Nov. 8, 1960 L. E. FENN 2,959,663

HEATING ELEMENT FOR CIGAR LIGHTERS

Filed Nov. 12, 1952

Fig. 1

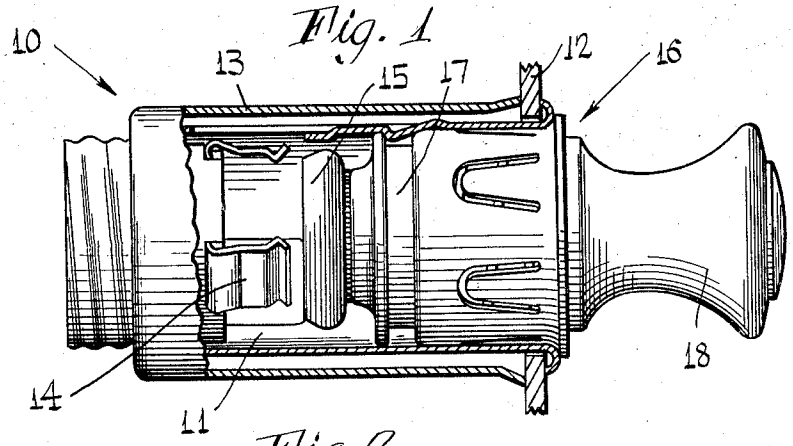

Fig. 2

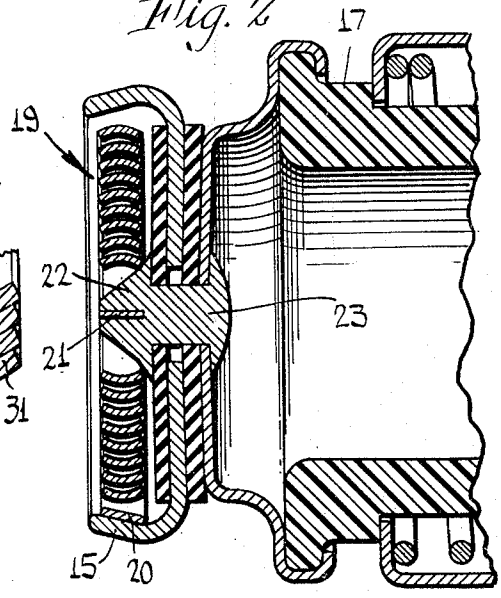

Fig. 7

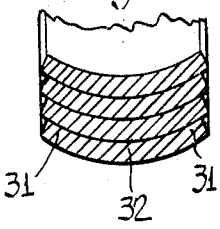

Fig. 8

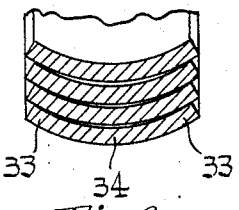

Fig. 9

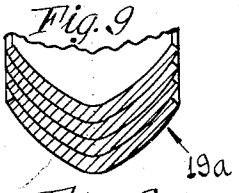

Fig. 3

Fig. 5

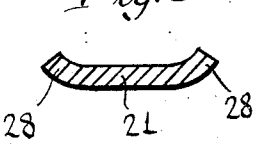

Fig. 6

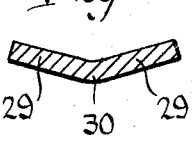

Fig. 4

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2,959,663

HEATING ELEMENT FOR CIGAR LIGHTERS

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10 Claims. (Cl. 219—32)

This invention relates to electric cigar lighters such as are used in automobiles, boats, aircraft and the like.

Where such lighters are produced for operation on twelve-volts potential the structure of the usual six-volt lighter is utilized, changing only the specifications and construction of the heating coil or wire to adapt it to twelve-volt use. The twelve-volt coil is made of thinner wire and has a greater strength, resulting in a greater number of turns. Due to the lack of mechanical strength inherent in this organization the coil is impregnated with a ceramic composition which, when it hardens, keeps the convolutions of the coil in place and prevents the coil from failing electrically due to physical displacement of its turns.

While such a twelve-volt coil has in general proved to be satisfactory in use, it is more expensive to produce than the six-volt coil consisting of a shorter length of heavier wire, since the latter has sufficient strength to be self-supporting in the heating element cup. Also, the twelve-volt, ceramic-supported coil does not retain a cherry-red heat as long as is desired, requiring re-energization if several lights are to be obtained.

