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BATTERY POWERED CIGARETTE LIGHTER

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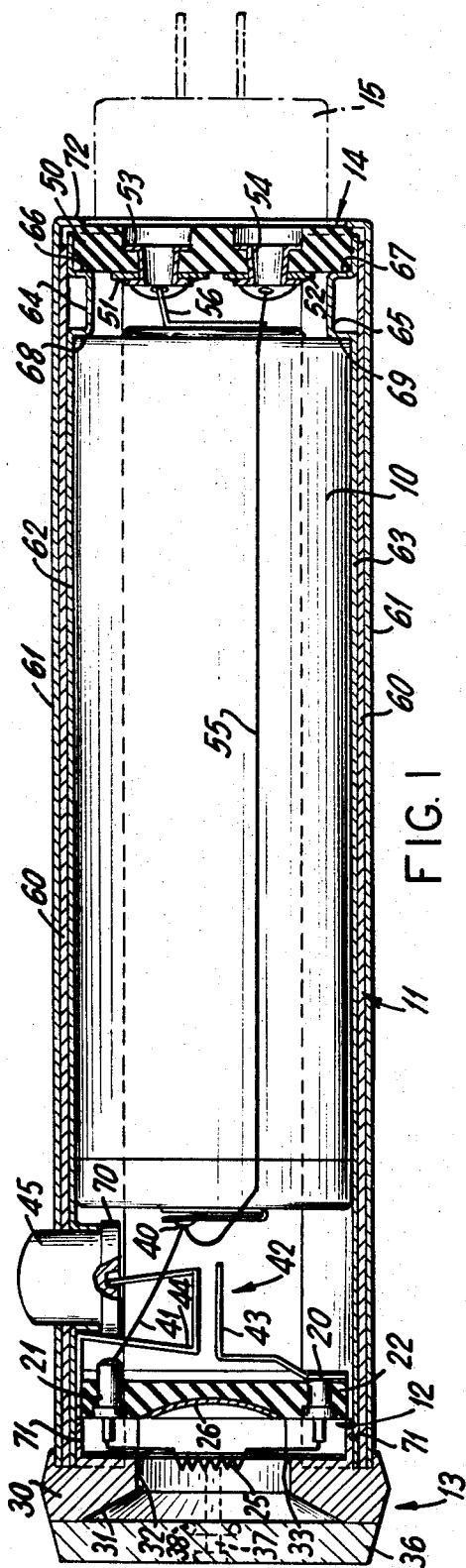


FIG. 1

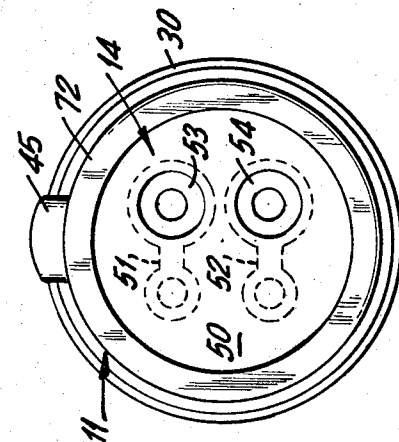


FIG. 3

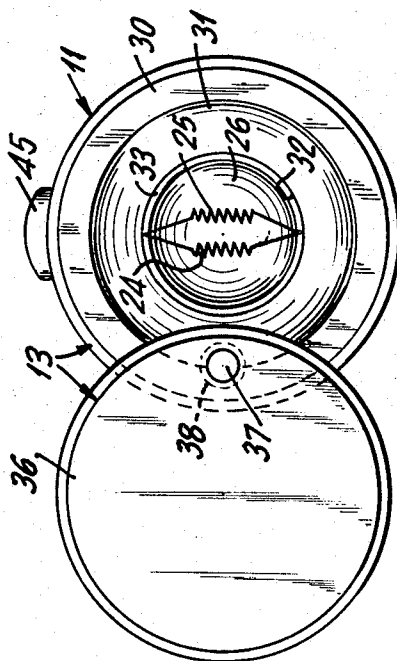


FIG. 2

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BATTERY POWERED CIGARETTE LIGHTER
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ABSTRACT OF THE DISCLOSURE

Pocket size electric cigarette lighters having a fine wire heating element drawing low wattage, and including a parabolic reflector for enhancing visibility of the heating element when energized by a battery.

This invention relates to electric cigarette lighters and, more particularly, to portable, pocket size, electric cigarette lighters.

