

[54] **IGNITION PLUG FOR ELECTRIC CIGARETTE LIGHTER**

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[58] Field of Search ..... 219/262, 263, 264, 265, 219/266, 267, 270

[56] **References Cited**

**UNITED STATES PATENTS**

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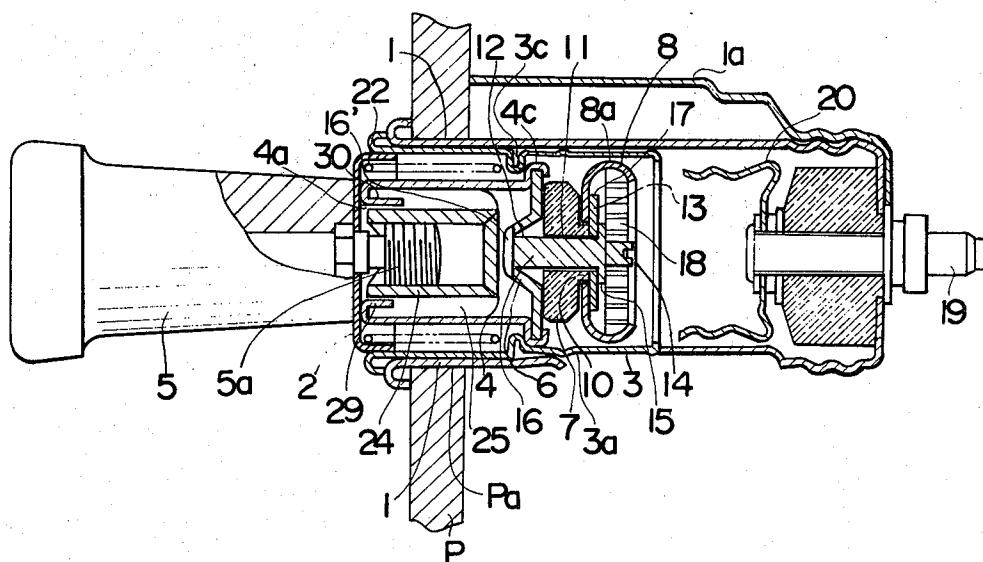
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Attorney, Agent, or Firm—Craig & Antonelli

[57] **ABSTRACT**

An ignition plug for an electric cigarette lighter which comprises a unitary assembly formed by the use of an elongated connecting member of polygonal cross section that extends through the cup, insulating spacer and end plate, each having a centrally disposed opening adapted to pass the connecting member there-through and shaped to conform to the cross section of the polygonal connecting member, thus eliminating unfavorable relative motion. Furthermore, the securing of the knob to the plug body in manufacturing of the ignition plug is much simplified by employing a special nut with projections and corresponding opening with notches formed in the sleeve for the plug.

**13 Claims, 6 Drawing Figures**





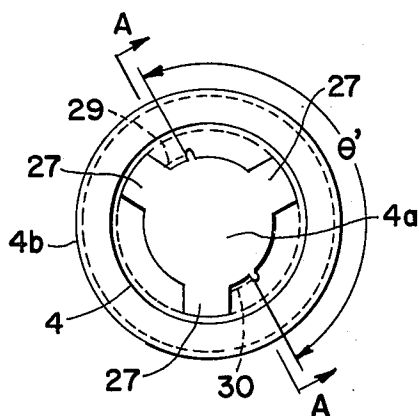


FIG. 3

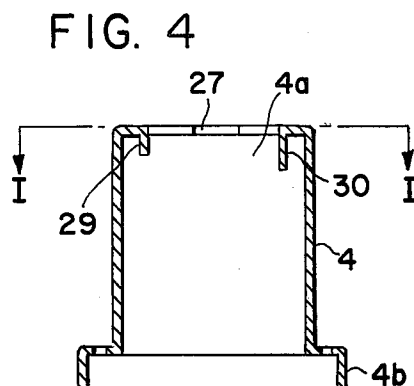


FIG. 4

FIG. 5

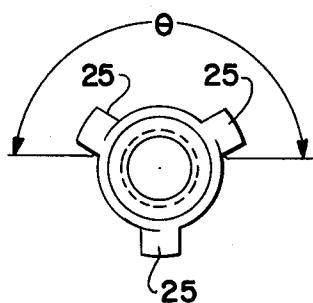
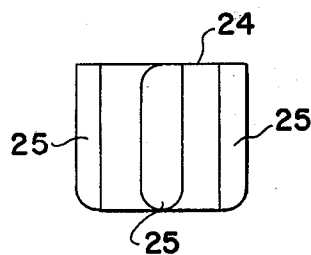


FIG. 6



## IGNITION PLUG FOR ELECTRIC CIGARETTE LIGHTER

The present invention relates to electric cigarette lighters of a type including an ignition plug adaptable to be energized in a socket and removable therefrom for use in lighting a cigarette or tobacco.

