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SEAL STEM FOR ELECTRIC DISCHARGE DEVICES

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This invention relates to electric discharge devices and more particularly to the arrangement of the electrodes and stem construction in such devices.

In electric discharge devices, e. g., gaseous discharge devices, such as metal vapor lamps, it is customary to seal the lead-in conductors for the electrodes in stems that extend into the discharge envelope; however, this type of construction has certain disadvantages, among which is the fact that the length of the discharge path is substantially reduced resulting in an appreciable portion at each end of the envelope from which no radiations are emitted, thereby decreasing the efficiency of output for a given length of envelope. Devices that have been constructed heretofore with the aim of avoiding such disadvantages have met with still other objections, such as increasing the resistance to arc formation and darkening of the inner walls of the envelope.

It is accordingly an object of the invention to provide an improved discharge device of the type having inwardly extending stems, in which the discharge path for a given length of envelope is increased. More specifically an object of the invention is the provision of a discharge device of said type having increased output efficiency for a given envelope length, wherein resistance to arc formation and darkening of the inner walls of the envelope are substantially reduced. Further objects and various advantages of the invention will appear from the following detailed description taken in connection with the accompanying drawing in which:

Figure 1 is a view shown largely diagrammatic and partly in section of a discharge device constructed in accordance with the invention, and Figure 2 is a sectional view taken on the line 2-2 of Figure 1.

Referring now to the drawing in detail, the lamp illustrated therein is a metal vapor discharge device which may be designed for generating ultra-violet ray transmissive substances, or it may be designed to convert ultra-violet into visible radiations through excitation of a fluorescent coating on the interior of an envelope of glass or the like. For starting and supporting the discharge, the device is usually filled with rare gas and contains a small quantity of mercury or other vaporizable metal. Each end of the tubular envelope 5 is closed by a stem 6 having a base section 7 and seal section 8 in which are sealed the lead-in wires 9 for the electrode 10, usually formed of a coiled coil of an

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oxide coated filament. The lead-in wires 9 pass through an endcap 11 on the envelope 5 where they may be connected into an energizing circuit.

In order to lengthen the discharge path of the device, the lead-in wires 9 are bent back along the stem 8 so that they will carry the electrodes 10 in a position close to the base section 7 rather than positioning the electrodes in the customary way i. e. inwardly of the seal section 8. This arrangement for the electrodes provides a discharge that extends into the end portions of the envelope whereby light is emitted from substantially the full length of the envelope. This arrangement, however, also materially reduces the space in the end portions of the envelope in which the arc must form requiring a high starting voltage. Furthermore merely bending of the lead-in wires back toward the end wall of the envelope will result in locating the electrodes close to the radiating walls of the envelope where they will cause blackening of the envelope due to sputtering of the electron-emitting material from the electrode. This blackening of the wall of the envelope may be somewhat decreased by providing a sputtering protector or shield 12 between the electrode and the wall of the envelope.

According to the invention I am able to employ a low starting voltage and to reduce blackening of the envelope by positioning the seal stem eccentrically in the tubular envelope rather than positioning it along the axis of the envelope as has been the practice heretofore. Preferably the seal stem is spaced from the axis of the envelope to an extent which will permit locating of the electrode on said axis. Satisfactory results are had, however, where the distance between one side of the seal stem and the wall of the envelope is at least about 30% greater than the distance from the opposite side of the stem to the wall of the envelope.

This new arrangement for the seal stem is more clearly shown in Figure 1, the lower space between the stem and the wall of the envelope being substantially greater than the space above the stem, whereby an arc will form in the larger space and will require a lower starting voltage. Also, in the form shown in Figure 1 the center of electrode is located on the axis of the tube in which position it is removed as far as possible from the walls of the envelope.

It is desirable that a lamp constructed according to the invention be adapted for use with conventional sockets. This is made possible in the illustrated embodiment by bending the lead-in

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connectors 9 as shown at 13 and connecting them to terminal pins 14 which are located symmetrically around the center of the end cap in their customary positions.

