Nov. 8, 1960 L. E. FENN 2,959,664

CIGAR LIGHTER HEATING ELEMENT

Filed June 8, 1956

Fig. 1

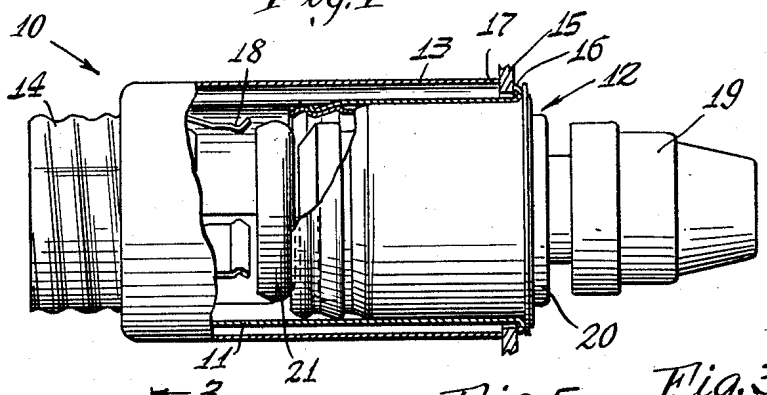


Fig. 2

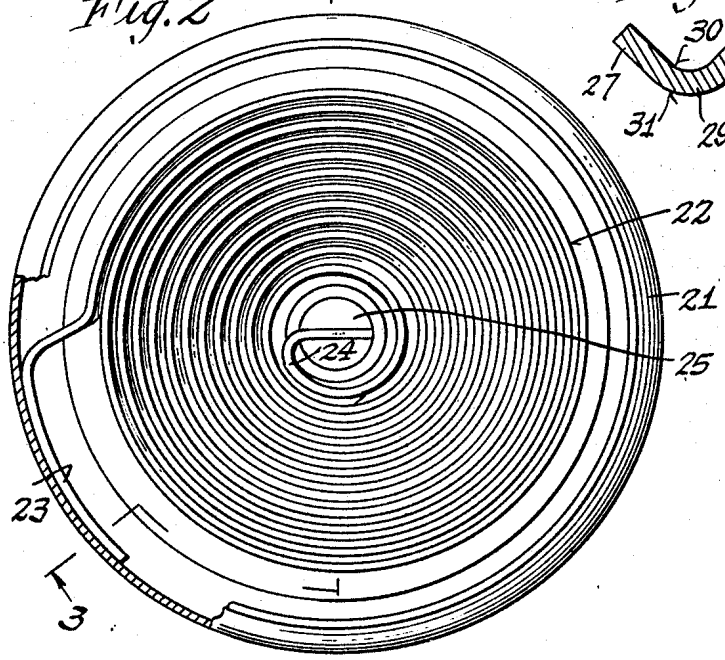


Fig. 5

Fig. 3

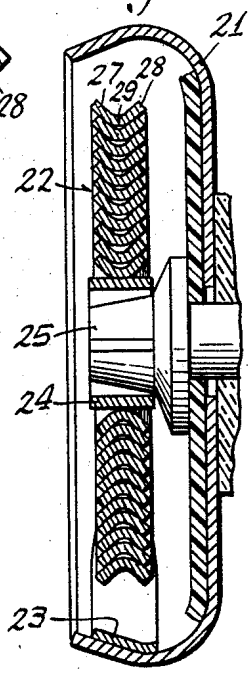
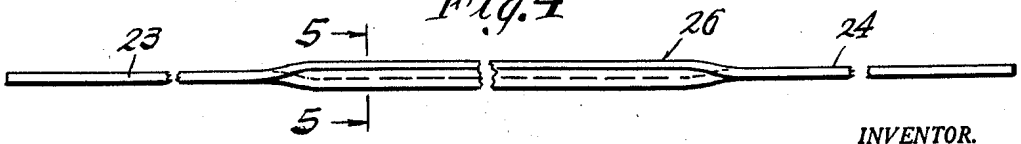


Fig. 4



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CIGAR LIGHTER HEATING ELEMENT

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3 Claims. (Cl. 219—32)

The present invention relates to an electric cigar lighter of the type having a removable plug, and more particularly to an improvement in the heating element of the plug, which is used when incandescent to ignite tobacco.

The present application discloses another embodiment of my invention described and claimed in my copending application, Serial No. 320,071, filed November 12, 1952.

In said application, there is disclosed a heating coil for a cigar lighter in which the heating element is made by spirally winding a length of resistance wire to form a flat coil. The wire, in its intermediate lengths, is shaped so that it has a formed cross-section. The wire is wound in a tight spiral so that one convolution of the spiral is partially nested within the adjacent convolution in order to provide for lateral support of the turns which prevents distortion of the coil from its original flat plane. In addition, the metal selected for the resistance wire is such as to form an integral surface oxide which provides the necessary insulation between touching convolutions and prevents shorting from one convolution to another.

