

July 20, 1943.

L. L. STOFFEL

2,324,961

RESISTOR

Original Filed May 24, 1940

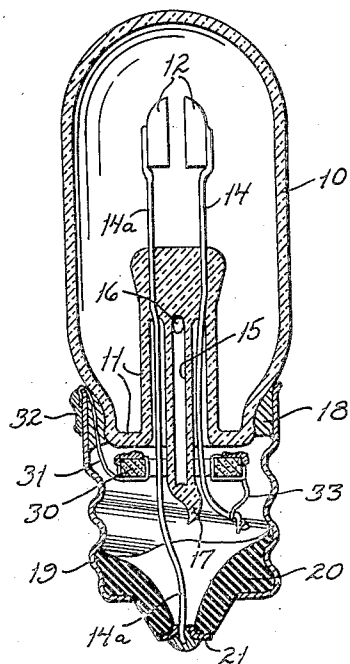


FIG. 1

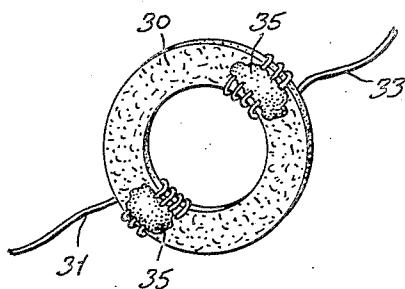


FIG. 2

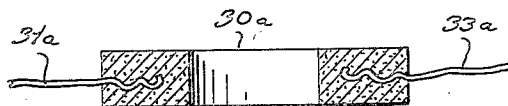


FIG. 3

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2,324,961

RESISTOR

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Original application May 24, 1940, Serial No. 337,005. Divided and this application December 11, 1941, Serial No. 422,553

3 Claims. (Cl. 201—75)

This invention relates to a resistor suitable for mounting within the base of an electric lamp. The present application is a division of my co-pending application, Serial No. 337,005, filed May 24, 1940, Patent No. 2,285,875, June 9, 1942, claiming an electric lamp assembly including the resistor of this application.

Certain types of electric lamps are provided with filaments or electrodes, the current requirements of which are such that it is preferable to use a resistor in the filament or electrode circuit to permit the use of the lamp in standard power supply systems. In some instances, external resistors have been used, or a plurality of lamps have been connected in a series. Either of these methods are disadvantageous. Neither assures protection of the lamp. If the external resistor is omitted or removed and/or a lamp having no resistor is connected with the power line, such lamp may be seriously damaged.

The object of the invention is to provide a resistor which may be readily mounted within the base of the lamp below the bulb and surrounded by the base shell and may be held in position without special clamping or holding devices. Another object is to secure the electric terminals to the resistor in a manner which will effect a good electric contact between the terminals and resistor and will also provide for a proper mechanical support for the resistor.

The invention is hereinafter more fully described in connection with the drawing showing the resistor in place in a lamp assembly and also showing two different methods of connecting the terminals to the resistor.

In the drawing, Fig. 1 is an axial section through an electric lamp having my resistor incorporated therein; Fig. 2 is a perspective view on an enlarged scale of one form of my improved resistor unit; Fig. 3 is a cross section of another form of such unit.

I will first describe the lamp assembly employing the resistor, as shown in Fig. 1. For the most part, the lamp illustrated is typical of the standard lamp construction now in general use.

As shown, the lamp comprises tubular glass envelope 10, into the base of which a glass header insert 11 or electrode supporting element extends. A pair of electrodes 12 are shown as being secured to the top of lead wires 14 and 14a which extend through and are carried by the header insert. The header is tubular as shown in Fig. 1 and is provided with a downwardly extending glass exhaust tube 15. This tube is axially aligned with the envelope 10 and extends some

distance below the bottom of the header and envelope. The upper end of the exhaust tube 15 is in communication, as by a passageway 16, with the interior of the envelope. This enables the exhausting of the air from the envelope and the formation of a partial vacuum therein. After the vacuum has been formed in the envelope, the lower end of the exhaust tube 15 is closed, as indicated at 17.

Secured to the envelope 10, as by cement 18, and enclosing the exhaust tube is a metallic base 19. The lower end of the base is closed by insulating compound 20 in which is set an axially positioned metal contactor 21. The lead wire 14a extends from the header through the contactor 21 and is secured thereto as by soldering. In standard lamp constructions the other lead wire 14 is secured directly to the base shell 19 as by soldering. Thus, the shell itself acts as a second contactor. The size of the lamps vary from miniature lamps, the base and envelope of which may be about one quarter of an inch in diameter and the length of which may be about one inch, to lamps many times this size.

The present invention is concerned with an annular resistor as 30, placed within the base shell and in series with one of the lead wires and its contactor. For instance, the lead wire 14 and the metallic base shell.

