet 2

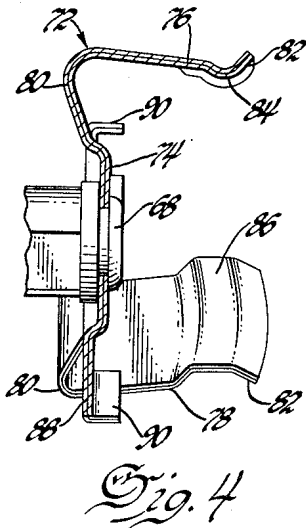


Fig. 4

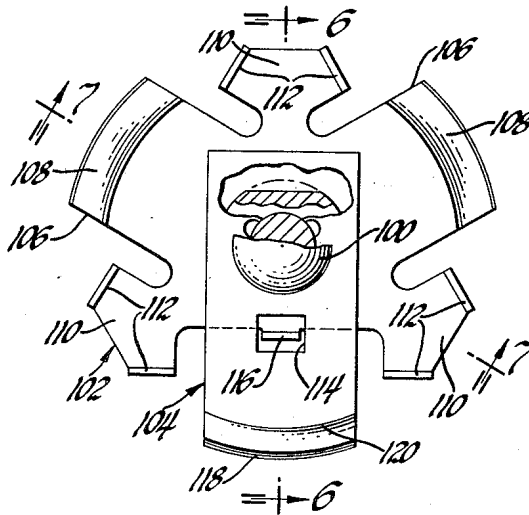


Fig. 5

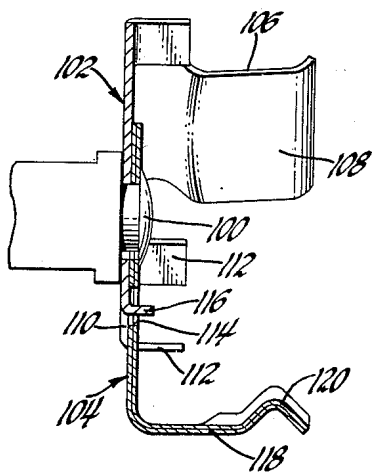


Fig. 6

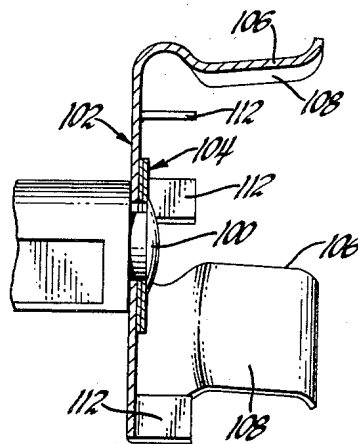


Fig. 7

Inventors
Clarence H. Jorgensen &
Lawrence C. Deemond
by
Willetts, Helwig & Baillie
Attorneys

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2,704,318

CIGAR LIGHTER

Clarence H. Jorgensen, East Rochester, and Lawrence C. Dermond, Rochester, N. Y., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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11 Claims. (Cl. 219—32)

This invention relates generally to electric cigar lighters of the type adapted to be used in vehicles, and more particularly to certain improvements in lighters of this type which are automatic in their operation with a removable igniting unit which is manually moved to its closed-circuit position and automatically returned to open-circuit position after the heating element carried by the unit has been brought to incandescence.

One object of the invention is to improve the construction of the thermostatic latch mechanism which retains the igniting unit in its closed-circuit position and provide a separate contact arm for completing the circuit through the heating element independently of the bimetallic latch fingers.

A further object is to provide a safety device in the form of an automatic circuit breaker which can be manually reset which is adapted to open the circuit to the heating element of the lighter upon either overheating thereof or upon a short-circuit or overload.

Other objects are to simplify and improve the construction of various features of both the lighter and circuit breaker such as will appear from the following description of the embodiment with a modified form of one feature which is illustrated in the accompanying drawings.

Figure 1 is a longitudinal sectional view of the present lighter and circuit breaker unit.

Fig. 2 is an enlarged sectional view taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary sectional view of the bimetallic latch and contact construction taken substantially on line 4—4 of Fig. 2.

Fig. 5 is a detached plan view, partly in section, showing a modification of the bimetallic latch and contact construction.

Fig. 6 is a sectional view of this modification taken substantially on line 6—6 of Fig. 5.

Fig. 7 is a sectional view taken substantially on line 7—7 of Fig. 5.