More particularly, the present invention pertains to the arrangement of the ignition plug wherein a unitary assembly including at one end a cup provided therein with an electrically heated ignition coil and at the opposite end an insulating block can, relative to a knob having a threaded stud to be secured to the insulating block of the unitary assembly, be rotated without accompanying relative rotation between any two members of the cup, igniting coil and insulating block, the relative rotation between the knob and the unitary assembly being required for facilitating rigid connection between the threaded stud of the knob and the insulating block of the unitary assembly during manufacture or assembly of the ignition plug.

As is well known to those skilled in the art and clearly discussed in the U.S. Pat. No. 3,088,015 patented on Apr. 30, 1963, since a sleeve encircles the periphery of the assembly and is mounted thereon for axial and rotary motion with respect to said assembly, the only available portion of the unitary assembly which can be held stationary such as by grasping is the cup and part of an insulating spacer positioned behind the cup and between the cup and the insulation block. If in addition to the availability of relative motion between the knob and the unitary assembly, relative motion between any two members of the unitary assembly, i.e., the cup, ignition coil, insulating spacer and insulating block, is available, there will be possibilities that the igniting coil is distorted and that the cup is axially misaligned with respect to the unitary assembly. These unfavorable possibilities adversely affect the operability of the electric cigarette lighter when the igniting plug is inserted into the socket having therein electrodes through which electric power is supplied to the igniting coil to energize the latter.

According to the prior art, an exemplary type of which is disclosed in the above numbered U.S. patent, these unfavorable possibilities have been successfully eliminated by providing projections and indentations cooperative with said projections, formed in the cup and the space and in the cup and the flange carrying the insulating block. When the cup, spacer and flange are to be secured together by the use of a rivet of circular cross section passing therethrough, each projection in one member engages in the corresponding indentation in the adjacent member whereby either said one member or said adjacent member can be held against rotation of the other.

Despite the successful solution to the problem of eliminating the above mentioned unfavorable possibilities, it has been found that manufacture of the cigarette lighter is relatively complicated. By way of example, during formation of the projections or the indentation in, for example, the cup, care should be taken in forming these projections or indentations at definite positions in said cup relative to the positions of the indentations or projections that have been formed, or will be subsequently formed, in the member, i.e., insulating spacer, adjacent to the cups, or otherwise an exact axial

alignment therebetween will not be achieved without difficulties during assembly of the cigarette lighter.

Furthermore, together with the disadvantages described above, the fixing of the insulating disk to the plug body is rather complicated, in the manufacturing of the igniting plug, because said disk is secured at the other end of the rigid tubular member of the recessed flange by lugs bent into the grooves formed in said disk with said disk being formed with a threaded aperture to receive a threaded stud of the knob.

Accordingly, an essential object of the present invention is to provide an improved ignition plug arrangement adaptable to be energized in a socket and removable therefrom for use in lighting a cigarette or tobacco, which can be easily assembled with substantial elimination of the inconveniences inherent in the manufacture of the prior art cigarette lighter.

Another important object of the present invention is to provide the ignition plug arrangement of the type above referred to, wherein the knob can be attached to the unitary assembly without disturbing the relationship of the cup, igniting coil, and insulating spacer when the latter are grasped to facilitate the attachment.

According to the present invention, there is provided the ignition plug arrangement of the type referred to, wherein the unitary assembly is formed by the use of an elongated connecting member of polygonal cross section that extends through the cup, insulating spacer and end plate, each having a centrally disposed opening adapted to pass the connecting member therethrough, and shaped to conform to the cross section of the polygonal connecting member. Because of the particular shape of the central opening in each of the cup, insulating spacer and end plate in relation to the mating cross section of the polygonal connecting member, an unfavorable relative motion does not take place, without such combined projections and indentations as required in the prior art ignition plug.