The above disadvantages of lack of sturdiness and heat retention in twelve and higher-voltage coils have been overcome by the present invention, and an object of the invention is to provide an improved twelve and higher-voltage heating element coil of small, compact construction suitable for incorporation in standard-diameter heating element cups, which coil is mechanically sturdy enough for ordinary usage without the need of ceramic support even though it has more turns of a thinner wire.

Another object of the invention is to provide an improved heating element coil as above set forth, in which the retention of heat is materially increased, so that the coil maintains a cherry-red ignition temperature for a longer period, eliminating the necessity for re-energization if several lights are required.

I accomplish this by the provision of a novel coil structure which is characterized by the turns thereof engaging and being nested with each other, the wire or ribbon of the coil being formed transversely of its length so as to be substantially concave or hollow on one face and substantially convex or bulging on the other. Thus when the ribbon is wound into a spiral the convolutions will readily nest with each other and be mutually supporting. The complete spiral may be encased in the standard-diameter, shallow cup and the ends welded in the usual manner, and I have found that by so nesting the turns and allowing them to engage each other they will remain in a flat plane within the cup and will not be dislodged therefrom during use of the lighter.

The formation of the wire need not be perfectly curvilinear transversely of its length in order to effect the said nesting of the turns. For example, the wire may be given a channel-like cross section or a flat-V cross section or other shapes by which a nesting or mutually supporting structure is had. The touching of the turns is not electrically of serious consequence, since short-circuiting of the coil can be effectively prevented by an insulating oxide coating on the wire.

Another object of the invention is to provide an improved, small and compact, high voltage heating coil having adjacent turns contacting each other as set forth above, wherein effective electrical insulation of the turns is had throughout the life of the coil.

In accomplishing this I provide a thin aluminum coating on the wire and oxidize the coating by suitable heating of the coil. The oxidized aluminum provides an efficient and effective insulation which prevents short-circuiting of the adjacent contacting turns. I prefer to form the heating element by coiling the aluminum coated wire, prior to the oxidation of the aluminum, into a spiral shape, the wire being bent transversely of its length to enable a nesting of adjacent turns to be had. I then incorporate the spiral coil in the heating element cup and weld the ends of the wire to the cup and central stud thereof. After this has been done, I pass a heating current through the coil to cause the aluminum coating thereof to melt and oxidize, thereby to effectively insulate the coil convolutions from each other. Oxidation of the coil may be effected in other ways, as for example, by high frequency heating, as will be more fully brought out in following paragraphs.

Such a heating coil, made in accordance with this invention, is economical to fabricate, rugged and durable, effective for use in twelve and twenty-four volt lighters, and because of its concentrated metallic mass, retains a cherry-red temperature for a relatively long time.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a side elevational view of a cigar lighter made in accordance with the invention, a portion of the holding device being broken away to reveal the igniting unit.

Fig. 2 is an enlarged fragmentary axial sectional view of a cigar lighter igniting unit having a heating element made in accordance with the invention.

Figs. 3, 4, 5 and 6 are transverse sectional views of heating element wires made in accordance with the invention.

Figs. 7 and 8 are fragmentary axial sectional views of spiral heating coils, illustrating further modifications of the invention.

Fig. 9 is a fragmentary axial sectional view of a spiral heating coil illustrating another modification of the invention.

Referring to Figs. 1 and 2 the cigar lighter shown therein comprises a holding device 10 having a tubular body 11 secured to an instrument panel 12 by a screw sleeve 13. The holding device 10 has bimetallic fingers 14 constituting a clip for engagement with a shallow cup 15 of a removable igniting unit 16. The unit 16 comprises a plug-like body 17 having a knob 18 at its front end, the rear end of the body 17 carrying the cup 16. As seen in Fig. 2, within the cup 15 there is provided a spiral heating coil 19 having its outer end 20 welded to the cup and its inner end 21 welded to the head 22 of a rivet 23 which secures the cup 15 to the body 17.

In accordance with the present invention the heating element 19 is wound of a flat wire or a ribbon which is formed transversely of its length in such a manner that the convolutions of the coil will nest with each other and prevent misalignment of any turn or turns. The wire may be formed to have various shapes; in Fig. 2 the flat wire is curved transversely of its length to provide on one side a concave face 24, Fig. 3, and on the other side a convex face 25. The wire may be formed as in Fig. 4 wherein the edge portions 26 are bent to lie in a flat plane, the

intermediate portions being curved to provide concave and convex surfaces. In Fig. 5 the wire is shown as being roughly of channel shape, having a flat central portion 27 and angularly extended edge portions 28 formed to effect flanges of the channel. In Fig. 6 the heating coil wire is shown as having a flat V-shape in cross section, with angularly disposed planar portions 29 joined together by a bend 30 extending longitudinally along the center of the wire.

