June 19, 1962 L. J. GAUDET ET AL 3,040,160

ELECTRIC CIGAR LIGHTER

Filed July 1, 1959 2 Sheets-Sheet 1

Fig. 1.

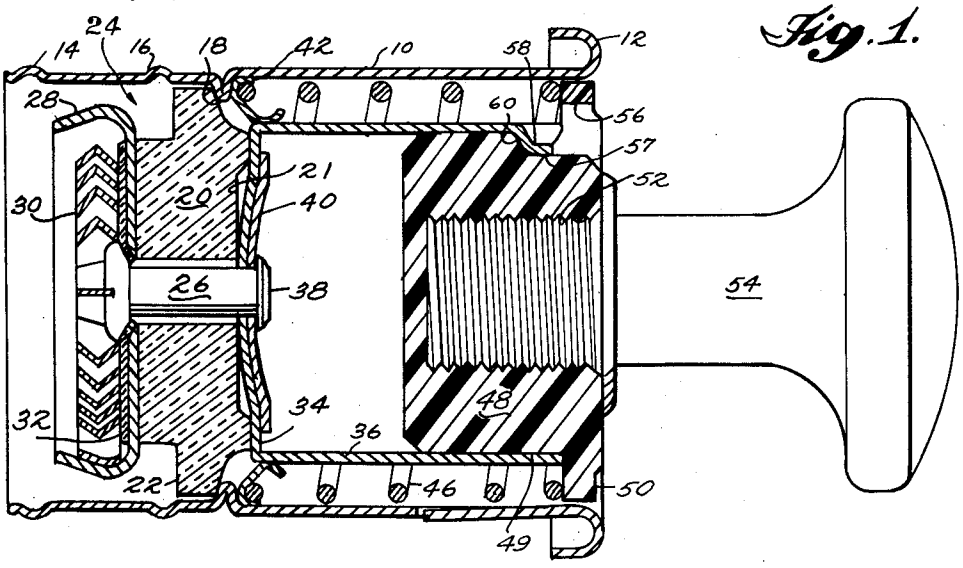


Fig. 2.

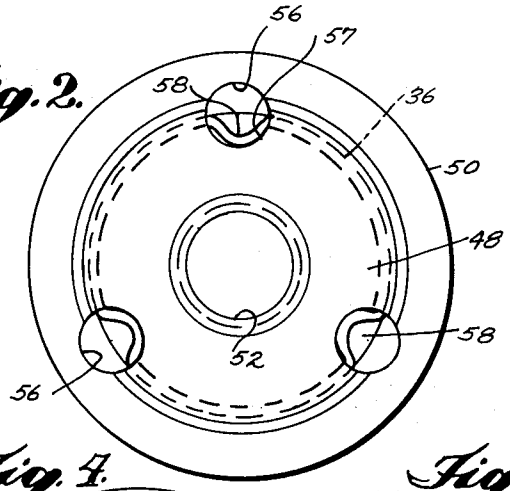


Fig. 3.

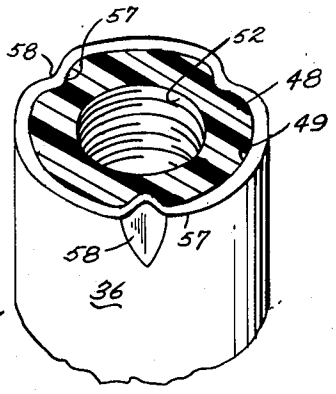


Fig. 4.