In the manufacture of the heating element particularly since it is a mass produced item, automatic machines must be employed for both economy and efficiency. The cross-sectional shapes of the heating element disclosed in my copending application can be generically referred to as segmental tubular and each shape has what may be termed a convex side and a concave side. In that application, the wire was wound into a spiral with the convex side nearer the center of the spiral or stated differently, the convox side of a turn nested within the concave side of the next outward turn. Though such a coil is satisfactory, it has been found that a much improved coil would be formed if the concave side of the ribbon was nearer the center, that is, if the convex side of a turn nested within the concave side of the next inward turn. This improved coil produced a more uniform tightness with which the whole coil was wound and between the individual turns thereof with a resulting decrease in distortion during usage and an increase in the life of the coil. Moreover, the improved coil is more susceptible to manufacture by automatic machinery because the dimensions of the cross-section shape are not as critical which extends the number of ribbons which can be formed before the tools need replacing; the oxide forms on the coil more readily and with less human attention and the number of unsatisfactory or rejected coils is minimized.

It is an object of the present invention to provide an improved heating coil for a cigar lighter in which the above advantages are obtained and which is more susceptible for manufacture on automatic machinery.

It is a further object of the present invention to provide a heating coil in which the tendency of the coil to distort during usage is minimized and as a consequence, a much longer life thereof is obtained.

Another object of the instant invention is to provide a heating coil of the spiral type in which the convolutions of the spiral have an inherent tendency to nest together tightly and thereby provide a more substantial interlock for maintaining the coil in a flat plane.

Still another object of this invention is to provide a cigar lighter heating coil which utilizes an integral oxide on the surface of the ribbon for insulation and in which the oxide may be more quickly formed and with a minimum of human attention.

Other features and advantages will hereinafter appear.

In the accompanying drawing:

Fig. 1 illustrates a cigar lighter in which the present improvement may be incorporated.

Fig. 2 is an elevation of the heating coil as assembled in the cigar lighter plug.

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

Fig. 4 is a view of the formed ribbon prior to winding.

Fig. 5 is a section taken on the line 5—5 of Fig. 4.

Referring to Fig. 1, there is shown a cigar lighter, generally indicated by the reference numeral **10**, which includes a holding device or tubular socket **11** and a removable igniting plug **12**. A screw sleeve **13** encircles the socket **11** and has a threaded portion **14** which is screwed onto an end of the socket **11**. In the instant embodiment shown, the cigar lighter **10** is adapted to be mounted in an opening in an instrument panel **15** of an automobile. Accordingly, the adjacent portions of the opening are located between an annular flange **16** of the socket **11** and an end **17** of the sleeve **13** so that as the sleeve **13** is screwed on the socket **11**, the instrument panel is clamped between the elements **16** and **17**. The socket **11** is provided with a plurality of bimetallic contact fingers **18** which constitute a latch for holding the plug in energizing position until the igniting temperature of the heating coil is obtained.

The removable plug **12** has a manually graspable knob **19** attached on one end of a body **20** and on the other end a heating cup **21** is mounted.

As seen in Fig. 2, within the heating cup **21** there is provided a spiral heating coil **22** formed from a resistance ribbon with an outer end **23** attached to the interior periphery of the cup, as by welding, and with an inner end **24** clamped in the head of a split rivet **25**. The rivet **25** also secures the cup **21** to the body **20**.

In accordance with the present invention, the heating coil **22** is wound from a flat resistance wire or ribbon which has a formed cross-sectional intermediate portion so that the adjacent convolutions of the coil can nest within each other and prevent axial deformation of any turn or turns. The cross-sectional form of the wire may be of various shapes but it is essential that one side be convex or projecting, and the other side be concave or recessed. The shape of each side must be substantially similar so that the convex side of one convolution can partially nest within the concave side of a succeeding convolution. Thus, an arcuate shape, a V shape, a somewhat channel shape and an undulating shape or a combination thereof will serve to fulfill the above requirements.

According to the specific embodiment illustrated, the ribbon **26** has flat end portions **23** and **24** and its intermediate portion has a cross section in the shape of a V with an arcuate apex. Thus there are two straight leg portions **27** and **28** (see Fig. 5) and a curved apex portion **29**. The ribbon is made from material which forms an insulating oxide when heated. To form the heating coil illustrated in Figs. 2 and 3, the inner end **24** is clasped in a chuck and the chuck is revolved while holding the ribbon to cause a tight coil to be formed. The chuck revolves and the ribbon is placed therein so that bight portion **29** is located nearer the center of the spiral while the legs **27** and **28** point outward or toward the periphery of the cup. Thus, the convex or projecting

side of the cross-sectional shape is wound to be nearer the center of the coil while the concave or recessed side is wound to be farther away from the center of the coil in a single convolution. The concave side is indicated by the reference numeral **30** while numeral **31** indicates the convex side.