Furthermore, in the manufacturing of the ignition plug of the above described type, the fixing of the knob to the plug body is much simplified by preparing a special nut of cylindrical shape which is provided with three projections of key shape outwardly, radially extending at equal intervals from the outer surface of said nut. One end of an inner sleeve for the plug body facing the threaded stud of the knob is formed with a centrally disposed concentric opening of somewhat smaller diameter with three notches on the brim thereof at positions corresponding to the projections of said nut so as to pass the above nut and has a shape to conform to the cross section of said nut. In the facing inner edges of the above opening adjacent to two notches a narrow, short rectangular tongue in one edge and another similar longer tongue in the other edge are formed, for engaging the sides of the corresponding projections of the nut, which are bent at right angles to the surface of the brim of the opening, extending inwardly into the sleeve from said edges. The upper end face of each projection of the nut is slightly tapered towards neighboring projection in the direction of threading of said nut for guiding purpose upon insertion of the nut into said opening of the plug body sleeve. Similarly the one lower corner of the short tongue is suitably rounded for guiding the projection of the nut. In fixing the knob to the plug body sleeve, the threaded stud of the knob is, through an opening of a mounting plate, engaged with the nut to some extent and inserted into the notched opening

of the plug body sleeve with the projections of the nut fitting into the corresponding notches in the opening. The knob is then turned in the direction of tightening. In this state, as the nut which loosely engages the stud of the knob turns in the same direction as the knob, one of the projections passes under the tip of the short tongue without contacting therewith, while the side of another projection located in the direction of rotation of the nut engages the side edge of the longer tongue to stop the rotation of the nut with the upper face of the nut remaining stationary under the edge of the notched opening of the plug body sleeve. A further turning of the knob draws the nut closer to the knob with the short tongue now contacting the side face of another projection of the nut, and the upper face of the nut with the projections is tightly pressed against the mounting plate of the plug body sleeve, thus securing the knob rigidly to the plug body.

These and other objects and features of the present invention will become apparent from the following description taken in conjunction with a preferred embodiment thereof with reference to the accompanying drawings, in which,

FIG. 1 is a longitudinal sectional view of an electric cigarette lighter, with a portion broken away, embodying the present invention,

FIG. 2 is an exploded view of a unitary assembly in the ignition plug of FIG. 1,

FIG. 3 is a top plan view of a plug body sleeve employed in the plug of FIG. 1,

FIG. 4 is a cross-sectional view taken along the line A-A in FIG. 3,

FIG. 5 is a top plan view of a nut with projections, employed in the plug of FIG. 1,

FIG. 6 is a side elevational view of the nut shown in FIG. 5,

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like numerals throughout the several views of the accompanying drawings.

Referring now to FIGS. 1 and 2, the electric cigarette lighter comprises a removable ignition plug 3 shown as inserted in a socket 1. The socket 1 includes a clamping sleeve 1a for clamping the socket 1 in an opening Pa formed in a wall P such as a vehicle dashboard. The socket 1 is provided with bimetallic fingers 20 connected to a current inlet post 19 which contain and conduct electricity to the plug 3 when engaged thereto to heat the spirally wound ignition coil 18 and release the plug 3 after the coil 18 has reached a predetermined temperature for lighting cigarettes or tobacco. The above arrangement of the socket which may be used with the plug of the invention is well known to those skilled in the art and, therefore, the details thereof are herein omitted for the sake of brevity.

The cup 8 in which the ignition coil 18 is contained is provided with a square opening 13 formed at the center thereof through which the shank of a connecting member 16 passes, and has an axially protruding flange 8a adapted to surround an ignition coil 18. A connecting member 16 of square cross section has one end extremity integrally formed with a pin-like element 14 for an electrode having a groove 9. The groove 9 extends at right angles to the longitudinal axis of said pin-like element 14, the latter being adapted to hold the ignition coil 18 in such a way that one end of said coil 18 is rigidly received in said groove 9. At the boundary be-

tween the connecting member 16 and the pin-like element 14, an annular collar or support 15 is mounted for backing up the ignition coil 18 in position within the cup 8 while the other end of said coil 18 is substantially secured to the axially protruding flange 8a of said cup 8. The coil 18 is thus positioned within the cup with a heat-resistant insulating plate 17 with a square opening, formed at the center thereof, supported on the adjacent surface of the cup 8.

Abutting the back face of the cup 8, there is provided a ceramic spacer 7 which has a square opening 11 axially formed therein and is formed at one end face with an outwardly projecting square portion 10 which fits into the opening 13 of the cup 8.

