May 1, 1934. G. SPERTI 1,956,599

LAMP

Filed Feb. 13, 1932

Fig. 1.

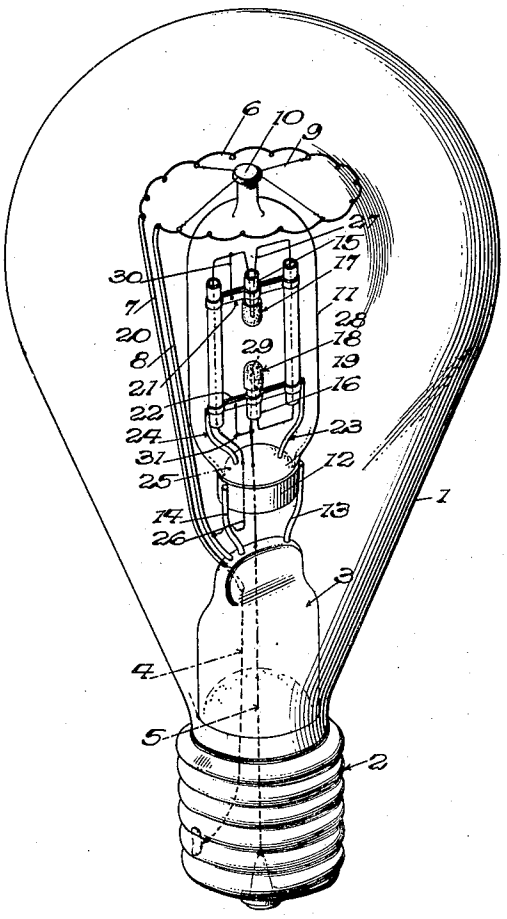
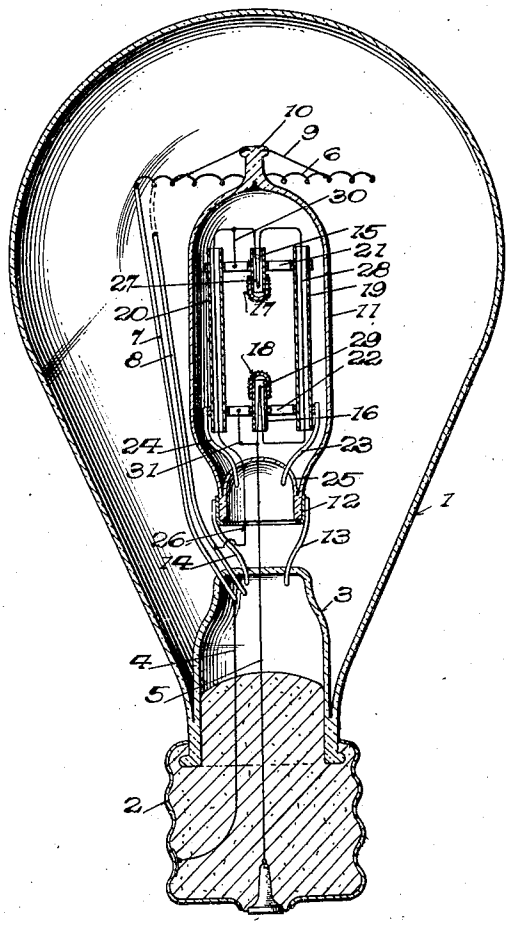


Fig. 2.



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Patented May 1, 1934 1,956,599

UNITED STATES PATENT OFFICE

1,956,599

LAMP

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Application February 13, 1932, Serial No. 592,745

7 Claims. (Cl. 176—126)

This invention relates to arc electrodes for use in lamps of the type combining a source of visible radiation and an arc constituting a source of ultra-violet radiation, or for use in any arc lamp.

In the prior application of George Sperti, Serial No. 572,394, filed October 31, 1931, there is disclosed a lamp embodying an outer bulb containing the usual or any suitable incandescent filament which provides a source of visible radiation and an inner bulb in which an arc is established to provide a source of ultra-violet radiation. The resultant spectrum of such a lamp is that of an incandescent filament such as tungsten having superimposed thereon the radiation of an arc in some ionized gas or vapor, for example, the mercury arc which is rich in the blue end of the visible spectrum and also in the short wave region of the ultra-violet spectrum that is valuable for therapeutic purposes. By separately enclosing the incandescent filament and the arc, the two sources are rendered independent of one another and can be operated under optimum conditions, so that the lamp can be operated at normal house lighting voltages and currents as in the case of the ordinary incandescent lamp. With such uses in view, the lamp is entirely self-contained and the arc is self-starting without the use of devices external to the lamp.

The present invention relates primarily to the ultra-violet arc element of a lamp of this type, although generally applicable to other types of arc lamps either with or without the incandescent filament. As described in the aforesaid application, the arc is established between spaced electrodes in an atmosphere of ionized gas such as neon, argon, etc., or of ionized vapor such as mercury, or of both, and in order to render it self-starting, the electrodes are preferably heated by filaments connected in the lamp circuit and also connected across the electrodes so as to provide a suitable potential drop therebetween. Due to the heat given off by the filaments, together with the use of oxides such as zirconium, strontium and barium in the electrodes, the gas or vapor in the arc chamber quickly ionizes and the arc strikes between the electrodes.