In Fig. 7 the heating coil wire is concavo-convex, but the side edge portions 31 have less thickness than the center portion 32. In Fig. 8 the wire is concavo-convex with the edge portions 33 thicker than the center portion 34.

In Fig. 9 a fragmentary section of a heating element 19*a* is shown, wherein the wire ribbon is formed transversely to provide a deeper hollow or groove than that shown in Figs. 2, 3, 7 and 8. By this construction a more effective mutual support of the coil convolutions is had.

In each of the above instances it will be seen that the formed wire may be wound into a spiral coil wherein the convolutions nest with each other, as shown in Figs. 2, 7 and 8, thereby locking each individual turn to its adjacent inner and outer end. I have found that the entire coil assembly when so made is sturdy and able to withstand the effects of continued usage without causing deformation of the turns and failure of the heating element. While I have shown a number of shapes of wire which will provide for a nesting or interlocking effect when wound into a spiral, it should be understood other shapes than those shown may also be utilized to obtain this result, and thereby come within the scope of the invention.

By virtue of the compactness of the coil, and because of its concentrated metallic mass it will retain a cherry-red heat longer than the previous coils in which the turns are spaced apart and provided with ceramic composition in the spaces to insulate and support the coil convolutions.

The shaping of the wire or ribbon may be readily accomplished by a high speed rolling operation whereby there would be no reduction in the rate of production of the wire. When the formed wire is made into a heating coil with the turns nested the presence of oxidation on the surface of the wire will prevent damage to the coil from short circuit when adjacent turns touch each other as shown in Figs. 7 and 8.

By the present invention I provide an effective oxide coating on the wire, which efficiently insulates the adjacent turns even though these touch each other. This coating is formed by depositing or otherwise applying aluminum in a thin layer to the outside of the wire and then heating the wire to cause the aluminum to become oxidized whereby it will act as an effective low-voltage insulator which will not deteriorate or be easily dislodged during the use of the coil.

In carrying out my invention, by which effective insulation of the turns of the coil is provided, several procedures or methods may be employed. The wire after being coated with the aluminum may be wound into a spiral shape, placed in the heating element cup, and the ends of the wire welded to the cup and the central stud thereof. With the turns nested in each other and in substantial engagament, the coil is energized by passing a heating current through it. This will cause the aluminum to melt and to be oxidized, effectively providing a desirable, low-voltage insulation between the adjacent turns. During the heating of the coil the melted aluminum will be retained and prevented from dropping out from between the coil convolutions by the transverse shaping of the wire and nesting of the convolutions, and by the engagement between adjacent convolutions. The melted aluminum will not flow appreciably, but instead will be quickly oxidized to provide an effective insulation.

My improved process may be advantageously utilized with all types of metals used for heating coils. Certain heating element alloys, for example, have aluminum in their composition, and when these alloys are heated sufficiently the exposed surface of the wire will be coated with aluminum oxide which provides a certain degree of insulation. One such alloy, known commercially as Kanthal D, consists of 3½% aluminum, 23% chromium, 2% cobalt and 71½% iron. If wire formed of this alloy is coated with aluminum and processed as above, the resultant oxide will provide an insulation superior to that obtained without the coating. Other alloys, such as nickel chrome, which are devoid of aluminum in their make-up, do not provide self-insulation when heated. Instead, the oxide formed on nickel chrome alloys is conducting and results in short-circuiting of the coil convolutions of the coil. However, regardless of the alloy used, the provision of a preliminary aluminum coating on the wire will result in a very effective insulation of the turns of the coil when the wire is properly heated and its surface oxidized.