An end plate 6 is also formed, at the center thereof, with a square opening 12 having a spherical portion of said opening axially recessed or projected. The square shank portion of the connecting member 16 is inserted through the square openings of the heat-resistant insulating plate 17, the cup 8 the ceramic spacer 7 and finally through the opening 12 of the end plate 6. The end of the connecting member 16 is called as at 16', securing the cup 8, the insulating plate 17, the cup 13, the ceramic spacer 7 and the end plate 6 rigidly together.

Referring to FIGS. 3 and 4, an inner sleeve 4 of a hollow cylindrical shape has a flange portion 4b with a larger diameter than that of the main portion 4. The end plate 6 connected to the cup 8, the ceramic spacer 7 and insulating plate 17 in the above manner is inserted in the flange portion 4b of the inner sleeve 4 and secured therein in such a manner that the edge of the flange portion 4b is bent inward around the periphery of the end plate 6 as at 4c in FIG. 1. The other end of the inner sleeve 4 facing a threaded stud 5a of the knob 5 is formed with an centrally disposed concentric opening 4a of somewhat smaller diameter than that of the sleeve 4 with three notches 27 formed on the brim of the opening 4a. In the facing inner edges of the above opening 4a adjacent two notches a narrow, short rectangular tongue 29 in one edge and another similar longer tongue 30 in the other edge are formed which are bent at right angles to the surfaces of the brim of the opening 4a, extending inwardly into the sleeve 4 from said edges.

Referring to FIGS. 5 and 6, a special nut 24 is formed on its outer peripheral surface with a plurality of, for example, three key shaped projections 25 which extend in parallel to each other equidistantly about the axis of the nut 24 and which also extend in parallel to the axis of the nut 24. The upper end face of each projection 25 of the nut 24 is slightly tapered towards the neighboring projection in the direction of threading of said nut 24 for guiding purpose upon insertion of the nut 24 into said opening 4a of the inner sleeve 4. Similarly the one end corner of the short tongue 29 is suitably rounded for guiding the projections 25 of the nut 24 upon insertion. In fixing the knob 5 to the inner sleeve 4, the threaded stud 5a of the knob 5 is, through an opening of a mounting plate 2, engaged with the nut 24 to a slight extent and inserted into the notched opening 4a of the inner sleeve 4 with the projections 25 of the nut 24 fitting into the corresponding notches 27 in said opening 4a. The knob 5 is then turned in the direction of tightening. In this state as the nut 24 which loosely engages the stud 5a of the knob 5 turns in the same direction as the knob 5, one of the projections passes

clear of the tip of the short tongue 29 without contacting therewith, while the side of another projection 25 located in the direction of rotation of the nut 24 engages the side edge of the long tongue 30. Upon engagement of the projection 25 to the long tongue 30, no further rotation of the nut 24 does take place and, therefore, the nut 24 is held stationary relative to the knob 5.

It should be noted that the angle  $\theta'$  between the neighboring edges of the short tongue 29 and the long tongue 30 should be approximately equal to the angle  $\theta$  between the opposing two sides of the neighboring two projections 25 as shown in FIGS. 3 and 5.

A further turning of the knob 5 draws the nut 24 close to the mounting plate 2 with the short tongue 29 now contacting the side face of another projection 25 of the nut 24, and the upper face of the nut 24 with projections 25 is tightly pressed against the mounting plate 2 of the plug body sleeve 3a. The above unitary assembly is included in the plug body sleeve 3a and is adapted to be axially movable with respect to the sleeve 3a. The sleeve 3a is provided with an annular protuberance 3c adjacent to the connected portion 4c of the end plate 6 and the flange portion of the 4b of the sleeve 4. A spring 22 is provided between the protuberance 3c and the inner face of the mounting plate 2, encircling the sleeve 4 to enable the sleeve 4 to move the unitary assembly both axially and circumferentially with respect to the plug sleeve 3a in a manner well known in the art.

As is clear from the above description, the use of an elongated connecting member of polygonal cross section that extends through the cup, insulating spacer and end plate is very effective in eliminating the unfavorable relative motion between the components without requiring such combined projections and indentation as required in the prior art ignition plug.

Furthermore, the manufacturing of the ignition plug is made much simplified by the use of the special nut with key shaped projections and the sleeve which advantageously receives the projections, enabling the knob to be attached to the ignition plug very rigidly and simply.

Although the present invention has been fully described by way of example with reference to the attached drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art.

Therefore, unless otherwise such changes and modifications depart from the scope of the present invention, they should be construed as included therein.

