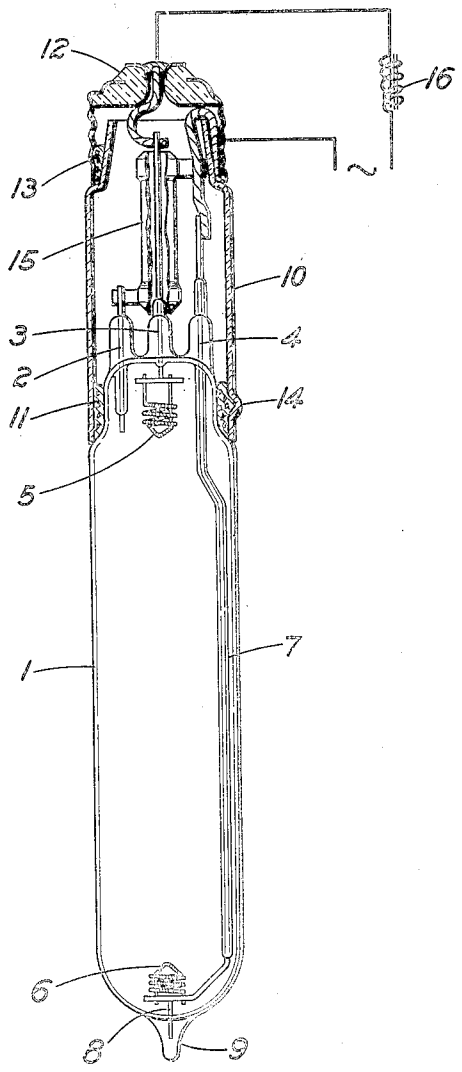
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ELECTRIC GASEOUS DISCHARGE DEVICE

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ELECTRIC GASEOUS DISCHARGE DEVICE

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The present invention relates to electric gaseous discharge devices, and particularly to lamps and the like operating at a relatively high temperature.

A particular object of the invention is to provide a novel means to prevent uneven cooling of a high intensity vapor arc lamp of the type which operates with an unsaturated vapor pressure. Another object of my invention is to provide a novel means of attaching a base to a lamp operating at a high temperature. A further object of the invention is to reduce the heat lost from the lamp to its supporting base. Another object of the invention is to minimize the operating temperature of the base. Another object of the invention is to house a resistance which is connected to said device. Still other objects and advantages of the invention will appear from the accompanying detailed specification or from an inspection of the accompanying drawing.

The invention consists in the new and novel combination of parts, as hereinafter set forth and claimed.

For the satisfactory operation of the recently introduced high intensity mercury vapor arc lamps it is essential that every point of the lamp envelope should be maintained during operation at such a temperature that none of the mercury within the lamp can condense thereon. In the past it has been customary to entirely enclose these lamps within a heat insulating jacket in order to help keep all parts of the lamp at the desired elevated temperature. This structure has proved to be highly successful in extended commercial use. In some cases, however, as in the case of relatively low wattage lamps, it is desirable to simplify this structure, both to reduce the cost and the bulk of the lamp by omitting this jacket. It has been found that when the jacket is thus omitted the ends of the lamp, behind the electrodes, are the points which tend to operate at the lowest temperature, and that special precautions must be observed to prevent mercury condensation at these points. This condensation is moreover increased if an attempt is made to attach a base directly to one end of the lamp, due to the large thermal losses to such a base. Moreover, these large heat losses cause the socket to operate at an undesired high temperature. Hence to the problem of preventing condensation is added the problem of providing suitable connecting and supporting means for the lamp. I have now discovered that both of these problems are solved by a novel structure of my invention. According to this novel construction one end of the lamp is provided with a heat insulating dead air space by means of a tubular glass or ceramic sleeve which is suitably cemented to said lamp at one end while the other end of said sleeve has a conventional screw base attached thereto in the usual manner. Said sleeve, which can be of Pyrex or other suitable heat resisting glass or ceramic material, is of considerable length and has relatively thin walls whereby the heat flow therealong is kept extremely small, so that condensation of the mercury is prevented at this end of the envelope. In practice this sleeve is preferably made opaque or translucent so as to conceal the electrical connections which pass therethrough, as well as the resistance for the starting electrode which is conveniently housed therein.

The opposite end of the envelope is kept at the desired high temperature in my novel structure by means of a wire which is connected to the adjacent electrode at one end and which is fused into the end of said envelope. By fusing this wire into the envelope the long lead to which this electrode is attached is given a rigid support which is vitally needed in order to avoid damage in transit and in handling. I have furthermore discovered that by positioning this wire in the tubulation of the lamp it can be fused therein at the same time the envelope is sealed off, whereby no new fusion step, with its hazard of strains, is required in order to anchor this wire.

For the purpose of illustrating my invention I have shown in the accompanying drawing a high intensity mercury vapor arc lamp which embodies a preferred form thereof.

As shown in this drawing the lamp has a tubular sealed envelope 1 of suitable heat resisting glass or the like. This envelope, in a lamp which is designed for operation with an input of 250 watts, has a diameter of approximately 1⅛ inches and is about 5⅛ inches long, measured over the hemispherical ends. Three inleads 2, 3 and 4 of molybdenum, tungsten or the like are sealed through the upper end of the envelope 1. The inlead 2 has a short portion thereof exposed within said envelope which serves as an auxiliary starting anode. The inlead 3, which is preferably centrally located carries on its inner end a cathode 5 which as here shown is of the type disclosed in my Patent 2,009,211, granted July 23, 1935, although other types of thermionic electrodes may be used if desired. The inlead 4 extends within said envelope 1 close to the wall to the opposite end thereof, where it supports a cathode 6 of the same type as the cathode 5.

