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ARC DISCHARGE LAMP
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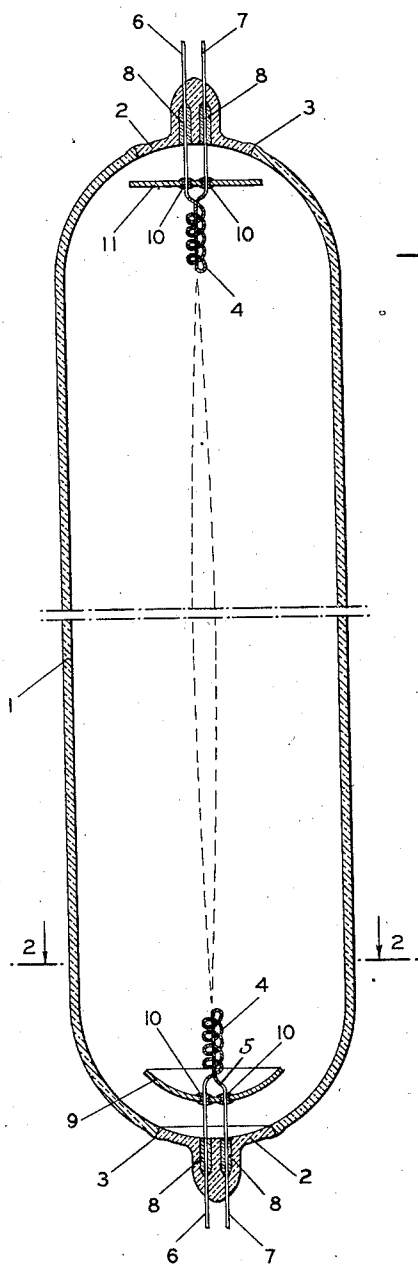


Fig. 1.

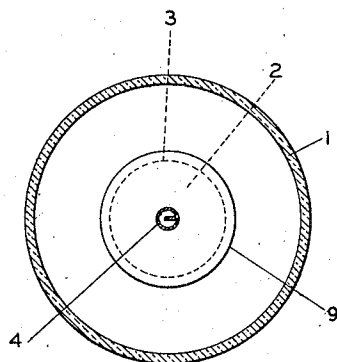


Fig. 2.

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ARC DISCHARGE LAMP

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3 Claims. (Cl. 176—126)

This invention relates to electric lamps and with particularity to lamps of the type designed to operate with an arc-like discharge through an ionizable medium.

5 The invention is in the nature of an improvement upon the type of lamp disclosed in application Serial No. 758,405, filed December 20, 1934. There is disclosed in said application a high pressure vapor lamp having one or both electrodes of the emissive type, and between which an arc-like discharge is produced. I have found that in the case of such lamps, particularly those designed for high power operation, that the end portions or electrode chambers may be subjected to very high temperatures tending to soften the joint between the lead-in wire and the usual graded seal. Accordingly, one of the principal objects of this invention is to provide means to protect the graded seal from excessive temperatures which may exist in the vicinity of the electrode.

10 I have also found that in the case of high power vapor arc-discharge lamps, there is a pronounced tendency for the arc to become unsteady and to oscillate or bow outwardly toward the wall of the enclosing envelope, resulting in a reduction of the luminous efficiency of the arc. It is therefore another object of this invention to provide a shield adjacent an electrode of an arc-discharge lamp which shield acts to control the convection currents within the lamp so that these currents travel in a substantially uniform and steady path or circuit.

15 A feature of the invention relates to a member positioned adjacent to an electrode of a high pressure vapor lamp for controlling the direction of flow of the hot gases or vapors in the lamp to reduce the turbulence in the gas or vapor column, and to protect the graded seal from excessive temperatures.

20 A further feature relates to the particular design and disposition of a heat shield for high power arc-discharge lamps.

25 A still further feature relates to the novel organization, arrangement and relative location of parts which go to make up an efficient lamp of the high pressure or gaseous arc-discharge lamp type.

30 Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims.