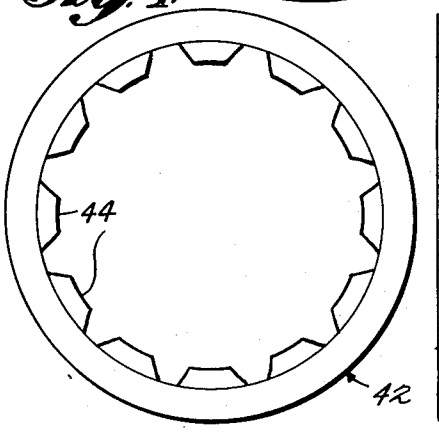
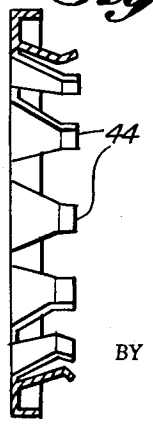


Fig. 5.



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Fig. 6.

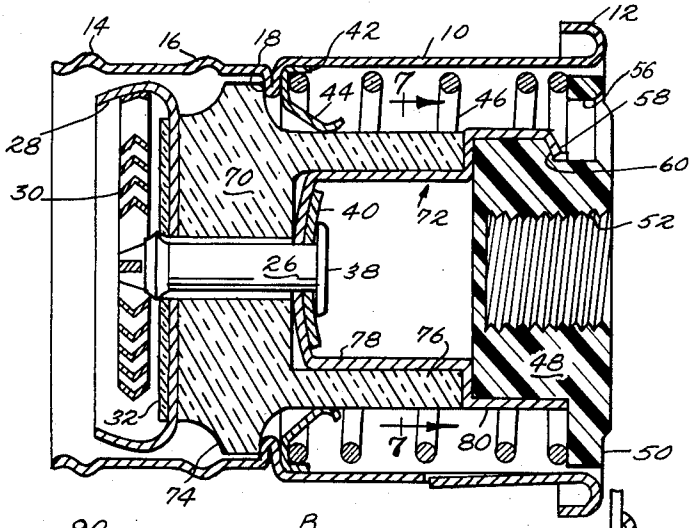
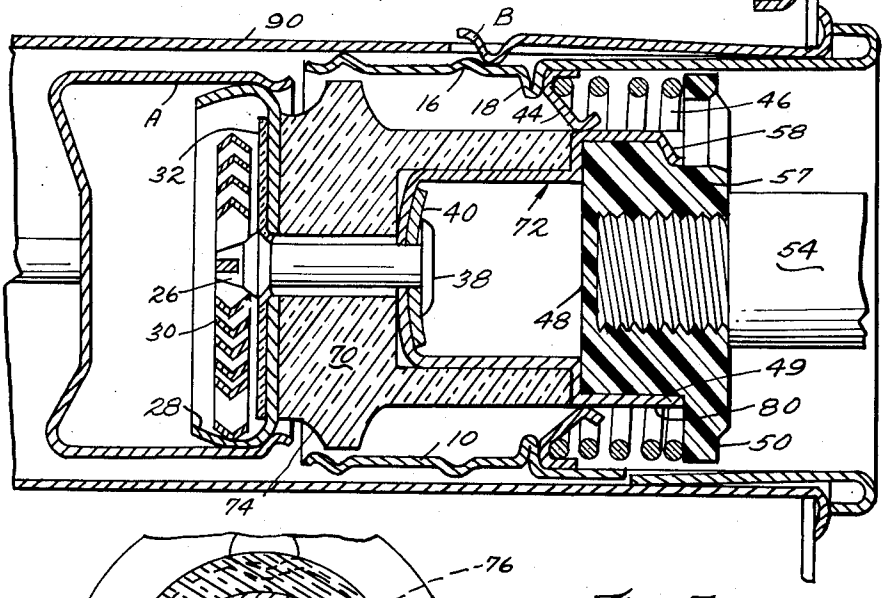


Fig. 8.



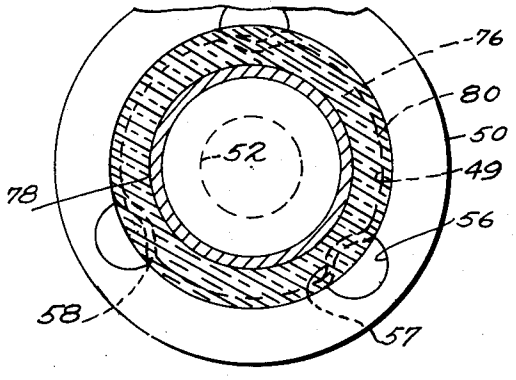


Fig. 7.