This arrangement necessitates spaced electrodes in the arc chamber, heating filaments preferably one for each electrode, means for supporting the electrodes and connections from the electrodes and filaments to external sources of supply. Where the electrodes are separately mounted, precision is required during assembly of the lamp in the relative location and spacing of the electrodes; in most cases the electrodes have been separately supported and where they have been mounted end to end the supporting means have been sealed in the arc chamber at opposite ends, requiring a duplication of the sealing operations. Moreover, it is desirable that filaments and wires within the arc chamber be enclosed in order to prevent the arc striking to them which requires special provision unless the conductors to the filaments and electrodes are led out of the arc chamber separately.

One of the objects of the present invention is to provide a novel electrode unit embodying a pair of electrodes assembled with supporting means into a unitary electrode element and mounted in the arc chamber by common supporting means.

Another object is to provide a novel electrode element wherein the supporting means which carry the electrodes are designed to provide insulated passages for the various conductors to the electrodes and heating filaments.

A further object is to provide a novel electrode element embodying spaced electrodes of any suitable type rigidly assembled on a common supporting means which can be mounted from one end only of the arc chamber and can be installed as a unit with the electrodes in definitely spaced positions.

Another object is to provide a novel electrode unit which can be assembled outside the lamp and installed as a unit, and which is small, light, inexpensive, and easy to manufacture, assemble, and install.

One embodiment of the invention has been illustrated in the accompanying drawing, but it is to be expressely understood that said drawing is for purposes of illustration only and is not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawing,

Fig. 1 is a perspective view of a complete lamp embodying the invention; and

Fig. 2 is a sectional view of the lamp shown in Fig. 1.

Referring now to the drawing, which illustrates for purposes of example a lamp of the type disclosed in the aforesaid application, the bulb 1 may be of any suitable type, size and shape and is mounted in the usual or any suitable base 2 which as shown is of the conventional screw type. The bulb 1 may be of any suitable material which transmits the desired ultra-violet radiations, such as quartz glass or any other ultra-violet

transmitting glass, and is preferably filled with an inert gas such as nitrogen at a pressure near atmospheric. Sealed in the neck of the bulb 1 is a stem or standard 3 which constitutes the usual means for supporting elements within the lamp and for introducing the usual conductors 4 and 5 therein. An incandescent filament 6, preferably of tungsten, is supported in the bulb 1 by means of supporting wires 7 and 8 that are fused in the stem 3, the supporting wire 7 constituting a connection between one end of the filament 6 and the conductor 4. Said filament may also be supported by one or more wires 9 fused in a bead 10 formed on the upper end of an inner bulb or arc chamber 11, which is supported within the outer bulb 1 by means of a band 12 and supports 13 and 14 which are fused in the stem 3. The inner bulb 11 may also be of any suitable material which transmits ultar-violet radiations, such as quartz glass or any of the known ultra-violet transmitting glasses, and contains a quantity of ionizable material such as mercury, neon, argon, etc. Where it is desired to prevent radiation from the lamp of wave lengths shorter than predetermined limits, the bulb 11 may be of material having filtering characteristics such as the glass known as corex. It will be understood, however, that the lamp thus far described constitutes no part of the present invention and is shown merely to illustrate the application of the invention to a practical form of lamp.

Mounted within the inner bulb 11 is a pair of electrodes of any suitable type which as above stated are preferably heated by suitable filaments. In the lamp illustrated, the heating filaments for the electrodes are connected in series with the incandescent filament 6, and the potential drop across the heating filaments is impressed across the electrodes in accordance with the lamp disclosed in the aforesaid patent application although it will be understood that the present invention is not limited to this particular lamp circuit. The electrodes may be of any suitable type and as shown comprise tubes 15 and 16 of suitable material such as nickel, the ends of the tubes being covered with caps 17 and 18 of material such as tungsten or zirconium oxide which constitutes a good arcing surface. The particular electrodes here shown are disclosed and claimed in the prior application of George Sperti, Serial No. 588,747, filed January 25, 1932, the tubes 15 and 16 being preferably coated with one or more oxides which have high electronic emission when heated.

The electrodes 15 and 16, or a pair of electrodes of any other suitable type, are assembled in accordance with the present invention on a support which constitutes a unitary electrode element to be installed and supported in the inner bulb 11 as a unit. Referring particularly to Fig. 2, tubes or sleeves 19 and 20 of suitable insulating material such as magnesium oxide or the like are disposed in parallel spaced relation and constitute a means for supporting the electrodes 15 and 16 between them. Preferably the electrodes are connected by metal bands or straps 21 and 22, these straps being passed around the tubes 19 and 20 and electrodes 15 and 16 and being crimped together between these elements. It will accordingly be seen that the insulating tubes 19 and 20 and the straps 21 and 22 comprise a rigid supporting frame in which the electrodes 15 and 16 are mounted in definitely spaced and related positions. This framework can be mounted in the inner bulb 11 in any suitable manner, and in the form shown, supporting wires 23 and 24 are welded to the lower band or strap 22 and are fused in a stem 25 that is sealed in the neck of the inner bulb 11.