35 In the drawing, there is shown in partial sectional view a lamp embodying features of the invention.

40 While the invention will be described herein as embodied in a lamp employing an ionizable filling such as mercury vapor at relatively high pressure as the luminous medium, for example in the range of 100 mms. to 3000 mms., it will be understood that certain aspects of the invention

are desirable in other types of lamps, such as gas-filled lamps or low pressure vapor lamps. However, the invention is primarily concerned with high pressure vapor lamps wherein the luminous efficiency depends to a certain extent on the vapor pressure within the lamp and wherein the main luminosity is produced by an arc phenomenon between the electrodes through the vapor. It has been found that when this type of lamp is operating at the desired luminous efficiency, relatively high temperatures obtain both in the main luminous column portion of the lamp as well as in the portion where the electrodes are positioned. As pointed out in said application Serial No. 758,405 in order to produce a commercially satisfactory lamp of this high pressure type, substantially all the mercury within the lamp must, during the operation of the lamp be maintained in a vaporized state. Furthermore, the temperature conditions of the lamp must be materially restricted at certain portions, particularly where a lamp having a main body portion of refractory glass is employed, because in such lamps it is necessary to employ a softer grade of glass between the body portion and the lead-in wires. As pointed out in said application Serial No. 758,405, the main body portion of the lamp can be of high temperature glass such as combustion tubing, sealed through the series of graded glasses to the lead-in wire. The electrode or electrodes are positioned in the electrode chambers in such a way as to maintain all the mercury in vaporized form but being positioned at such a point that the graded seal is outside the destructive temperature field of the arc and electrode. The lamp according to the present invention is preferably substantially similar in construction to that disclosed in said application, Serial No. 758,405 and comprises a tubular envelope 1 of refractory transparent tubing such as combustion tubing or the like. The portion 1 terminates at opposite ends in hollowcap-like portions 2 of a softer grade of glass for example uranium glass. Preferably the cap portions 2 are butt-sealed to the tubular portion 1 as indicated by the numeral 3. Sealed into each of the cap portions 2 is an electrode 4 consisting preferably, although not necessarily, of a refractory wire core such as tungsten, molybdenum or the like coiled to the shape shown in the drawing. The refractory core may have spirally wound around it a fine tungsten wire 5 which may be welded at suitable points to the said core. The ends of the core are welded or otherwise fastened to lead-in wires 6 and 7 so that current may be passed through the electrode to expel the gases therefrom during the initial evacuation of the lamp. Each of the lead-in wires 6 and 7 is provided with a suitable glass bead 8 having substantially the same coefficient of expansion as the lead-in wire, for example these beads may con-