As shown in Fig. 1 the present lighter comprises a tubular case or holder 10 having at its front end a flange 12 adapted to engage the front face of an instrument panel 14 or other support having an opening through which the holder may be mounted with the holder clamped to this support by a retainer 16 which is threaded on the rear end of the holder and engages the rear face of the support.

A sleeve 18 which is preferably formed of a sheet brass stamping having a circular offset base flange 20 and three spaced forwardly extending arms 22 of arcuate section is slidably mounted within the holder 10. As shown in Fig. 2 the holder 10 is provided with peripherally spaced openings 24 between its ends with inwardly bent lugs 26 which extend on opposite sides of the arms 22 to limit relative rotation between the sleeve 18 and holder 10.

The rear end of the holder 10 is formed with an inwardly extending flange 28 and an ejecting spring 30 is interposed between this flange and the flange 20 of sleeve 18 to urge the sleeve towards the front end of the holder. The front ends of the arms 22 of the sleeve are offset inwardly as shown at 32 to be engaged by the removable igniting unit, indicated generally at 34, as will be hereinafter described.

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The igniting unit or removable plug 34, as it is conventionally termed, is provided with the usual heating element 36 at its inner or rear end which consists of a coil of resistance wire that is welded at one end to a rivet 38 and at its other end to a metal cup or ferrule 40 which is secured to but insulated from the rivet 38 by insulating washers 42. A brass plate 44 and a cup-shaped member 46 are also secured on the rivet 38 and an insulating spacer or plug body 48 may be clamped between the plate 44 and member 46 by spinning over the open end of the member 46 as indicated at 50.

An operating knob and handle 52 is adapted to be secured to the front end of the plug body 48 in any convenient manner. As shown herein, the body 48 is provided with an end cap 54 and sleeve nut 56 to receive one end of the stud 58 with a hollow shell 60 between the end cap and knob 52 which is threaded on the other end of stud 58.

Referring now to the thermostatic latch and contact construction which is located in the base of the holder to cooperate with the removable plug, a hollow cage 62 which extends forwardly within the holder 10 is welded to the flange 28 of the case and formed with an inwardly extending flange clamped between insulating washers 64 and 66 on a terminal nut 68. A spacer washer 70 is interposed between washer 66 and the head of the nut 68 and the diameter of insulating washer 66 is such that the periphery thereof will be engaged by the flange 20 of sleeve 18 to limit the outward movement of the sleeve by spring 30.

The combined thermostatic latch and contact member, generally indicated at 72, is riveted on the front end of the terminal nut 68. In the lighter shown in Figs. 1 to 4 this element is formed entirely of suitable bimetallic material having a central disk portion 74 and three spaced spring fingers or arms. As will be hereinafter described, these arms are adapted to be engaged by the ferrule 40 when the removable plug 34 is manually moved to a closed-circuit position with the two arms designated by numeral 76 so formed as to function as resilient latch fingers while the third arm 78 is formed to function only as a resilient contact arm.

Each of the arms 76 and 78 is offset rearwardly and extends outwardly from the disk portion 74 as indicated at 80 in Figs. 1 and 4, and the arms then extend forwardly and incline inwardly with their free ends bent out as at 82 for suitable engagement by the ferrule 40. As shown in Fig. 2 the spacer washer 70 is of substantially triangular shape to accommodate the rearwardly offset portions of the arms which may also extend outwardly between arms 22 of sleeve 18 and within openings 24 in holder 10.

The end portions of the three arms are arcuately formed to conform to the periphery of the ferrule 40 and each of the latch arms or fingers 76 is provided with an inwardly extending transverse depression or rib 84 adjacent its end which is adapted to engage over the ferrule 40. The contact arm 78 is not provided with such a transverse rib but is formed with an inwardly extending contact surface 86 of appreciable width which is adapted to slidably engage the periphery of the ferrule 40.

In addition to the arms 76 and 78, the member 72 is provided with projections 88 on the disk portion 74 between the arms with forwardly extending relatively short flanges 90 on each projection which are adapted to function as stops to be engaged by the ferrule 40 to limit the inward movement of the removable plug 34.

The removable plug 34 and other parts of the present lighter are shown in Fig. 1 in full lines in the normal storage or open-circuit position in which the plug is resiliently retained against accidental displacement by peripherally spaced inwardly bent spring detents on the holder 10 such as shown at 92 which have outwardly bent ends to engage a flange 94 on the plug body 48.

