Dec. 31, 1946. A. L. PEACOCK 2,413,650

GLOW DISCHARGE LAMP

Filed June 8, 1945

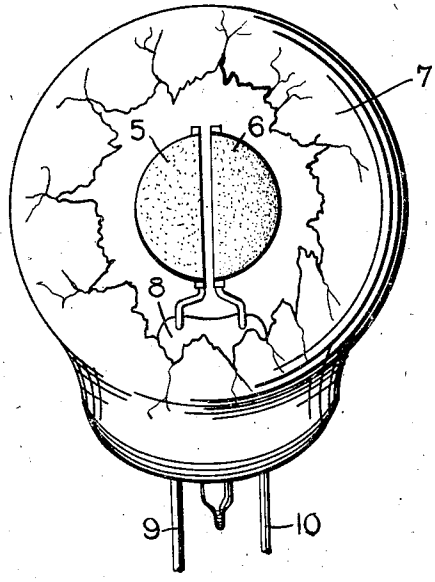


FIG. 1

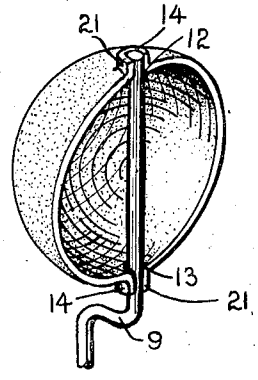


FIG. 2

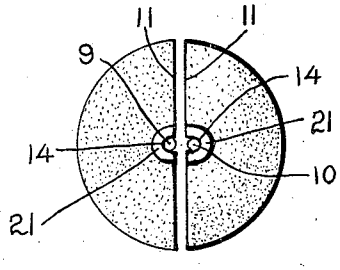


FIG. 4

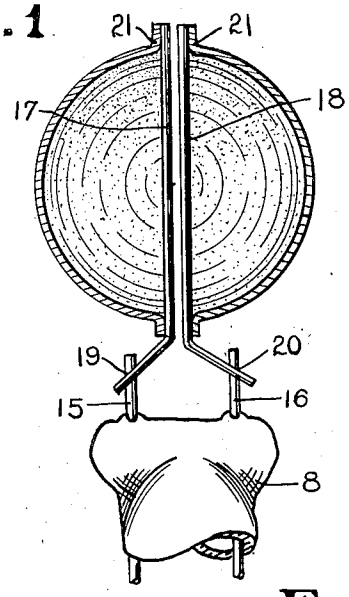


FIG. 3

ARNOLD L. PEACOCK *INVENTOR.*

BY Lawrence Brooks

ATTORNEY

Patented Dec. 31, 1946

2,413,650

UNITED STATES PATENT OFFICE

2,413,650

GLOW DISCHARGE LAMP

Arnold L. Peacock, Danvers, Mass., assignor to Sylvania Electric Products Inc., Salem, Mass., a corporation of Massachusetts

Application June 8, 1945, Serial No. 598,342

1 Claim. (Cl. 176—122)

1

This invention relates to electronic discharge type lamps and particularly to the smaller low power glow type lamps.

It has been found that in the operation of lamps of the type herein disclosed a tendency exists for cathode sputtering to cause discoloration of the lamp bulb walls. It is an object of the invention to provide a glow lamp in which lamp discoloration is reduced to a minimum.

A further object of the invention is to provide a glow lamp in which the cathodes conform to a geometrically regular structure similar to that of its enclosing bulb.

A further object of the invention is to provide a glow lamp in which the light is emitted therefrom uniformly in all directions.

A further object of the invention is to provide a glow lamp in which the electrodes are rigidly held in closely spaced relation each forming substantially one-half of a regular geometric figure whose external surface is uninterrupted.

Other objects and features will more fully appear from the following description and will be particularly pointed out in the claim.

The broad aspects of the invention are embodied in a glow lamp having a pair of electrodes rigidly mounted within a transparent envelope. The electrodes are composed of hollow hemispherical elements juxtaposed and having their peripheral edges adjacent each other and spaced a short distance apart. In this manner the two electrodes present a substantially complete and symmetrical hollow sphere.

A pair of lead wires extend into the envelope and act as supports for the electrodes which desirably have an emissive coating applied to them in the conventional manner.

To present a better understanding of the invention a particular embodiment thereof will now be described and illustrated in the accompanying drawing in which:

Figure 1 is a general view of a lamp embodying the invention;

Figure 2 is a perspective view of one of the electrode elements detached from the lamp;

Figure 3 is a cross sectional view through the assembled electrodes; and

Figure 4 is a plan view of the electrodes.

In the development of glow lamps of the type herein disclosed the structure of the cathodes thereof has much to do with the efficiency and long life of the lamp. The cathodes 5 and 6 of the present invention combine the benefits of high efficiency and attractiveness. The cathodes are enclosed in a glass envelope 7 which is provided with a stem portion 8. A pair of lead wires 9 and 10 extend through and are sealed into the stem portion with their inner ends projecting into the envelope. The outer ends of the lead wires may desirably be secured to a suitable base member not shown.

2

The cathodes 5 and 6 are hollow hemispheres of equal size drawn from sheet metal such as nickel or other suitable material and are held in position with their peripheral edges 11 in juxtaposed relation and spaced a slight distance apart whereby the two cathodes form a hollow sphere whose contour is interrupted only by the slight separation between the cathodes.