sist of so-called "Nonex" glass or other similar borosilicate glass. As will be apparent from the drawing the cap 2 forms with the end of tube 1 a substantially hemispherical chamber in which the electrode 4 is positioned. Preferably the electrode 4 is so positioned that the joint 3 between the relatively hard glass 1 and the softer glass 2 is in back of the said electrode, but with the electrode 4 positioned for the greater part of its length within the hemispherical electrode chamber. With this arrangement the heat of the electrode 4 is sufficient to maintain the temperature in the electrode chamber sufficiently high to prevent condensation of the vapor filling in back of the electrode but without subjecting the joint 3 to excessive temperatures. In the case of high powered lamps of this type, I have found that it is desirable to control not only the amount of heat that is radiated from the electrode 4 to the seal 3 but also to control the flow of the hot gases and vapors within the tubular portion 1. For this purpose and in accordance with the present invention, there is mounted between the electrode 4 and the cap portion 2 a shielding member 9 which may be of a suitable metal or of an insulating material such as mica or glass. When a metal shield is employed, it must be insulated from the wires 6 and 7 as indicated in the drawing by the insulation beads 10. The shield 9 may be supported in any convenient manner either from the wires 6, 7, or from the cap 2. When the lamp as shown in the drawing is used in a vertical position, the luminous arc exists between the electrodes substantially as indicated by the dotted lines, consequently the gases or vapors adjacent the arc proper are at the highest temperature while the gases or vapors further removed from the arc are at a relatively lower temperature. This results in the production of convection currents in the gas or vapor filling and when the shielding 9 is not provided these convection currents tend to follow irregular paths caused probably by the turbulence of the vapors. The result of this turbulence is that the main luminous arc is subjected to lateral displacement or bowing at various points throughout its length. In other words the arc tends to follow the turbulent vapor currents. I have found that this oscillating condition of the arc reduces the luminous efficiency thereof and in order to overcome this effect the shield 9 is disposed between the lower end of electrode 4 and the cap 2 in such a position that it protects the seal 3 from direct radiation from electrode 4 but allows the hot gases and vapors to circulate in back of it so that there is sufficient high temperature maintained in the electrode chamber to prevent condensation of the vapor filling. While the shield 9 may be given any desired shape preferably it is hollow and disk-shaped to conform to the curvature of the electrode chamber, although even a flat disc-like shield has desirable advantages in protecting the seal 3 and in reducing the turbulence of the hot gases and vapors within the tube. By properly designing the curvature of the shield 9 it is possible to cause the convection currents in the gaseous or vapor filling to follow substantially steady stream line paths conforming in general to the shape of the lamp wall. In any event the shield 9 reduces the tendency of the luminous arc to wiggle or oscillate, and results in an increase in the luminous efficiency of the lamp. Regardless of whether a flat or curved shield is employed this shield should not be of a materially larger

diameter than the diameter of the cap 2. Preferably the shield 9 is of just sufficient diameter to extend slightly beyond the circular boundary of the seal 3 as indicated in Figs. 1 and 2 of the drawing. Preferably the shield is disposed approximately half way between the lower end of electrode 4 and the bottom of cap 2. With this arrangement therefore, the shield 9 effectually protects the seal 3 from the direct heat radiation of electrode 4 and at the same time provides a sufficiently free path to prevent pocketing of the mercury or other vapor filling in back of the shield.

While the drawing shows the lower end of the lamp provided with a dish-shaped shield 9 and the upper end lamp provided with a flat disc-like shield 10, it will be understood that the upper shield may be similar to the lower shield and vice versa the lower shield may be similar to the upper shield. While the drawing shows a lamp of the single envelope type, it will be understood that this lamp may be enclosed in another heat conserving envelope and likewise if desired a separate starting electrode may be employed as described in detail in said application Serial No. 758,405. It will also be understood that the electrodes 4 may have incorporated therein or applied thereto a suitable material which renders these electrodes electron-emissive. Preferably also the pressure of the vapor filling and the dimensions of the enclosing envelope are so designed that when the lamp is operating the discharge current flowing therethrough is sufficient to raise the electrodes to thermionically emissive temperature, thus avoiding the necessity of employing a separate heater for rendering said electrodes emissive. It will be further understood that the invention is not limited to the particular type of electrode disclosed and that various changes and modifications may be made in the lamp without departing from the spirit and scope of the invention.

What is claimed is:

1. In a high pressure vapor arc lamp, an enclosing envelope having a main body portion of transparent refractory tubing, and shallow cup-like caps of softer material sealed to said body portion and forming therewith electrode chambers, an electrode mounted within each chamber, and a shield mounted between one of said electrodes and the associated end cap, said shield having a slightly larger diameter of the rim than the diameter of the end cap but being of materially less diameter than the internal diameter of the said body portion.

2. A high pressure vapor arc lamp according to claim 1 in which the electrode is mounted within the electrode chamber so that at least one half of its length is in advance of the end cap.

3. In a high pressure vapor arc lamp, an enclosing envelope having a main body portion of transparent refractory tubing, end caps of softer material sealed to said body portion and forming therewith electrode chambers, an electrode mounted within each chamber, and a shield mounted between one of said electrodes and the associated end cap, said shield having a slightly larger diameter than the diameter of the end cap but being of materially less diameter than the internal diameter of the said body portion, said electrode being mounted within the electrode chamber so that at least one half of its length is in advance of the end cap.

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