As the invention is contemplated for use with miniature lamps, it is highly desirable that the resistor be so shaped as to occupy as little space as possible, and thus enable a compact assembly. Likewise, it is desirable that the resistor be so constructed as to facilitate its attachment to the envelope and header structure in such a manner as to enable the positioning and cementing in place of the lamp base with little or no danger of displacement of the resistor and thereby eliminating the need for insulation to protect the resistor against short circuiting.

To the above ends, the resistor preferably is formed as a ring or annulus having an outer diameter which is less than the inner diameter of the base shell and an inner diameter greater than the outer diameter of the exhaust tube. When so constructed, the resistor may be positioned in contact with the glass header insert 11 and encircling the exhaust tube 15, as shown in Fig. 1. The lead wire 14 is then extended between the tube and the resistor and is secured to the resistor, as will hereinafter be more fully described. The other lead wire 14a may be passed between the resistor and the exhaust tube and extended directly to the contactor 21 in the base. The

base may then be cemented to the shell in the usual manner with a resistor terminal wire 31 extending through the cement between the shell and the envelope. The terminal wire 31 is then secured to the shell as indicated at 32.

It is desirable that the resistor have a relatively long life span. I have found that a carbon or carbon composition resistor is most suitable for this purpose as such type of resistors have a life span of some thirty thousand hours as compared with a one thousand hour life span of other types of resistors, such for example, as coated paper and the like.

The use of a carbon resistor presents a serious problem, in that it is extremely difficult to attach terminals or lead wires thereto in an economical manner and yet so as to insure an efficient electrical bond. The ordinary methods of attaching lead wires to resistors include perforation of the resistor, the securing of a metallic eyelet thereto and subsequently soldering the lead wire to the eyelet. Because of the fragility of the carbon material, however, this method cannot be used. The carbon, of course, cannot be perforated by a punching operation, but even were it drilled, an eyelet could not be secured in the perforation, either economically or in a manner as to provide a suitable electrical bond between the eyelet and the resistor. Likewise, such methods entail considerable danger of breaking or cracking the resistor and thus rendering it useless. Other methods of attaching the leads or terminals to the resistor have been tried, but have been found to be either equally as damaging to the resistor.

The present invention includes an economical method of fastening the terminals or lead wires to the resistor, in a manner which will make both a good electric connection between the lead wire and the resistor and such a firm attachment as will enable the lead wire to hold the resistor in place in the lamp. To this end the terminals comprise wires 31 and 33 which may be wrapped tightly around the resistor as shown in Fig. 2 and attached thereto by a cement 35, which not only securely fastens the wires to the resistor, but which also acts as an electrical conductor and thereby insures an electrical bond between the resistor and the terminal wires.

A cement which has been found to be suitable for the purpose of securing the conductors to the annular carbon ring, as shown in Fig. 2, comprises a mixture of water soluble thermo-setting resin, and flake graphite. These materials are thoroughly mixed by a pebble-tumbling operation. The operation is preferably continuous to retain the material in suspension for a period of about sixteen hours. I have found that a mixture in the proportion of from one hundred and fifty (150) to four hundred (400) parts of flake

graphite, to six hundred (600) parts of resin provides a satisfactory cement. The preferred proportion, however, is two hundred and twenty-four (224) parts of graphite to six hundred (600) parts of resin.

In using the above cement, a paste is made thereof using a suitable liquid such as water, alcohol or acetone for a carrier. The paste is brushed on the wires as indicated at 35 in the drawing, and is then air dried and subsequently baked at a temperature of about three hundred and twenty-five degrees Fahrenheit (325° F.), for about twenty (20) minutes. The baking operation insures an efficient bond between the cement and the carbon as it drives all moisture out of both the resistor and the cement. The resistor may then be secured in place in the lamp assembly as heretofore described, thus providing an economical lamp assembly.

In Fig. 3, I have shown a modification wherein the terminal wires, here designated 31a and 33a, instead of being wrapped around the annular resistor, as in the case of the wires 31 and 33 in Fig. 3, are now embedded in the resistor 30a. This resistor 30a is of the same material and has substantially the same dimensions as the resistor 30, but the conductors are embedded in it so as to provide an effective electrical contact therewith. The embedding may be made at the time of manufacture of the annular resistor, or radial holes from the outside may be made into the carbonaceous resistor and the conductors thereafter inserted and secured by conductive cement.

I claim:

1. A resistor for a lamp assembly, comprising a ring formed of carbonaceous material, a pair of terminals comprising wires wrapped around said ring in substantially diametrically opposed regions, and means electrically securing said terminal wires to said resistor, comprising a cement consisting of a mixture of resin and graphite substantially in the proportions of six hundred parts of resin and one hundred and fifty to four hundred parts of graphite.

2. A resistor for a lamp assembly comprising a ring formed of a carbonaceous material, a pair of terminals each comprising a wire wrapped around the ring radially and spaced from the other wire, and spaced cementitious means electrically securing respective terminal wires to said ring.

3. A resistor for a lamp assembly comprising a ring formed of a carbonaceous material, a pair of terminal wires wrapped around said ring in substantially diametrically opposed regions and a cementitious means electrically securing each terminal wire to said resistor.

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