

March 26, 1940.

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2,194,652

METALLIC VAPOR DISCHARGE LAMP

Filed Nov. 29, 1937

Fig. 1.

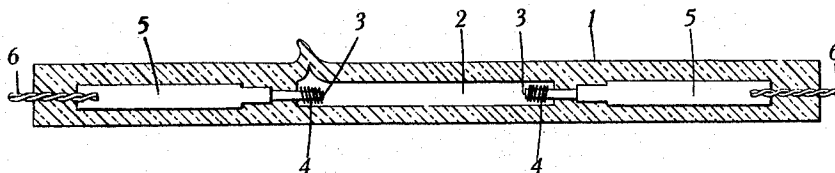
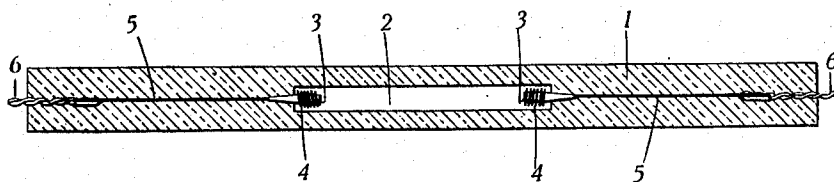


Fig. 2.



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2,194,652

METALLIC VAPOR DISCHARGE LAMP

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Application November 29, 1937, Serial No. 176,962
In Great Britain December 1, 1936

8 Claims. (Cl. 176—122)

The present invention relates to improvements in and relating to metallic vapor discharge lamps of the super high pressure mercury vapor lamp type, i. e., of the type operating at pressures above 4 atmospheres, e. g., from 5 atmospheres up to 100 atmospheres or more.

It has long been known that mercury vapor lamps with vaporizable electrodes in very narrow silica tubes with relatively thick walls and artificially cooled, for example by a stream of water in contact with the tube exterior, could be operated at a very high vapor pressure of several atmospheres or more, and that lamps operated at such very high vapor pressures were much more efficient and emitted a light of a color much closer to sunlight than mercury vapor lamps in which the vapor pressure did not exceed an atmosphere.

It was found, however, that the voltage drop across such super high pressure mercury vapor lamps was very high. To overcome this objectionable feature it has been proposed to employ, in the place of vaporisable electrodes, solid incandescent electrodes, preferably of the oxide-coated type. It was found that such incandescent electrodes had a short life unless they were almost completely immersed in a quantity of vaporizable metal which served to lower their temperature. Even under the most favorable conditions, however, it was found that the voltage drop across the super high pressure mercury vapor lamp remained high, exceeding 150 volts per centimetre of the discharge path under normal operating conditions and at higher vapor pressures corresponding to a higher luminous efficiency attaining still higher values, even as high as 300 volts/cm.

The object of the invention is to provide means whereby the voltage drop in super high pressure mercury vapor lamps is materially reduced.

According to the present invention I provide a super high pressure mercury vapor lamp in which during operation finely divided electron emissive material is distributed in the region of the discharge.

Distribution of the aforesaid electron emissive compound may be attained by first incorporating it in a heat vaporizable electrode, such as an electrode of mercury, or mercury amalgamated with another metal, with the result that as said electrode vaporises the electron emissive material is freed for distribution in the region of the discharge and around the inner wall of the envelope or alternatively such electron emissive material may be introduced as a non-adherent coating on

the surface of an electrode of the solid incandescent kind, the electron emissive material being again distributed by the discharge. In the latter case the electrode may advantageously have an adhesive under coating of an electron emissive material.

One or both of the electrodes of a super high pressure mercury vapor lamp may be formed in a manner according to the present invention, it being imperative of course that the electrode or electrodes serving as a cathode or cathodes should be so treated and it is found that in some cases the best results are achieved by incorporating in the lamp at least one heat vaporizable electrode.

The envelope of a lamp according to the present invention preferably comprises a silica envelope with a narrow bore and thick walls, such envelope containing a permanent filling of a rare gas such as argon, neon or a mixture of rare gases at a low pressure.

The aforesaid electron emissive material must of course be chemically inert with respect to the envelope of the lamp and may advantageously consist of thorium oxide.