An electric cigarette lighter of the type utilizing a heating element powered from a battery has several natural advantages over conventional cigarette lighters. The need for a wick, flint, ignition mechanism and leak proof container is eliminated resulting in a simple mechanical structure with a longer life expectancy. A flame is not required and therefore the electric lighter is safer and operates under windy conditions. Many designs for electric cigarette lighters have been proposed, and, in recent years, several commercial electric lighters have been developed.

The more recent electric cigarette lighters include one or more rechargeable batteries such as the nickel-cadmium batteries. The battery energizes a resistive heating element which, in the past, has required four to five watts at approximately three amps for a period of approximately five seconds in order to light a cigarette. With power requirements of this magnitude the prior commercially available electric lighters have been capable of lighting approximately 60 cigarettes (three packages) before requiring recharging.

It is an object of this invention to provide an improved electrical cigarette lighter with decreased power requirements so that the lighter can light approximately 200 cigarettes (a full carton of cigarettes) before requiring recharging.

It is another object to provide an electric cigarette lighter which is exceptionally compact and smaller than prior commercially available electric lighters.

It is another object to provide an electric cigarette lighter having a substantial apparent cigarette lighting capability when viewed by a potential customer.

It is another object to provide an electric cigarette lighter which minimizes the quantity of precious metals required in the construction.

It is another object to provide a standard electric cigarette lighter unit suitable for mass production which can be marketed with a variety of removable outer decorative casings.

It is still another object to provide a switch for an electric cigarette lighter which completes a low resistance circuit for the heater element and also secures a removable outer casing.

The foregoing and other objects of this invention will become apparent from the following detailed specification which sets forth an illustrative embodiment of the invention. The drawings form part of the specification wherein:

FIGURE 1 is a cross sectional view of an electric cigarette lighter in accordance with this invention;

FIGURE 2 is an end view of the same showing the heating elements; and

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FIGURE 3 is a view of the opposite end showing the battery charger connection terminals.

The electric cigarette lighter in accordance with this invention includes a rechargeable nickel-cadmium battery 10 as a power source. Preferably the battery is of the pen-lite size having a 600 milliamp capacity and a terminal voltage of approximately 1.25 to 1.40 volts. A cylindrical case 11 surrounds the battery and has an approximate outside diameter of $\frac{5}{8}$ inch. A heater sub-assembly 12 and a cover sub-assembly 13 are secured to one end of the case, and a sub-assembly 14 including contacts for connections to a battery charger 15 are secured at the other end. The overall length of the lighter, excluding the battery charger, is less than three inches.

The heater for lighting the cigarettes, included in the heater sub-assembly, is connected between a pair of terminal posts 20 and 21 which are mounted in, and pass through, a dielectric heater mounting block 22. The heater is made from platinum wire preferably including ten to twenty percent rhodium and commercially referred to as platinum 10-20. The diameter of the wire is between .003 and .006 inch, and is preferably between .004 and .005 inch, this being approximately one-half the diameter of heater wire used in prior commercial electric lighters. Platinum wire of this diameter, although relatively fine, can be produced commercially without difficulty. Platinum 10-20 is desirable since it does not oxidize or tarnish and since it has a relatively long life when heated periodically to temperatures of 1,800 to 2,200 degrees as is required for lighting cigarettes. Platinum 10-20 heater wires of this diameter have been found particularly desirable since the decreased diameter of the wire increases the resistance of the heater element and thereby reduces the heater power requirements. At the same time, the decreased mass of the heater element provides a more rapid temperature rise to the cigarette lighting temperature thereby improving the efficiency of the lighter by decreasing the time required to light a cigarette.

The heater consists of two coils 24 and 25 formed by winding the platinum wire around a suitable mandrel having a diameter between .010 inch and .012 inch. The coils are each approximately $\frac{1}{4}$ inch long and are connected in parallel between terminals 20 and 21. The spacing between the coils is approximately $\frac{1}{16}$ to $\frac{1}{8}$ inch. The heater coils provide higher temperatures than could be achieved by a straight wire heater since the infra red radiation of the individual turns of the coils radiate energy into adjacent coils to provide a better heat concentration and higher temperatures. The coils are quite small in order to achieve better mechanical strength and to obtain a more rapid temperature rise for the heater. Accordingly, it is preferable to use a pair of small coils rather than a single large coil. Having two coils has the added advantages of an interheating effect between the coils and improved reliability achieved by lighting the cigarette in two places. With a platinum 10-20 wire of approximately .0047 inch diameter wound into coils with the above indicated dimensions, the heater coils are found to each draw less than 1.2 amps so that the combined heater unit, including two such coils, consumes less than 3 watts.