Another procedure by which the aluminum coating on the wire may be advantageously oxidized is to coil the coated wire into a spiral, clamp the ends in suitable metal clamps and then subject the coil to high-frequency heating. The portion of the coil not clamped will become incandescent and the aluminum coating thereof will become thoroughly oxidized to provide an effective insulation. The clamped ends of the coil will not be heated enough to melt or oxidize the aluminum during this operation, by virtue of the clamps conducting the heat away rapidly. Upon completion of the induction heating, the clamps may be removed and the ends of the coil, which are not oxidized, may be welded to the heating element cup and central stud thereof.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. An igniting element for a cigar lighter comprising a spiral igniting coil having its convolutions closely spaced and engageable with each other, said coil being wound of metal ribbon having an integral insulating surface, said ribbon being curved transversely of its length to provide a concave face on one side of the ribbon and a convex face on the other side of the ribbon and the convolutions of the coil being nested with each other to effect a mutual support of said convolutions.

2. An igniting element for a cigar lighter comprising a spiral igniting coil having its convolutions closely spaced and engageable with each other, said coil being wound of metal ribbon having an integral insulating surface, said ribbon being bent transversely to form a shallow longitudinally-extending groove, thereby to provide a concave face on one side of the ribbon and a convex face on the other side of the ribbon and the convolutions of the coil being nested with each other to effect a mutual support of said convolutions.

3. An igniting element for a cigar lighter comprising a spiral igniting coil having its convolutions closely spaced and engageable with each other, said coil being wound of metal ribbon having an integral insulating surface, said ribbon being bent transversely to form longitudinally extending flanges on the side edges of the ribbon and the convolutions of the coil being nested with each other to effect a mutual support of said convolutions.

4. An igniting element for a cigar lighter comprising a flat shallow circular metal cup; a stud insulatedly secured to the center of the cup and extending into the cavity thereof; and a spiral igniting coil disposed in said cup about the stud and having its ends secured to the cup and stud, said coil being formed of metal ribbon having an integral insulating surface, said ribbon being shaped transversely of its length to provide a hollow

face on one side and a substantially rounded face on the other side and the convolutions of the coil being nested with each other to effect a mutual support of said convolutions.

5. An igniting element for a cigar lighter comprising a spiral igniting coil having its convolutions closely spaced and engageable with each other, said coil being wound of metal ribbon having an integral insulating surface, said ribbon being bent transversely of its length to provide a hollow face on one side of the ribbon and a bulging face on the other side of the ribbon and the convolutions of the coil being nested with each other to effect a mutual support of said convolutions, said coil being characterized by a compact, relatively dense metallic mass having a high degree of heat retention.

6. The invention as defined in claim 5 in which the convolutions of the coil are in engagement with each other, and in which the coil has a coating of aluminum oxide to provide for electrical insulation between the turns.

7. A cordless electric cigar lighter plug of the type adapted to be housed and heated in a socket and to be separated therefrom for use, a heating element comprising a spirally wound annulus of resistance ribbon of segmental tubular cross-section along at least a portion of its length, successive courses of said spiral being substantially in contact each with the next whereby said annulus resists deformation in an axial direction, said courses being insulated from each other at their points of contact solely by an insulating oxide formed on the surface of said ribbon, terminals for said heating element, one of said terminals comprising a metallic carrier on said plug connected to the outer end of said heating element.

8. The invention as defined in claim 7, wherein said carrier is a cup enclosing said heating element.

9. The invention as defined in claim 7, wherein said ribbon is substantially V-shaped in cross-section.

10. The invention as described in claim 7, wherein said ribbon is substantially arcuate in cross-section.

References Cited in the file of this patent

UNITED STATES PATENTS

515,280	Brown	Feb. 20, 1894
1,275,785	Stratton	Aug. 13, 1918
1,637,033	Basch	July 26, 1927
1,746,244	Diack	Feb. 11, 1930
1,946,434	Bach	Feb. 6, 1934
2,062,701	Cohen	Dec. 1, 1936
2,085,431	Johnston	June 29, 1937
2,088,949	Fekete	Aug. 3, 1937
2,157,050	Bilger et al.	May 2, 1939
2,269,394	Cuno et al.	Jan. 6, 1942
2,287,460	Wagenhals	June 23, 1942
2,596,325	Cerny	May 13, 1952
2,628,921	Weinrich	Feb. 17, 1953

OTHER REFERENCES

Woldman & Metzler, Engineering Alloys, 2nd edition, 1945, published by American Society for Metals; page 200.

Woldman; Engineering Alloys, 3rd edition, 1954; published by American Society for Metals, pages 238, 810.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,959,663 November 8, 1960

Lawrence E. Fenn

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 22, for "strength" read -- length --.

Signed and sealed this 25th day of April 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

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