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ELECTRIC CIGAR LIGHTER

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9 Claims. (Cl. 219—32)

This invention relates to electric cigar and cigarette lighters, and more particularly to cigar and cigarette lighters of the type currently used in automobiles, motor boats, aircraft and the like.

The invention specifically relates to an improved lighter plug which may be used in known types of cigar lighter plug sockets such as are shown in U.S. Patents 2,495,657, and 2,531,901.

One of the problems encountered in the use of cigar lighter plugs is the assembling of its various parts, and more particularly the securing of the plug carrier shell to the bushing which carries the knob. Presently, tabs or ears are provided on the metallic carrier shell which are, upon assembly, inserted into slots in the bushing and then bent or rolled over. This procedure is a rather slow operation and involves heavy pressure. Care must be taken to assure secure joining of the elements and to line up the tabs or ears of the carrier shell with slots provided in the bushing element.

Another problem encountered in cigar lighter plugs now in use is that of current arcing internally in the socket wherein portions of the plug or socket are damaged. A particular area of such arcing is between the heating unit cup and the thermostat of the socket, which by roughening the mating surfaces may have an adverse effect on the uniformity of timing of the operation of the lighter.

It is, therefore, an object of the present invention to provide a cigar lighter plug which is simple in structure and easily assembled.

It is another object of the present invention to provide efficient means for securing the knob carrying bushing to the plug carrier shell which is free from rattles, and presents a very tight assembly.

It is a further object of the present invention to provide a cigar lighter plug which by its structure inherently cuts down the arcing between the heating unit and plug socket, and also provides for an internal "breaking" of the electric circuit.

These and further objects and advantages will become readily apparent to those skilled in the art upon consideration of the specification and the appended drawings in which:

FIGURE 1 is a longitudinal sectional view of an exemplary embodiment of the cigar lighter plug of the present invention;

FIGURE 2 is an end elevational view of the carrier shell and bushing of the cigar lighter plug in assembled position, looking from the right hand end of FIGURE 1 with the knob removed;

FIGURE 3 is a perspective view of a portion of the carrier shell and bushing with its flange removed;

FIGURE 4 is an end view of the annular ground contact spring;

FIGURE 5 is a cross sectional view of the spring in FIGURE 4;

FIGURE 6 is a longitudinal sectional view of a modification on the cigar lighter plug of the present invention;

FIGURE 7 is a sectional view taken along line 7—7 of FIGURE 6;

FIGURE 8 is a longitudinal sectional view of the modification of FIGURE 6 shown in a closed circuit position within a cigar lighter plug socket.

The preferred cigar lighter plug assembly of the present invention as shown in FIGURES 1–3 comprises a substantially cylindrical plug shell **10** adapted for use in standard electric cigar lighter sockets conventionally used in motor vehicles and the like. The plug shell has an outwardly curled flange **12** at its rearward end which cooperates with a cigar lighter socket (not shown), to limit the forward motion of the cigar lighter plug within the socket. The forward end of the plug shell **10** is provided with annular beads **14** and **16** axially spaced and arranged for engagement with a spring friction finger provided in the wall of the socket (as schematically indicated at B in FIG. 8) so as to prevent accidental ejection of the plug. Disposed rearwardly from the annular bead **16** is an annular inwardly projecting rib **18**. A heating element and carrier assembly indicated generally as **24** is disposed within shell **10** and is adapted for axial movement therein. The assembly **24** comprises a ceramic heating element carrier **20** having an outwardly extending integral flange **22** adapted to engage the rib **18** of shell **10** and thereby limit the rearward axial movement of assembly **24** within the shell. In the preferred embodiment the heating element carrier **20** is substantially disc-shaped, having a diameter substantially less than the diameter of integral flange **22**, which is sufficiently large to engage the interior wall of shell **10** and to engage the rib **18** therein.