The relatively small, fine wire coils provide the necessary heat for lighting a cigarette but, because of their smaller size, provide a lesser red glow and a somewhat deceptive appearance to a potential customer when comparing this lighter with other lighters having larger heating coils. To offset this deceptive appearance the center portion of heater mounting block 22 is provided with a concave, approximately parabolic, depression which is coated with a reflective material to form a small reflector

26 located behind the heating coils. Although the reflector surface can be silvered, a gold plated surface is preferable since it has better infrared reflecting characteristics. The gold plated reflector has been found to improve the efficiency of the heating coils by approximately ten percent.

Terminal posts 20 and 21 are made from nickel since nickel provides good electrical conductivity while at the same time providing relatively low thermal conductivity. Accordingly, the nickel terminals resist heat transfer away from the heating coils and thereby improve the heating efficiency. With the temperatures involved at the terminal posts, the heating coils leads could be soldered to the terminal posts. However, soldered connections tend to form heat sinks that dissipate heat from the heating elements, and therefore, spot welded connections are used.

Cover sub-assembly 13 includes a cigarette guide plate 30 having a central frusto-conical opening 31 extending from one surface which tends to funnel cigarettes into a communicating circular cigarette opening 32 which extends through the guide plate to the other side. Opening 32 is dimensioned to accommodate the end of the cigarette which is to be lit. Heating coils 24 and 25 are resiliently suspended within cigarette opening 32 and are positioned to engage the end of the cigarette when inserted in the opening. The resiliently suspended heating coils eliminate the need for a supporting structure that would otherwise tend to dissipate heat from the heating coils.

A mica washer 33 is mounted in an annular recess on one side of the cigarette guide plate and has an inside diameter somewhat less than the diameter of a cigarette to thereby partially close off the far end of the cigarette opening 32. The washer limits the travel of a cigarette when pushed into the cigarette opening and thereby prevents damage to the resiliently suspended heating coils. The leads of coils 24 and 25 pass through the central opening of washer 33 to resiliently position the heating coils within the cigarette opening. When a cigarette is inserted, it engages the heating coils before abutting against washer 33. Therefore, when the cigarette is in position for lighting, the heating coils are maintained in resilient contact with the end of the cigarette by means of the heater coil leads.

A circular cover 36 has a diameter approximately the same as the outer diameter of cigarette guide plate 30 and is used to cover the end of the guide plate to thereby close off the open end of the lighter when not in use. The cover pivots about a rivet 37 which is located near the edge of the cover and is secured in the cigarette guide plate. Thus, the cover can pivot from an open position as shown in FIGURE 2 to the closed position as shown in FIGURE 1. The cover is provided with an annular recess surrounding rivet 37 which accommodates a rubber "O" ring. The depth of the recess is slightly less than the thickness of the "O" ring to squeeze the "O" ring between the cover and the cigarette guide plate to provide a frictional holding force which maintains the cover in any selected position.

Terminal post 21 is connected directly to the center terminal 40 of the battery via a copper lead wire 41 and terminal post 20 is connectable to the casing of the battery via a switch 42. The circuit completed through the switch is a high current, low voltage circuit and, therefore, the switch must complete a very low resistance contact. Accordingly, the stationary contact 43 of the switch is made from a relatively wide copper strip coupled to terminal 20 at one end and bent to form a resilient contact portion that extends away from the heater mounting block. The associated movable contact 44 is similarly fashioned from a relatively wide copper strip and includes a contact portion which is generally parallel with the contact portion of the stationary contact 43. The movable contact is bent so that it extends toward and then parallel to the lighter casing, the portion extending along the casing being spot welded to provide electrical contact with

the casing. The other end of the contact portion is also bent to extend toward the casing with the free edge retained in a suitable groove of a push button 45. The contacts are preferably made from heat treated beryllium copper which provides flexibility and a low resistance surface. When the push button is depressed, movable contact 44 moves toward and engages stationary contact 43 to complete the electrical circuit from terminal 40 of the battery through terminal post 21, heating coils 24 and 25, terminal post 20, stationary contact 43, movable contact 44, casing 11 to the case of the battery. The relatively wide contacts 43 and 44 provide a relatively large, low resistance, contact area in the switch as is required for the low resistance contact.