The hollow insulating tubes 19 and 20 also serve as a means for leading the necessary conductors to the heating filaments and electrodes without exposing them to the arc. As shown, the supporting wire 8 which is connected to one end of the filament 6 is also connected by a wire 26 with a heating filament 27 positioned within the electrode 15. As shown in Fig. 2, wire 26 is sealed in the stem 25 and then passes through the insulating tube 20 to the filament 27. The other end of the filament 27 is connected by a wire 28 with a filament 29 within the electrode 16, the wire 28 passing through the insulating tube 19. The other end of filament 29 is connected to the conductor 5. Filaments 27 and 29 are insulated from the electrodes in any suitable manner as by coating them with suitable insulating cement. As stated above, the potential drop through the filaments 27 and 29 is impressed across the electrodes 15 and 16 and to this end the wire 26 is connected by a wire 30 with the supporting band or strap 21, while the conductor 5 is connected by a wire 31 with the supporting band or strap 22.

When current is supplied to the lamp, it passes through a series circuit comprising the conductor 4, supporting wire 7, filament 6, supporting wire 8, wire 26, filament 27, wire 28, filament 29 and conductor 5. The filament 6 heats up and provides a source of visible radiation. The filaments 27 and 29 heat the electrodes 15 and 16 and the atmosphere within the arc chamber 11 rapidly becomes ionized due to the heat from the filaments and to electronic emission from the oxide coatings on the electrodes. Since an arc voltage is impressed across the electrodes by means of the wires 30 and 31, the arc strikes between the electrodes as soon as the atmosphere becomes ionized. Most of the current now flows through the arc, and the filaments 27 and 29 cool off.

It will be seen that the arc tends to establish itself between the caps 17 and 18 and since the wires 26 and 28 are substantially completely enclosed in the insulating tubes 19 and 20 the arc cannot strike directly to these wires except at their exposed ends which are protected by the fact that the arc current passes between the electrodes themselves whereas the exposed ends of the wires are further apart. This enclosure of the conductors is made possible by the novel form of the electrode element which includes the spaced insulating tubes acting as a supporting means for the electrodes. Owing to the assembly of the electrodes and insulating tubes in a unitary rigid element, the electrodes can be mounted in the inner bulb by the simple operations of sealing the supporting wires 23 and 24 and the conductors 5 and 26 in the stem 25 and then sealing the stem in the neck of the bulb 11. In this way the electrodes are mounted in definitely spaced relationship before they are placed in the lamp. The entire element is simple and inexpensive and can be manufactured readily in large quantities from readily obtainable materials.

It will be understood that invention is not limited to the form described and illustrated in the drawing and that various changes may be made in the form, details of construction and arrangement of the parts without departing from the spirit of the invention. For example, the

electrodes themselves may be of any suitable type and shape, being mounted in the supporting frame in a manner similar to that described above. The lamp circuit may also be varied as desired, and it will be understood that the invention may be applied to arc lamps with or without the incandescent filament. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. An electrode element for use in electric arc lamps comprising spaced tubes of insulating material, connections between said tubes to constitute a rigid frame, and electrodes mounted on said frame in spaced and insulated relation, said tubes, connections and electrodes all lying in substantially the same plane.

2. An electrode element for use in electric arc lamps comprising a pair of tubes disposed in spaced parallel relation, a pair of straps connecting said tubes to constitute therewith a rigid frame, and an electrode carried by each of said straps whereby said electrodes are maintained in spaced insulated relation between said tubes, said tubes being of insulating material.

3. An electrode element for use in electric arc lamps comprising a pair of tubes of insulating material disposed in spaced parallel relation, straps connecting said tubes at their ends and comprising metal bands crimped around said tubes, electrodes carried by said straps and arranged in spaced relation between said tubes, said straps being crimped around said electrodes and constituting supporting means and also means for supplying current to said electrodes.

4. An electrode element for use in electric arc lamps comprising spaced parallel members of insulating material, electrodes positioned between and substantially coplanar with said members, and means for assembling said members and electrodes as a rigid element comprising straps each connecting said members and carrying an electrode, said straps being crimped around said members and electrodes.

5. An electrode element comprising spaced parallel members of insulating material, straps connecting said members to constitute a substantially rectangular framework, and electrodes carried by said straps in spaced relation between said members, said members, straps and electrodes all lying in substantially the same plane.

6. An electrode element comprising spaced parallel members of insulating material, straps connecting said members to constitute a substantially rectangular framework, and electrodes carried by said straps in spaced relation between said members, said straps being of metal and each having electrical contact with one only of said electrodes.

7. An electrode element comprising spaced parallel members of insulating material, a pair of straps connecting said members to constitute a substantially rectangular framework, and an electrode carried by each of said straps whereby said electrodes are maintained in spaced relation between said members, said members being hollow and constituting insulating conduits for electrode conductors, and all of said members, straps and electrodes lying in substantially the same plane.

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