Suitably secured to the forward face of the heating unit carrier, as by the customary stud **26**, is a metallic heating element cup **28** which is insulated from the stud **26** by mica washer **32** and encloses a heating element **30** which is preferably secured in the conventional manner by welding its inner and outer ends to stud **26** and the inner wall of cup **28**, respectively. This sub-assembly is secured to the closed end **34** of cylindrical carrier shell **36** by means of the head **38** of stud **26**. Interposed between the head **38** and the closed end **34** of the carrier shell is a reinforcing washer **40**. The rear face of the carrier **20** may advantageously have a slight concavity or depression **21** to ensure a tight peripheral seat for shell **36**.

Bushing **48** having flange **50** at the rearward end thereof is adapted to be disposed within the rearward end of carrier shell **36** so that the flange **50** engages the rearward end thereof upon assembly. The bushing is adapted as by socket **52** to accommodate a suitable knob **54**. A plurality of axially extending grooves **57**, are formed for a purpose to be later explained, in the wall **49** of bushing **48** and are made accessible from the rear face of the bushing by holes **56** which are aligned with them for that purpose.

In assembly, the heating element carrier **20**, heating element cup **28**, heating element **30** and associated parts are connected to carrier shell **36** as a sub-assembly. Bushing **48** is then placed open end down and the spring **46** is placed thereon with one end engaging the flange **50**. Contact spring **42**, provided with a plurality of inwardly projecting radially and axially extending flexible fingers **44**, is then placed on the other end of the spring **46** so that the fingers project toward flange **50** of the bushing **48**. Plug shell **10** is then placed over the last mentioned assembly. The remainder of the sliding parts first assembled are then dropped into the open end of the plug shell, and pressure is applied upon the cup **28** to secure the carrier shell to the bushing as described below.

In order to secure the bushing **48** to carrier shell **36**, lips **58** are struck inwardly from the rearward edge of the carrier shell **36** adjacent the flange **50** into each of the grooves **57**, so that the lips **58** are bent inwardly over the bottoms **60** and edges of the grooves **57**, firmly securing the bushing and carrier shell together.

The bushing and carrier shell may be readily and conveniently joined by a suitable tool including a plurality of small punches corresponding to the number of axial grooves in the bushing. The tool is moved axially of the bushing so that each punch enters into each of the

axial grooves in the flange and bushing so that each punch engages a portion of the rearward end of the carrier shell. Continued inward axial movement of the tool causes the punches to strike a portion of the rearward end of the carrier shell inwardly over the bottom of each of the grooves so as to stretch the portion of the carrier shell engaged, and to deform it to define a plurality of lips each conforming with a corresponding axial groove. In actual practice it has been found most practical and efficient to employ punches having tapered diamond section tips.

In such a method of assembly little pressure is needed to strike the lips **58** of the shell inwardly over the edges of the grooves **57** in the bushing **48**. The fact that the edges of the grooves serve as fulcrums over which the metal is bent, together with the stretching of the lips of the shell, makes a very tight assembly which is free from ratles and remarkably resistant to being pulled apart when compared with the small punch pressure involved. As indicated above, the customary procedure is to provide tabs or ears on the carrier shell and corresponding slots in the bushing in order to secure the elements together. The operation of bending or rolling the tabs or ears is slow and involves rather heavy end pressure. In addition, assemblage in accordance with the present invention provides a "blind" assembly, leaving no metal parts exposed to conduct heat or current, and is tight with the use of very low end pressure. It should also be noted that the absence of ears or tabs in the carrier shell makes for a lower cost shell and eliminates the problem of aligning the tabs or ears with the slots in the bushing upon assembly.