The electrodes are supported upon the lead wires 9 and 10 to the upper ends of which they are fastened preferably by welding. The upper ends of the wires extend diametrically across the concave face of the electrodes and are welded at their points of contact with the peripheral edges 11 as at 12 and 13. The lead wires are received in notches 14 in the cathode to permit the wires to extend into the cathodes sufficiently to insure that no part of the wire will extend outward beyond the plane of the peripheral edge of the cathode. By so securing the cathodes to the lead wires the cathodes may be closely spaced without causing the lead wires to engage each other or interfere with the proper operation of the device.

To create a rigid and efficient connection between the cathode and lead wires it has been found of advantage to reinforce the points of connection between the cathodes and their supports. A desirable means of doing this is to form semi-cylindrical ears 21, desirably struck from the metal of the cathodes and within which the wires are received.

Desirably the inner ends of the lead wires are bent outwardly to facilitate the welding operation after which the electrodes are properly positioned by bending the lead wires between the stem of the lamp and the cathodes into the general shape shown in the drawing.

The lead wires may be in one piece as shown in Figures 1 and 2 or they may be made as shown in Figure 3, wherein the portion of the wires extending inward from the stem 8 are short as at 15 and 16. In this construction the cathodes are secured to short sections of lead wire 17 and 18 the bottom ends of which are bent outwardly to cross the wires 15 and 16 to which they are welded at 19 and 20.

Before the electrodes 5 and 6 are assembled into their final position desirably their inner surfaces are coated with a gettering agent such as

a suspension of powdered zirconium while their outer surface is coated with a suitable activating agent such as barium dioxide. The latter coating may be applied before the final assembly and adjustment of the electrodes upon the stem or thereafter.

If desired, a suitable fluorescent coating may be applied in the conventional manner to the inner surface of the envelope 7 after which the stem is assembled to the envelope.

The lamp is then placed in a radio frequency field to heat its elements sufficiently to break down the coating into oxide thus preparing the electrodes for their proper function.

During the heating operation the lamp is exhausted after which a low pressure of inert gas may be admitted to the envelope in the usual manner after which it is sealed off and a suitable base applied thereto.

As above stated the phenomenon of sputtering with consequent discoloration of the lamp bulb has been a serious limiting factor in the life and efficiency of such lamps. In the present invention discoloration is reduced to a minimum by reason of the spherical shape of the cathodes which present no sharp edges extending toward the wall of its envelope. It has been found that the greatest source of discoloration of the lamp is from sputtering which takes place from sharply defined edges such as the unbeaded edge of a sheet metal element within the lamp. However, if such edge or edges are turned away from or if the plane of the margin forming the sharp edge extends parallel or concentric to the wall of the lamp envelope, sputtering if it occurs, will deposite a minimum of particles upon the envelope wall.

By constructing the electrodes according to the invention discoloration is greatly reduced without resorting to beading the edges of the electrodes or constructing electrodes having abrupt surface contour changes. Irregular contour forms have been used prior to the present invention chiefly to obtain added mechanical strength. For many reasons the use of electrodes having abrupt contour changes have proved to be inefficient in operation and cause trouble in manufacture. In the present invention special shapes for mechanical reasons are not required because the relatively rigid lead wires are welded to the electrodes at opposite points along their edges and the welding is facilitated and reinforced by the use of the ears 21.

In the present invention the shape of the electrodes is chosen to best function electronically and to reduce discoloration of the lamp while their mechanical rigidity is taken care of by the novel manner of supporting the electrodes.

Distinct advantages arise from the use of true hemispherical form for the electrodes in addition

to those above pointed out. When spray coating the exterior of the electrodes their symmetrical shape insures that the coating will be evenly applied. When irregular shaped cathodes are used such as those having flanges, grooves or ridges, the coating material tends to accumulate upon certain areas more than upon others especially at the junction, between main areas thereof and flanges, ridges or grooves. The present invention eliminates this trouble. Moreover, during the spray coating the edges of the cathodes may be pressed into contact thus preventing the material from reaching the inner surfaces thereof. The cathodes are thus properly separated.

The spherical form of electrode of the present invention presents no abrupt changes in contour thus promoting uniform cathode breakdown by radio frequency induction heating. The uniform surface insures even heat distribution as compared to uneven heat induced in irregular shaped electrodes caused by non-uniform flux paths.

The ears 21 provide a convenient means for handling the cathodes to prevent contamination of or injury to their surfaces either before or after coating and before they are welded to their supports.

The cathode structure of the invention also improves the starting characteristics of the lamp. The relatively sharp oppositely disposed peripheral edges of cathodes present a minimum impedance to the applied starting voltage since the starting discharge takes place in a straight line between the said edges. This starting characteristic is further improved by the presence of burrs at the cathode edges caused by the die which formed the cathodes. This improved starting feature insures consistent and positive starting of all lamps. Moreover the starting ability of the lamps is further improved by the close spacing of the cathodes permitted by the special method of securing the cathodes to the lead wires as above described.

What I claim is:

A negative glow type discharge lamp comprising an envelope of substantially spherical form, a stem sealed in said envelope, a pair of lead-in-wires sealed in said stem and extending into said envelope, a pair of hollow hemispherical electrodes mounted on said lead-in-wires with their concave faces adjacent each other but spaced a short distance apart whereby said electrodes define a spherical body substantially concentric with the envelope in which they are enclosed, each of said lead-in-wires extending across the concave faces of said electrodes, and a sleeve-like reinforcing member disposed at two points on opposite peripheral edges of each of said electrodes within which said lead-in-wires are received.

ARNOLD L. PEACOCK.