When it is desired to use the lighter the plug 34 is manually pushed rearwardly within the holder 10 to the closed-circuit position in which only certain parts have been shown in dot-and-dash lines in Fig. 1. During this movement of the plug 34, the sleeve 18 will be moved rearwardly to compress spring 30 and the ferrule 40 will engage the bent ends of the resilient latch fingers 76

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and resilient contact arm 78 and force them outwardly until the ribs 84 of fingers 76 engage over the ferrule 40.

It will be understood by those familiar with this art that the bimetallic latch fingers 76 are adapted to gradually expand or move outwardly as they are heated by heat from the heating coil 36 during energization thereof and the resiliency and rate of movement of these fingers is such that they will grip and retain the ferrule 40 and plug 34 against return movement by the ejecting spring 30 until the heating coil has attained some predetermined temperature at which the spring 30 will overcome the friction between the ferrule and fingers and return the plug to the open-circuit or storage position from which it may be withdrawn for use.

An important feature of the present lighter is the provision of the resilient contact arm 78 to complete the energizing circuit to the heating coil 36 independently of the latch fingers 76. As previously described, this contact arm 78 is formed with a relatively wide contact surface 86 which is adapted to slidably engage the periphery of the ferrule 40. Since this arm is bimetallic it will be subject to some expansion when heated but it is initially tensioned inwardly to such a greater extent than the latch fingers that the contact surface 86 will be maintained in resilient engagement with the ferrule 40 whenever the plug is moved to closed-circuit position until the plug is returned to the storage position by the ejecting spring 30 in the manner heretofore described.

The contact arm 78 is also preferably so formed that the bent end thereof will be engaged by the ferrule 40 to complete the circuit to the heating coil as the plug is moved inwardly before the ferrule engages the bent ends of the latch fingers, and during the automatic return movement of the lighter after the heating coil has attained the desired temperature the ferrule will disengage the latching ribs 84 of the expanded latch fingers before the circuit is opened between the ferrule and contact arm.

From the foregoing it will be apparent that the latch fingers 76 never function as circuit making or circuit breaking contacts and there will consequently be no destructive arcing between the ferrule 40 and the latch fingers such as has been found to occur in prior lighter constructions wherein the latch fingers also function as contacts for initially making the energizing circuit to the heating element at the beginning of the heating cycle and for breaking the circuit at the end of the cycle.

Although the circuit for the heating element should be obvious from the showing in Fig. 1 it should perhaps be noted that during the energization thereof, the current is conducted from the terminal nut 68, which is connected to a source of current in the manner to be hereinafter described, through the contact arm 78 and ferrule 40 to the outer end of heating coil 36, and from the inner end of this coil through rivet 38, plate 44, and sleeve 18 to the holder 10 which may be grounded through the panel 14 or through some other suitable ground connection.

Referring now to the modification shown in Figs. 5 to 7, the terminal nut 100 corresponds to the terminal nut 68 and the general configuration of the bimetallic latch and contact construction is quite similar to that previously described. Instead of being formed entirely of bimetallic material, this material is used only for a single latch finger and two contact arms are provided by a separate member which may consist of a suitable conducting material such as phosphor bronze. This separate member is generally indicated at 102 with the bimetallic member to form the latch finger generally indicated at 104 and these members are shown as riveted on the terminal nut 100.

The member 102 is formed with a substantially flat central portion having two spaced forwardly extending spring contact arms 106 with their free ends bent out for engagement by the ferrule and with elongated contact surfaces 108 adapted to resiliently engage the periphery of the ferrule around the heating element of the lighter plug whenever the plug is moved to and retained in its closed-circuit position. The member 102 is also formed with the projections 110 having forwardly extending relatively short flanges 112 corresponding to the previously described flanges 90 adapted to function as stops to limit the inward movement of the plug.

The member 104 may be conveniently and economically formed of a single straight strip of bimetal having an opening 114 to receive a positioning lug 116 on member 102 with a forwardly extending spring latch finger

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118 having an inwardly extending rib 120 and a bent out end to function in a manner similar to that described heretofore with reference to the latch fingers 76. Both the latch finger 118 and contact arms 106 have the end portions thereof arcuately formed to engage the circular ferrule as in the prior construction.

In this modification the operation of the latch and contact construction is generally similar to that of the entirely bimetallic construction heretofore described in that the latch finger 118 does not function primarily as a contact but the circuit is always closed or opened by engagement between the ferrule and the contact arms 106 which are, however, not of bimetallic material in this modification so there is no tendency for these arms to expand outwardly when heated upon energization of the heating element and they can be designed to engage the ferrule around the heating element with a uniform pressure at all times that the plug is in the closed-circuit position.