The device illustrated in FIGURES 6–8 is a modification of the device previously described, showing an alternative structure of the ceramic heating element carrier **70** and carrier shell **72**. The modified heating element carrier **70** is substantially cylindrical and has an annular flange **74** near the forward end thereof to engage the interior wall of plug shell **10** and engage the annular rib **18** thereof to limit the rearward motion of the heating unit carrier within the plug shell. Disposed rearwardly of the flange **74** is an axially extending tubular skirt **76** adapted to contact the flexible fingers **44** of ground contact spring **42** when the plug is in, or approaching "open circuit" position. Forward portion **78** of cylindrical carrier shell **72** is disposed within the tubular skirt **76** of the heating element carrier **70** and is secured thereto along with heating element cup **28** and heating element **30** by the stud **26** as previously described. The rearward end of carrier shell **72** is provided with a step shoulder **80** which engages the rearward end of the tubular skirt **76** of heating element carrier **70**. Cylindrical bushing **48** is inserted within the step shoulder **80** of carrier shell **72** to seat against it, and the two are secured together by striking lips **58** inwardly from the rearward end of carrier shell **72** as previously described above.

In approaching a closed circuit position heating element cup **28** engages the thermostat A of socket **90** before the circuit through the lighter is completed by the switching engagement of ground contact spring fingers **44**, with carrier shell **72**. The circuit is broken by the separation of fingers **44** and shell **72** before the separating of heating element cup **28** and thermostat A. As the thermostat A serves as a spring detent and not as a positive latch, it is to some extent sprung open by a wedging effect of the cup **28** under the influence of spring **46** which results in the cup **28** and thermostat A separating at some point on, or slightly past, the equator of the cup.

It will thus be seen that the devices of the present invention have overcome a serious problem in the assembling of the various components of cigar lighter plugs and also provide new and useful cigar lighter plugs which are economical and easily assembled. In assembling the devices of the present invention in accordance with the method described herein firmly secured, rattle free cigar lighter plugs are easily constructed.

In a plug as shown in FIGURE 1, the electrical path is through heating unit cup **28**, element **30**, stud **26**, washer **40**, and shell **36** to contact spring **42** and plug shell **10** which cooperates terminal-wise with the wall of socket **90** (see FIGURE 8) and the heating unit cup **28** will similarly cooperate with thermostat A when pressed into contact therewith. Contact between cup **28** and thermostat A has a circuit controlling function which results in arcing between and roughening of the parts; this causes undesirable variations in timing and may be remedied by modification of ceramic unit carrier **20** and its associated carrier shell **36** as described above.

It will thus be seen that the objects of this invention have been fully and effectively accomplished. It should be realized, however, that the foregoing specific embodiments have been shown and described only for the purpose of illustrating the principles of this invention and are subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

What is claimed is:

1. A cigar lighter plug for use in an electric circuit comprising a metallic plug shell having an annular rib projecting inwardly therefrom, a heating element and carrier assembly adapted for axial movement within said plug shell, said assembly including a carrier shell, a heating element carrier secured to the forward end of said carrier shell, and a bushing mounted in the rearward end of said carrier shell, said bushing having a portion extending radially outwardly from the rearward end thereof, said bushing being grooved in an axial direction at a plurality of angularly spaced positions, and each groove being aligned with an opening through said portion, lips struck inwardly from the rearward edge of said carrier shell into said grooves securing the carrier shell and bushing together, said carrier having an integral annular flange extending outwardly therefrom and adapted to engage the forward side of said plug shell rib, and spring means disposed between the rearward side of said plug shell rib and the forward side of said bushing flange adapted to urge said assembly rearwardly with respect to said shell, and an annular ground contact spring adapted to engage said plug shell rib and said carrier shell.

2. A cigar lighter plug as defined in claim 1 wherein the electric circuit is open and closed internally of said plug by the engagement and dis-engagement of said contact spring and said carrier shell.