Contact sub-assembly 14 includes a dielectric contact base 50 having therein a pair of apertures. Suitable copper contact lugs 51 and 52 are positioned surrounding the apertures at the inner end. Hollow copper rivets 53 and 54 are then passed through the apertures with the flanged ends remaining on the outside. The inner ends are thereafter flared to secure the rivets and the contact lugs to the contact base. Preferably, the flanged end of the rivet is recessed into the contact base as shown in FIGURE 1. Contact lug 52 is connected to terminal 40 of the battery via an insulated copper wire 55, and contact lug 51 is connected to the case of the battery via a copper strip 56.

The battery charger 15 can be of the type including a transformer having a primary winding connected to male contact extensions suitable for insertion into a wall receptacle. The secondary winding of the transformer is selected to provide a voltage suitable for charging battery 10. The secondary winding is connected in series with a rectifying diode and a pair of male contact extensions suitable for insertion through hollow rivets 53 and 54. Thus when the charger is inserted into the wall receptacle and into the contact end of the lighter, the battery charging circuit is completed and battery 10 is charged.

The case 11 for the cigarette lighter includes an inner cylindrical casing 60 and an outer removable covering 61. A pair of quarter round component spacers 62 and 63 are positioned diametrically opposite one another and curved to fit inside casing 60. Spacers 62 and 63 are deformed to provide inwardly extending, quarter round, projections 64 and 65 which provide shoulders 66-69. Contact block 50 is secured within one end of casing 60 abutting shoulders 66 and 67. The end of battery 10 is positioned abutting shoulders 68 and 69 with the width of projections 64 and 65 being selected to maintain the minimum necessary spacing between the battery and terminals 53 and 54.

Push button 45 has a cylindrical body portion which is rounded at one end and provided with an annular flange 70 at the other end. Inner casing 60 is provided with a suitably positioned aperture of a diameter sufficient to accommodate the body portion of push button 45. A similar aperture is provided in component spacer 62 with the edges bent inwardly to provide a stop surface engaging flange 70. Push button 45 is shown in FIGURE 1 in its outermost position. When depressed, the push button moves inwardly and urges movable contact 44 toward stationary contact 43.

The cigarette guide plate includes an annular skirt 71 which fits inside the end of casing 60 and is used to secure the cover sub-assembly to the casing. The annular skirt also acts as a spacer to maintain the proper spacing between heater mounting block 22 and cigarette guide plate 30 so that the heating coils are properly positioned within cigarette opening 32.

All of the components are mounted on inner casing 60 whereas outer covering 61 is removable and is used merely to provide a decorative exterior so that the lighter can be marketed in a variety of different styles and designs without affecting the production of the main assembly. The outer casing is cylindrical and is dimensioned to slide over inner casing 60. One end of the outer casing is

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bent inwardly to provide a flange 72 which overlies the circumferential edge of contact block 50. The covering is provided with an aperture positioned to accommodate push button 45. The push button is depressed as the outer casing is slid into position and is thereafter released to pass through the aperture in the outer covering when in its proper position.

While only one illustrative embodiment has been described in detail, it should be clear to those skilled in the art that there are numerous variations within the scope of this invention. The scope of the invention is more particularly defined in the appended claims.

What is claimed is:

1. An electric cigarette lighter comprising a case adapted to contain at least one battery cell, means secured to said case and defining a cigarette opening, a heating element formed of at least one fine wire helical coil, said heating element being disposed in said cigarette opening for contacting the ends of cigarettes and lighting the same when energized, an electrical switch mounted on said case, circuit means for interconnecting said battery cell, said switch and said heating element so that said heating coil is energized from said battery when said switch is actuated, said heating coil consisting of a fine wire element which, when energized by said battery, has the characteristics of consuming less than three watts, and a parabolic reflector visible through said cigarette opening and located closely behind said heating coil, said reflector enhancing the visibility of said coil when the latter is energized.

2. A cigarette lighter according to claim 1 wherein said reflector has a gold reflective surface.

3. A cigarette lighter according to claim 1 wherein said heating element comprises a multiturn coil made of platinum wire having a cross section diameter between 0.003 and 0.005 inch.

4. A cigarette lighter according to claim 1 wherein said

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coil is made of platinum wire having a cross section diameter of between 0.003 and 0.005 inch and wherein the diameter of each helical turn of said coil is between 0.010 and 0.012 inch.

5. A cigarette lighter according to claim 1 wherein said heating element is formed of a pair of fine wire helical coils connected in parallel.

6. A cigarette lighter according to claim 5 wherein each of said coils is made of platinum wire having a cross section diameter of between 0.003 and 0.005 inch and wherein the diameter of each helical turn of each coil is between 0.010 and 0.012 inch.

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