What is claimed is:

1. An ignition plug for an electrical cigarette lighter adapted to be inserted into a socket for energization and removable from said socket for use in lighting cigarettes comprising:

a unitary assembly including, at one end thereof, an elongated connecting member of polygonal cross section extending through an electric heating unit, said electric heating unit including an ignition coil connected to one end of said connecting member, a cup connected to and surrounding said ignition coil, an insulating spacer and an end plate, each of said cup, insulating spacer and end plate having a centrally disposed opening adapted to pass said connecting member therethrough and shaped to conform to the cross section of said polygonal connecting member so that no relative motion takes

place among said cup, insulating plate and end plate, and

means for fixing an insulating knob to said unitary assembly at an opposite end of said unitary assembly, said fixing means comprising a nut formed on its outer peripheral surface with a plurality of projections which extend in parallel to each other spaced at equal distances about the axis of said nut and which also extend in parallel to the axis of said nut, a centrally disposed opening with a brim which is formed on corresponding end of an inner sleeve of said unitary assembly, and which is shaped with notches to conform to the cross section of said nut, said opening having a short tongue bent at right angles to a surface of said brim axially inwardly extending into the sleeve from an inner edge of one notch and a long tongue similarly bent at right angles to said surface of said brim axially inwardly extending into the sleeve from an inner edge of another notch so that, when said nut slightly engaged with a threaded stud of said knob through which a mounting plate is inserted is passed into said opening with subsequent further turning of said knob, said long tongue engages said projections and is prevented from rotation, resulting in rigid engagement between said knob and said unitary assembly.

2. An ignition plug for an electrical cigarette lighter as claimed in claim 1, wherein said elongated connecting member is of square cross section at a shank thereof with one end extremity integrally formed with a pin-like element having a groove, and has an annular collar at a boundary between said pin-like element and said shank.

3. An ignition plug for an electrical cigarette lighter as claimed in claim 1, wherein said connecting member has a square cross section and said cup has a square opening formed at the center thereof with an axially protruding flange.

4. An ignition plug for an electrical cigarette lighter as claimed in claim 1, wherein said connecting member has a square cross section and said insulating spacer has a square opening axially formed therein, said insulating spacer having one end face outwardly projecting in alignment with said square opening.

5. An ignition plug for an electrical cigarette lighter as claimed in Claim 1, wherein said connecting member has a square cross section and said end plate is formed at the center thereof with a square opening, a peripheral portion of said opening being axially recessed or projected.

6. An ignition plug for an electrical cigarette lighter as claimed in claim 1, wherein said inner sleeve is formed with a flange portion at an end facing said end plate of said unitary assembly, said end plate being inserted into said flange portion with a peripheral edge of said flange portion bent inward to rigidly hold a periphery of said end plate.

7. An ignition plug for an electrical cigarette lighter as claimed in claim 2, wherein the other end of said connecting member projecting from said end plate is calked or flattened.

8. An ignition plug for an electrical cigarette lighter as claimed in claim 2, wherein said ignition coil is connected to said pinlike element.

9. An ignition plug for an electrical cigarette lighter as claimed in claim 8, wherein said pin-like element has

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a groove at the end thereof and said ignition coil has one end rigidly received in said groove.

10. An ignition plug for an electrical cigarette lighter as claimed in claim 9, wherein said cup is provided with a flange, said ignition coil being connected at its other end to said flange.

11. An ignition plug for an electrical cigarette lighter as claimed in claim 2, wherein said ignition coil is positioned within said cup between said annular collar and a heat-resistant insulating plate having a centrally disposed opening which conforms to said square cross section of said connecting member.

12. An ignition plug for an electrical cigarette lighter comprising a unitary plug assembly and fixing means for fixing said plug assembly to an insulating knob, said unitary plug assembly comprising an elongated connecting member having a polygonal cross section and an electrical heating unit fixed to

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said connecting member at one end thereof, said heating unit including in sequence from said one end an ignition coil, a cup member containing said ignition coil, an insulating spacer and an end plate, each of said cup member, insulating spacer and end plate having a central opening conforming to said polygonal cross section to prevent relative rotation therebetween, wherein said ignition coil has a first end connected to said one end of said connecting member and a second end connected to said cup member, and wherein said fixing means fixes said insulating knob at an end of said unitary plug assembly opposite to said one end of said connecting member.

13. An ignition plug according to claim 12, wherein said polygonal cross section and the respective central openings are square-shaped.

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