While it is not completely understood why winding this ribbon in such a manner provides novel and improved heating coils as compared to prior heating coils utilizing a formed heating ribbon, it is believed that the following explanation will aid in understanding the principles involved.

When a ribbon having a V cross-section for example, is wound either in an arc or a spiral, the side of one turn of the ribbon furthest from the center of the arc tends to be placed under tension while the side nearer the center of the arc is placed under a compressive force. This effect results because the radius at which the outer side is bent is larger than the radius at which the inner side is bent and accordingly for the same angular arc, the outer side has to be longer than the inner side. But since the length of both the outer and the inner sides are equal prior to winding, the outer side has to stretch or lengthen and the inner side contract or else one side remains the same length with a corresponding increase in the change of length of the other side. When the ribbon shown in Figs. 4 and 5 is wound, the apex or bight portion **29** is placed under a compressive force while the straight leg portions are placed under a tensional force. However, the mass of material constituting the apex is such as to resist the compression force and not substantially contract which necessitates that the straight leg portions **27** and **28** be placed under a greater tensional force. This stretches or elongates the legs **27** and **28** with the result that they come toward each other to decrease the angular opening therebetween. Accordingly, as one convolution is wound on an adjacent turn, the convex side of the former fits against the concave side of the latter and the legs of the latter come together to somewhat grasp the nested convex side thereby creating a greater interlock and a larger area of contact between the adjacent surfaces of the convolutions. During the winding operation, a restraining force is applied to the unwound part of the ribbon to cause the spiral to be wound tight.

After the coil has been wound and fixed in the heating cup **21**, it is preferably energized with a lower voltage than is customarily employed in normal usage in order to cause the initial formation of an insulating oxide on the surface of the ribbon. This voltage and its consequent elevation in temperature of the ribbon causes an expansion in the length of the ribbon with a resulting movement between the turns in addition to a distortion tending to cause the convolutions of the coil to move axially of each other. Thus, the oxide when being formed is apt to, and actually does, become rubbed off in spots by the movement creating a short-circuit condition at the spots which requires a person to inspect each coil and eliminate the condition by poking the turns to separate them. However, in the embodiment comprising the instant invention, because of the tendency of the coils to nest within each other, there is less tendency to distort and since there is more area of one convolution in contact with the adjacent convolution, the effect of the rubbing action is minimized with a consequent lessening of the short-circuited spot conditions. Thus the coil, as presently formed with its convex side nearer the center of the spiral, is capable of being manufactured on automatic machines with substantially the elimination of short-circuited conditions occurring in the coil during its oxide forming operation. This reduces the cost of manufacture and in addition decreases the number of unsuitable coils or rejects.

From the foregoing, there has been disclosed an improved heating coil for a cigar lighter which has a longer life expectancy than was heretofore possible, and which has less tendency to distort since each turn has an inherent tendency to cause interlocking engagement with an adjacent turn. In addition, the coil of the present invention is capable of being manufactured by automatic machinery with more uniformity, producing a coil that is more tightly wound; in which the angular formation of the formed cross-section of the ribbon is less critical resulting in a longer life of the cross-section forming tool, thus substantially reducing repair time; and which may be more cheaply manufactured by reason of the reduction in the number of rejects and the decrease in labor required.

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. In an electrical 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 having a formed cross-section along at least a portion of its length shaped to provide a convex side and a concave side, successive convolutions of said spiral being nested in each with the next whereby said annulus resists deformation in an axial direction, said convolutions being insulated from each other at their points of contact solely by an insulating oxide formed on the surface of said ribbon, said ribbon being wound so that the convex side of each convolution is disposed nearer the center of the spiral than the concave side and terminals for said heating element, one of said terminals comprising a metallic carrier connected to the outer end of said heating element.

2. The invention as defined in claim 1 in which the cross-section of the ribbon is substantially V-shaped and in which the apex of the V in each convolution is directed toward the center of the spiral.

3. In an electrical 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 having a formed cross-section along at least a portion of its length shaped to provide a convex side and a concave side, successive convolutions of said spiral being nested in each with the next whereby said annulus resists deformation in an axial direction, said convolutions being insulated from each other at their points of contact solely by an insulating oxide formed on the surface of said ribbon, said ribbon being wound so that the convex side of an outer convolution nests against the concave side of an adjacent inner convolution.

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