Referring again to the showing in Fig. 1 and to the detail section in Fig. 3, the present lighter construction incorporates an automatic circuit breaker which is interposed between the source of current and the terminal nut 68. A terminal screw 122 which is threaded into the nut 68 is adapted to secure a bimetallic latch 124 within the hollow rear end of the previously described cage 62. The latch 124 may be clamped by the terminal screw between washers 126 and a spacer washer 128 which engages the insulating washer 64 with a positioning notch in washer 128 to receive a bent end 130 on the latch.

The latch 124 extends rearwardly within the cage 62 and is formed with an inwardly bent rib 132 which is adapted to resiliently engage around the rear edge of a contactor 134 which is riveted on the inner end of a push rod 136. This push rod is slidably carried in a bearing 138 which is mounted by means of an insulating cover plate 140 at the rear end of the cage 62. Both the plate 140 and a spring blade contact 142 are clamped on the bearing 138 by spinning over the front end of this bearing and the blade contact 142 extends forwardly to resiliently engage the periphery of the contactor 134. A spring 144 is interposed between the rear side of the bearing 138 and a head 146 on the rear end of the push rod 136 and an elongated shield 148 having an external insulating sleeve 150 with the front end of the shield axially slit to be frictionally engaged over the rear end of the bearing 138 encloses the spring and rear portion of the push rod.

The closed rear end of the shield 148 is adapted to be engaged by a suitable terminal 152 on the end of the current supply cable 154 which is urged forwardly by a spring 156 between insulating disk 158 and an insulating collar 160 on the terminal 152. The terminal and its associated parts may be located within a suitable housing 162 which is detachably secured by a bayonet slot connection at 164 to a connector 166 with both the connector and cover plate 140 clamped to the cage 62 by crimping portions of the rear edge of the cage over the periphery of the connector 166.

With reference to the operation of the above described circuit breaker construction, the several parts thereof have been shown in full lines in their normal position to complete a circuit from the supply cable to the terminal screw and terminal nut 68 of the lighter per se. In this position it will be seen that current is conducted from the terminal 152 through the shield 148 and bearing 138 to spring contact 142, to contactor 134 on push rod 136 and then through the bimetallic latch 124 to the terminal screw 122. Although current could be conducted from the shield 148 through bearing 138 to the rod 136 or through the spring 144 to this rod, it is preferable to provide the spring blade contact 142 to insure a more positive current path from the shield and bearing directly to the contactor 134, and to prevent voltage drop due to either corrosion or oxidation of the contact surfaces of the spring contact 142, contactor 134, and bimetallic latch 124, it has been found desirable to plate these elements or at least the contact surfaces thereof with a relatively thin coating of silver.

As noted among the several objects of the present invention, the circuit breaker is incorporated in our lighter construction to open the circuit to the heating element of the lighter upon either overheating thereof or upon a short-circuit or overload in the circuit. In the construction shown herein, it will be apparent that the spring

144 exerts a rearward force on the push rod 136 but movement of the push rod is normally prevented by the engagement of the end of the bimetallic latch 124 with the contactor 134. Since the bimetallic latch is mounted on the terminal screw 122 some heat from the heating coil 36 when energized will be transmitted to the latch through the terminal nut 68 and screw 122 and since the bimetallic latch is in the circuit to the heating coil and is of such material as to offer some resistance to the passage of current therethrough it will also be subject to internal heating.

As the bimetallic latch 124 is heated it will gradually expand or move outwardly from the contactor 134 and at some predetermined temperature the spring 144 will overcome the friction between the contactor and latch and move the push rod rearwardly to the position shown in dot-and-dash lines in Fig. 1 to open the circuit. To operate as a safety device the bimetallic latch should be so constructed that it will not be sufficiently heated during normal operation of the lighter to release the push rod but will release the same if either the heating coil of the lighter reaches a dangerous degree of temperature which is above that desired for normal use such as may occur if the circuit through the heating coil is maintained for an excessive period by the plug being manually held in closed-circuit position or by failure of the plug to automatically return to its storage position during normal operation, or if the current passing through the circuit be subject to an overload as from a short circuit in the heating coil or for other reasons.