3. A cigar lighter plug comprising a metallic plug shell, and a heating element and carrier assembly adapted for axial movement within said plug shell, said assembly including a carrier shell, a ceramic heating element carrier secured to the forward end of said carrier shell, and a cylindrical bushing mounted in the rearward end of said carrier shell, said bushing having an annular flange extending outwardly from the rearward end thereof, said bushing being grooved in axial direction at a plurality of angularly spaced positions, forward of said flange and each groove being aligned with an opening therethrough, and lips struck inwardly from the rearward edge of said carrier shell into said grooves securing the carrier shell and bushing together.

4. A cigar lighter plug as defined in claim 3 wherein said heating element carrier is substantially disc-shaped.

5. A cigar lighter plug as defined in claim 3 wherein the rearward end of said heating element carrier is provided with an axially extending tubular skirt adapted to receive the forward end of said carrier shell, said carrier shell having a step shoulder adapted to engage the rearward end of said heating element carrier skirt and to seat said cylindrical bushing.

6. In an electric cigar lighter plug adapted for support

on a holding device having terminals for furnishing E.M.F. to an electrically resistant heating element carried by said plug at its forward end and having a contact for engagement with and separation from one of said terminals, said plug comprising a part movable relative to said holding device by manual manipulation of a knob to move said contact into engagement with said one terminal, and also comprising knob support means secured to said movable part, the novel improvement wherein said movable part is a hollow metallic shell having a rim and being open at its rearward end for embracingly receiving a first portion of said knob supporting means, a plurality of depressions in the embraced surface of said knob supporting means wherein portions of the wall of said shell are deflected into said depressions to interlock said knob supporting shell and said means, said means also comprising a second portion abutting said rim and extending rearwardly and radially thereof and having a rear face, said second portion being so shaped as to permit passage of a tool axially of said plug whereby portions of said wall may be deflected radially inwardly into said depressions.

7. An electric cigar lighter plug adapted for support within a socket having terminals for furnishing E.M.F. to an electrically resistant heating unit carried by said plug at its forward end and having terminals to cooperate with said first mentioned terminals, said plug comprising a hollow tongueless metallic member disposed rearwardly of said heating unit and movable by manual manipulation of a knob comprehended by said plug and attached thereto by knob supporting means having a first portion at least in part peripherally within and embraced and engaged by said metallic member by distortion of a part thereof radially toward the axis of said plug into a depression in the peripheral surface of said first portion, said knob supporting means also having a second portion extending rearwardly and radially of said member and having a forward face abutting the rear thereof for the transmittal of thrust thereto by manipulation of said knob and being so shaped as to permit access by a tool from the rear of said plug to a point forward of the rear of said member to effect said distortion of said part thereof whereby said embrace is tightened.

8. An electric cigar lighter plug assembly comprising a hollow metallic shell having an open rearward end and being arranged and adapted for the attachment and support of a heating unit at its forward end, said plug also comprising knob supporting means having a first portion housed within said shell and affording a surface engaging the interior wall thereof and further having a second portion which in part abuts the rim of said open end of said shell and in part extends radially and axially rearwardly therebeyond, said first portion having a plurality of depressions in said surface which extend axially of said shell and said second portion having discontinuities in alignment with said depressions whereby access may be had thereto by a tool traversing axially of said plug from the rear thereof to force lip-like deflections of said shell into said depressions and thereby secure said shell and said knob supporting means rigidly together.

9. In a cigar lighter plug of generally cylindrical form having a heating element adjacent its forward end and a knob at its rearmost end for manipulation and movement of at least a part of said plug lying axially between said heating element and said knob when the plug is supported in an E.M.F. supplying holding device, the novel improvement of said part being a metallic shell, said knob being attached to said metallic shell by knob supporting means having a peripheral surface extending axially of the plug and embraced by said shell, said peripheral surface having a depression into which a portion of said shell may be forced for interlocking engagement and contraction of said shell whereby its embrace of said peripheral portion is tightened.

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