Said inlead 4 is enclosed within a suitable sleeve 7 from the seal to a point close to the cathode 6. These cathodes 5 and 6 are separated by a distance of approximately 4⅛ inches. A wire 8, of tungsten or the like, has one end welded to the inlead 4 adjacent the cathode 6, while the other end thereof is fused into the envelope 1 at the seal-off tip 9 at the same time the envelope 1 is sealed-off. Said envelope contains a carefully measured quantity of mercury, of the order of 40 mg. in the 250 watt size, in addition to a filling of argon at a pressure of the order of 7 mm. of mercury.

The end of the envelope 1 through which the inleads are sealed is preferably slightly reduced in diameter so that a sleeve 10 of substantially the same diameter as said envelope can be slipped thereover and cemented in place by the basing cement 11. Said sleeve, which preferably consists of opaque or translucent Pyrex or other suitable heat resisting glass or ceramic material, is relatively thin walled, and is approximately 2½ inches long. The end thereof away from said lamp is reduced in diameter so that it will fit within an ordinary screw base 12, to which it is attached by the basing cement 13. The cement used at 11 is preferably of a heat resisting type, such as a mixture of asbestos, aluminum sulphate and zirconium silicate, while that used at 13 is conveniently the same although the conventional basing cements ordinarily used in the industry can be used for the latter, if desired. The sleeve 10 preferably has a plurality of bosses 14 blown therein at the larger end thereof to aid the cement 11 in holding said sleeve and envelope 1 together. The tip of the base 12 is connected to the inlead 3, while the sleeve of said base is connected to the inlead 4, and also through a resistor 15 to the inlead 2. Said resistor, which has a resistance of the order of 5000 ohms, is tubular and is conveniently mounted about the inlead 3.

In the operation of this lamp in series with a suitable ballast 16 on a line having a potential of the order of 110 volts A. C. a discharge immediately starts between the auxiliary anode 2 and the cathode 5 upon application of the potential. This discharge results in the ionization of the gaseous atmosphere and in the resultant initiation of the main discharge between the electrodes 5 and 6. As the lamp heats up the arc current decreases and the arc voltage increases until at equilibrium, that is, after all the mercury has evaporated, the arc drop is 70 volts and the current is 3.9 amperes with the structure given hereinbefore, the energy input then being 250 watts. Under these conditions the base 12 operates at a temperature of 140° C. or less under normal conditions, and at the same time there is no evidence of mercury condensation at either end of the lamp envelope 1, or at any other point within said envelope. The tolerance to changes in ambient temperature may moreover be greatly increased by enclosing this lamp within an enclosure which will shield it from drafts and reduce the air flow thereover, and such an enclosure is recommended for general use. The luminous efficiency of this lamp is 35 lumens per watt.

A novel feature of this lamp is that it can be operated in any desired position, instead of with the arc only vertical, as in the unsaturated vapor high intensity mercury vapor arc lamps heretofore introduced. This is due to the somewhat smaller quantity of mercury introduced within the lamp, whereby the operating pressure of the mercury is reduced, although the lamp still operates with unsaturated vapor.

While I have described my invention by reference to a specific embodiment thereof it is to be understood that it is not limited thereto, but that various omissions, substitutions and changes, within the scope of the appended claims, may be made therein without departing from the spirit of my invention.

I claim as my invention:—

1. An electric gaseous discharge device comprising a tubular sealed envelope having a vaporizable material therein, a plurality of inleads sealed into one end of said envelope and supporting electrodes therein, a non-metallic sleeve cemented to said end of said envelope and enclosing said inleads, and a base cemented to said sleeve and connected to said inleads, said sleeve serving to minimize the heat transfer from said envelope to said base and to provide a dead air space about said inleads whereby the adjacent end of said lamp is protected from drafts to maintain it at a temperature sufficient to prevent condensation of said material thereon.

2. An electric gaseous discharge device comprising a tubular sealed envelope having a vaporizable material therein in sufficiently small quantity to be wholly vaporized, a pair of inleads sealed into one end of said envelope, one of said inleads supporting an electrode at a point adjacent said end of said envelope, the other of said inleads being insulated and extending to the opposite end of said envelope where it supports a thermionic cathode, a seal-off tip on the end of said envelope adjacent said cathode, said tip being further removed from the path between said electrodes than the remainder of said envelope whereby it tends to be the coolest spot on said envelope during operation of said device, and a wire extending from said cathode support and fused into said tip, to rigidly suport said cathode and to heat said tip to prevent condensation of said vaporizable material in said tip.

3. An electric gaseous discharge device comprising a tubular sealed envelope having a vaporizable material therein in sufficiently small quantity to be wholly vaporized, a pair of inleads sealed into said envelope at one end thereof, one of said inleads supporting an electrode at a point adjacent the seal, the other of said inleads being insulated and supporting a thermionic cathode adjacent the other end of said envelope, a seal-off tip on the end of said envelope adjacent said cathode, said tip being further removed from the path between said electrodes than the remainder of said envelope whereby it tends to be the coolest spot on said envelope during operation of said device, a wire connected to said cathode and fused into said tip to rigidly support said cathode and to heat the end of said envelope to prevent condensation of said vaporizable material in said tip, and a non-metallic sleeve cemented to the opposite end of said envelope to reduce the escape of heat therefrom, whereby the adjacent end of said lamp is protected from drafts to maintain it at a temperature sufficient to prevent condensation of said material thereon, said sleeve enclosing said inleads and having a base cemented to the end thereof, said base being connected to said inleads.

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