In actual practice, lighter units constructed in accordance with the present showing have been designed for the circuit to carry a load of 15 to 20 amperes during normal operation and for the heating coil to attain the desired temperature for use and the plug automatically returned to its storage position within about 10 seconds after being manually operated to its closed-circuit position. The latching tension and dimensions of the circuit breaker latch have been so designed that if the circuit through the heating coil is maintained for a period of about 55 seconds the bimetallic latch will be sufficiently heated by both heat from the heating coil and internal resistance to release the push rod 136 and break the energizing circuit. If, however, the circuit is subject to an overload of about 30 amperes which represents the effect of a short circuit, the bimetallic latch will be heated to such an extent by its internal resistance to the passage of this higher amperage that it will release the push rod to break the circuit in approximately 20 seconds.

It will be apparent that after the circuit has been opened by the circuit breaker, the bimetallic latch 124 will cool off and return to a latching position and after the abnormal condition which caused the circuit breaker to open has been determined and any necessary repairs made to remedy this condition, the circuit breaker can be readily reset to again close the circuit therethrough by first removing both the housing 162 with the enclosed terminal parts and the shield 148 and then manually depressing the push rod 136 until the contactor 134 is engaged and latched by the bimetallic latch 124 after which the shield and housing may, of course, be returned to their original positions.

In describing the construction of the present circuit breaker it was noted that at least the contact surfaces of contact 142, contactor 134 and bimetallic latch 124 are preferably silver plated to prevent voltage drop due to corrosion or oxidation. It has been found that under certain conditions such as prolonged or continued use at above normal or excessive temperature of the heating coil there is a tendency for the contacting surfaces of the bimetallic latch fingers and contact arms of some lighters to oxidize or scale and it is contemplated that the member 72 or the contacting surfaces of the arms 76 and 78 thereof and the corresponding parts in the modification of Figs. 5 to 7 may be plated or coated with a relatively thin layer of silver or nickel which have both been found in actual practice to reduce or entirely eliminate this tendency.

It is believed that the many features and advantages of the present construction of both the lighter and the circuit breaker incorporated therein will be obvious from the foregoing detailed description, and it will be apparent that various modifications and changes may be made within the scope of the present invention as defined by the claims appended hereto.

We claim:

1. In a cigar lighter, a tubular holder, a removable igniting unit slidably mounted in said holder and projecting outwardly from the front end thereof, said unit having an electrically conducting surface portion lying in a plane generally transverse to the direction of slidable movement of the unit, a thermostatic latch mounted within said holder adjacent the rear end thereof, an electrically conducting sleeve slidably mounted in said holder with the front end of said sleeve so positioned as to engage said surface in pressure abutting relation to make positive electrical contact between the sleeve and surface, and a spring interposed between the rear end of said sleeve and said holder to normally hold said unit in spaced relation to said thermostatic latch.

2. In a cigar lighter, a tubular holder, a removable igniting unit slidably mounted in said holder and projecting outwardly from the front end thereof, said unit having an electrically conducting surface portion lying in a plane generally transverse to the direction of slidable movement of the unit, a thermostatic latch mounted within said holder adjacent the rear end thereof, an electrically conducting sleeve slidably mounted in said holder with the front end of said sleeve so positioned as to engage said surface in pressure abutting relation to make positive electrical contact between the sleeve and surface, a spring interposed between the rear end of said sleeve and said holder to normally hold said unit outwardly in spaced relation to said thermostatic latch, and yieldable means on said holder to engage a shoulder on said unit and normally limit the outward movement of said unit relative to said thermostatic latch.

3. In a cigar lighter, a tubular holder, a removable igniting unit slidably mounted in said holder and projecting outwardly from the front end thereof, a thermostatic latch mounted within said holder adjacent the rear end thereof, a peripheral flange on said unit adjacent the inner end thereof providing an electrically conducting surface portion lying in a plane generally transverse to the direction of slidable movement of the unit, an electrically conducting sleeve slidably mounted in said holder with the front end of said sleeve so positioned as to abut said surface to make pressure abutting contact between the sleeve and surface, a spring interposed between the rear end of said sleeve and said holder to normally hold said unit outwardly in spaced relation to said thermostatic latch, and spring detents on said holder to engage the said flange on the unit to normally limit the outward movement of said unit relative to said thermostatic latch.

4. In a cigar lighter, a holder, a manually removable plug slidably mounted in said holder and movable in a path longitudinal of said holder, yielding means opposing rearward movement of said plug in the holder, a heating element on said plug having an annular ferrule, a combined thermostatic latch and contact member mounted in said holder, said member including a thermostatic latch arm mounted in the path of movement of the ferrule for electrical engagement therewith when the plug is moved rearwardly in the holder, said member also including a contact arm in the path of movement of the ferrule for electrical engagement therewith when the plug is moved rearwardly in the holder, said contact arm being of greater length than the latch arm to close an energizing circuit through said heating element prior to the electric engagement of said latch arm with said ferrule, said thermostatic latch arm being adapted to engage the ferrule and hold the ferrule and contact arm in engagement against the pressure of the yielding means until the heating element attains a predetermined temperature sufficient to release said thermostatic latch, and electric energizing means of aforesaid heating element.