The lead-in conductors 9 are preferably positioned away from the center of the discharge path between the electrodes by bending the conductors away from the stem 6 near their ends that support the electrodes 10, as is shown at 15 in Figure 1 of the drawing. This feature of construction is of especial importance when a single lead-in conductor is used to carry current to the electrode, since a single electrode that is straight will lie in the line of the discharge path and will thereby disturb the arc formed between the electrodes. Interference of the discharge arc by the lead-in conductors may further be reduced by insulating the conductors with a coating of insulating material or by enclosing them in a tube 16 of glass or the like.

While I have described the invention more specifically with reference to a mercury or other metal vapor lamp, which may be a low pressure lamp, e. g. a germicidal or fluorescent lamp, or a high pressure lamp, it will be noted that the invention is equally applicable to other types of electric discharge device having a gaseous or metal vapor filling, or both.

The foregoing disclosure is to be regarded as descriptive and illustrative only and not as restrictive or limitative of the invention, of which obviously an embodiment may be constructed including many modifications without departing from the general scope herein indicated and denoted in the appended claims.

What I claim is:

1. An electric discharge device comprising an envelope of vitreous material containing at least two spaced apart electrodes, a filling of an ionizable medium, a stem of vitreous material extending eccentrically into said envelope, at least one lead-in conductor sealed in said stem, one end of said conductor passing outside of said envelope, and the other end of said conductor being bent back along said stem where it supports one of said electrodes.

2. An electric discharge device comprising a tubular envelope of vitreous material sealed at its ends and containing an ionizable medium, an electrode and a lead-in conductor in each of said ends, a stem of vitreous material integral with one of said ends and extending inwardly and eccentrically of said envelope and substantially parallel with the axis thereof, one of said conductors being sealed in said stem and being bent back along said stem to carry one of said electrodes in the larger of the spaces provided by the eccentricity of said stem.

3. An electric discharge device according to claim 2 wherein a sputtering protector is provided between said one electrode and the inner wall of said envelope extending the full length of and closely adjacent the electrode.

4. An electric discharge device comprising a

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tubular envelope of vitreous material sealed at its ends and containing an ionizable medium and at least two electrodes, a stem of vitreous material in each end of said envelope and integral therewith, at least one lead-in conductor sealed in each of said stems and being bent back where it supports an electrode, said stems being eccentrically disposed in said envelope to provide a space along the axis of said tubular envelope for accommodating said electrode.

5. An electric discharge device according to claim 4 and including a cap on each end of said envelope, at least two lead-in conductors for each of said electrodes, terminal pins symmetrically arranged on said caps, said lead-in conductors being bent for connecting to said terminal pins.

6. An electric discharge device comprising a tubular envelope of vitreous material sealed at its ends and containing an ionizable medium, a stem of vitreous material in at least one end of said envelope and integral therewith, at least one lead-in conductor sealed in said stem and having one end thereof located within said envelope and its other end located outside said envelope, an electrode carried by the inner end of said conductor, said conductor being bent to position said electrode between the ends of said stem, said stem being eccentrically disposed in said envelope to provide a space for accommodating said electrode.

7. An electric discharge device according to claim 6 wherein the inner end of said conductor is electrically insulated.

8. In a stem for an electric discharge device, a circular base portion and a seal portion of vitreous material, a lead-in conductor sealed in said seal portion and passing therethrough, one end of said conductor extending out beyond said base portion where it is adapted to be connected into an electric circuit, said seal portion being integral with said base portion and substantially parallel to but extends in its entirety in eccentric relationship with the axis of said base portion.

9. In a stem for an electric discharge device a circular base portion and a seal portion of vitreous material, a lead-in conductor sealed in said seal portion and passing therethrough, one end of said conductor passing through said base portion, said seal portion being integral with, substantially perpendicular and extending in its entirety in eccentric relationship to said base portion.

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