Upon application of appropriate potential to the terminals of a discharge lamp constructed according to the invention, an electric discharge passes through the permanent gas filling. This discharge causes some of the mercury to evaporate and at the same time heats some of the particles of the electron emissive powder. The particles of the electron emissive powder so heated act as sources of electron emission and, in the first place, cause an increase of electron emission at the surface of the electrode functioning as a cathode. In an alternating current lamp each electrode functions alternatively as an anode and as a cathode and the increase of electron emission due to the heated particles of the electron emissive powder is manifested at both electrodes. With further increase of discharge current more mercury is evaporated and, at the same time, more particles of the powder at the electrodes, in the region of the discharge, and on the inner wall of the envelope, are heated to a temperature at which they are capable of high electron emission. In this manner the conductivity of the entire discharge region is increased and the voltage drop across the lamp is reduced in a satisfactory manner. The effect is further enhanced by secondary electron emission due to collisions of particles of the electron emissive powder with primary electrons.

In order that my invention may be well understood I will now describe by way of example one

embodiment thereof with reference to the accompanying drawing on which:

Figure 1 shows one form of the device in front sectional elevation,

5 Figure 2 is a sectional plan view thereof.

Referring to the drawing, the lamp includes an envelope 1 of silica having thick walls and a narrow bore. Electrodes are provided at each end of the discharge space 2, which space is charged with mercury and a permanent gas such as neon.

Each of the electrodes consists of a tungsten wire 3, around which is wound a thin wire 4 serving as a carrier for the loosely adhering electron emissive powder and consisting for example of a tungsten wire coated with finely divided refractory electron emissive material such as thorium oxide.

The rear end of each of the electrodes 3, 3 is secured to a seal 5, 5 consisting of a short ribbon of molybdenum fused to the envelope 1 and a lead 6, 6, preferably consisting of twisted molybdenum wire extends from each sealing ribbon 5, 5, through the ends of the envelope 1 and serves for the external connection to any desired leads.

Whilst I have hereinbefore described one embodiment of my invention I wish it to be understood that the specific details may be varied or modified without departing from the scope thereof and therefore my invention is not to be limited by the description but solely by the appended claims.

I claim:

35 1. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes sealed into said envelope and electron emissive material disposed within said envelope and applied to a carrier in a loosely adherent manner so that during normal operation of said lamp said electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

45 2. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes, at least one of which is a heat vaporizable liquid electrode, and finely divided electron emissive material incorporated in said heat vaporizable liquid electrode so that during normal operation of said lamp, said electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

50 3. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes at least one of which consists of one of the group comprising mercury and mercury amalgams, and

finely divided electron emissive material incorporated in said last mentioned electrode so that during normal operation of said lamp, said electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

4. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes, at least one of which is of the solid incandescent kind, and electron emissive material applied to said solid electrode in a loosely adhering manner so that during normal operation of said lamp, said electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

5. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes, at least one of which is of the solid incandescent kind, electron emissive material applied to said solid electrode in a strongly adhering manner and further electron emissive material applied to said solid electrode in a loosely adhering manner so that during normal operation of said lamp, said last mentioned electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

6. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes, of which at least one is of the solid incandescent kind, a thin wire wound around the inner end of said solid electrode, electron emissive material applied to said thin wire in a strongly adhering manner and further electron emissive material applied to said thin wire in a loosely adhering manner so that during normal operation of said lamp, said last mentioned electron emissive material readily becomes distributed in the region of the discharge space of said lamp.

7. A super high pressure mercury vapor lamp comprising an envelope, electrodes and finely divided thorium oxide applied to at least one of said electrodes in a loosely adhering manner so that during normal operation of said lamp, said thorium oxide readily becomes distributed in the region of the discharge space of said lamp.

8. A super high pressure mercury vapor discharge lamp comprising an envelope, electrodes, finely divided electron emissive material applied to said electrodes in a loosely adherent manner so that said material readily becomes detached therefrom and distributed in the region of the discharge space of said lamp and mercury and a rare gas at low pressure located within said lamp.

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