5. In a cigar lighter as defined in claim 4 in which said combined thermostatic latch and contact member comprises a bi-metallic material.

6. In a cigar lighter as defined in claim 4 in which said thermostatic latch arm is a bi-metallic material and said contact arm is a mono-metallic material.

7. In a cigar lighter of the automatic type having a holder in which a removable plug having a heating element with an annular ferrule is adapted to be normally stored, and manually forced rearwardly against the pressure of an ejecting spring in said holder when desired to energize the heating element until it attains a predetermined temperature, a contact arm mounted in said holder and having a wide contact surface of substantial con-

tact area to frictionally engage the ferrule of the heating element to close an energizing circuit through the heating element, a thermally responsive latch arm mounted in said holder rearwardly of said contact arm and having a rib of lesser contact area than said contact surface to latch over the ferrule and hold the plug against return to storage position by the ejecting spring until the heating element has attained the desired predetermined temperature, and electrical energizing means for said heating element.

8. In a cigar lighter of the automatic type having a holder in which a removable plug having a heating element with an annular ferrule is adapted to be normally stored and manually forced rearwardly against the pressure of an ejecting spring in said holder when desired, to energize the heating element until it attains a predetermined temperature, a combined thermostatic latch and contact member mounted in said holder adjacent the inner end thereof and having a central disk-shaped portion with a plurality of flexible arms extending forwardly therefrom including a contact arm having an elongated contact surface of substantial contact area to frictionally engage the annular ferrule of the heating element, a thermally responsive latch arm having a rib of lesser contact area than said contact surface to frictionally engage the annular ferrule after engagement thereof by the contact surface of said contact arm and relatively short spaced flanges extending forwardly from said central portion of the latch and contact member so as to be engaged by the ferrule to limit the rearward movement of the plug in the holder, and electrical energizing means for said heating element.

9. In a cigar lighter having a holder in which a removable igniter plug is adapted to be received and be manually moved to engage a contact arm and energize the heating element to normally attain a predetermined temperature, a terminal in said holder for mounting the contact arm, a circuit breaker including a movable contactor extending rearwardly from said terminal and connected to a source of current in series with said contact arm, a thermally responsive latch arm having one end secured to said terminal and the other end in the path of movement of said contactor and engageable with said contactor to conduct current therefrom to said terminal, spring means to urge said contactor away from said latch arm, said latch arm being operative to hold said contactor in latched position in engagement with said arm and said latch arm being movable in response to heat from the heating element above a predetermined temperature to release said contactor to open the energizing circuit to the heating element, and an electrical energizing circuit for said heating element.

10. In a cigar lighter having a holder in which a removable igniter plug having a heating element is adapted to be received and be manually moved into engagement with a contact arm so as to energize the heating element to normally attain a predetermined tem-

perature, an automatic circuit breaker mounted in said holder and including a movable contactor extending rearwardly of said contact arm in series circuit therewith, a thermally responsive latch mounted in the path of movement of said contactor and adapted to engage said contactor to complete a circuit through said latch to the contact arm, said latch being movable in response to an overload in the circuit or excessive temperature of the heating element to permit separation of the contactor therefrom to open the circuit to the contact arm, means for moving the contactor out of engagement with the latch when the temperature thereof reaches a predetermined degree, and electrical energizing means for said heating element.

11. In a cigar lighter having a holder in which a removable igniter plug having a heating element is adapted to be received and manually moved into position to be heated, a contact arm engaging the igniter when in such position so as to energize the heating element to normally attain a predetermined temperature, an automatic circuit breaker mounted on said holder adjacent the inner end thereof and including a bi-metallic latch having one end electrically connected to said contact arm and the other end in the path of movement of and normally in latching engagement with a contactor on the end of a push rod which is slidably mounted for movement relative to said bi-metallic latch, spring means on said rod normally exerting a pressure thereon to effect disengagement of the contactor from the latch and effective when the latch reaches a predetermined temperature, electrical energizing means for said heating element including a conductor leading to a source of current, and means to connect said conductor to the contactor through the bi-metallic latch, so that current is normally carried to the contactor arm through said latch.

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