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ELECTRODE FOR A HIGH-PRESSURE DISCHARGE LAMP

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Fig. 1.

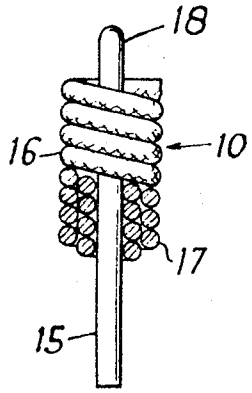
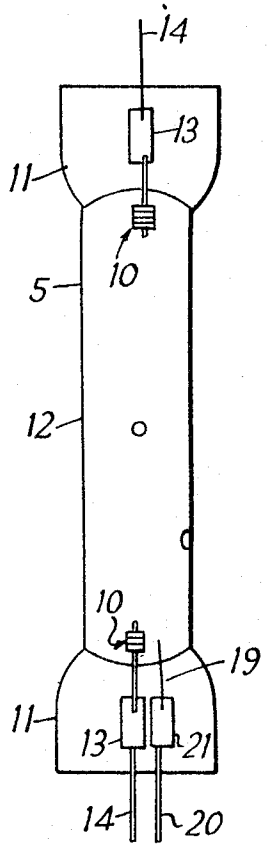


Fig. 2.



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ELECTRODE FOR A HIGH-PRESSURE DISCHARGE LAMP

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U.S. Cl. 313—211 3 Claims

ABSTRACT OF THE DISCLOSURE

Electrodes for a high pressure mercury vapour discharge lamp consist of a tungsten rod about which a layer or layers of a tubular braid of tungsten wires are wound, the braid being filled with thermionically emissive material.

The invention relates to an electrode for a high pressure discharge lamp and in particular, to an electrode for use in a high pressure mercury vapour discharge lamp.

Electrodes of high pressure mercury vapour lamps usually consist of a rod of a refractory metal such as tungsten containing a small percentage of thorium or thoria, about which are placed two concentric spirals of tungsten wire which have been coiled in such a way that the inner spiral fits closely on the central tungsten rod and the outer spiral fits closely on the inner spiral. The inner spiral may consist of a number of turns of tungsten wire with predetermined spaces between each turn. The outer spiral may consist of an equal number of more turns than the inner spiral, the turns may have a predetermined space between them. The size of the central rod and the diameter of wire for the inner and outer spirals of tungsten and the total length of the spirals is governed by the wattage of the lamp into which they are to be sealed. During the preparation of the electrodes, the spirals are generally coated with a paste of alkaline earth carbonates such as barium carbonate. The carbonates are subsequently reduced to oxides having a low work function and thus providing an electron-emitter on the electrodes. The amount of emissive material and its adhesion to the electrodes is governed by the spacing between the turns of wire in the tungsten spirals. Any surplus emissive material which may collect on the outer spiral has to be removed before the electrodes are fitted into the lamps or it has to be heated so that it adheres to the surface of the spiral. In such electrodes the amount of emitter is limited to the amount which can be made to adhere to the tungsten spirals. A disadvantage of these electrodes is that the emitter may be sputtered from the spirals when the lamp is operated over many hours, collecting on the arc tube inner surface and eventually reducing the light output of the arc tube.

According to the invention there is provided an electrode for a high pressure discharge lamp consisting of a tubular braid of tungsten wires which is filled with thermionically emissive material and is coiled about a tungsten rod.

An embodiment of the invention will now be described with reference to the accompanying drawing, in which,

FIGURE 1 is a partially cut-away view of an electrode constructed according to the invention, and

FIGURE 2 is a view of an arc tube of a discharge lamp incorporating electrodes as shown in FIGURE 1.

Electrodes **10** project from the pinch-seal ends **11** of a quartz arc tube **12** of a high pressure mercury vapour discharge lamp as shown in FIGURE 2. The ends of the electrodes within the seal are welded to a molybdenum foil **13** which has a thickness of 0.0014 inch and a width of 4 mm. Lead-in wires **14** are welded to the foils.

As shown in FIGURE 1 the electrodes **10** consist of a central tungsten rod **15**, containing 0.75% of thoria, which is surrounded by a double helical coil **16**, held in position by friction. The coil is formed from a number of tungsten wires which have been braided together in the manner described in British patent specification No. 931,059. The braid is filled with oxides of alkaline earths **17** such as barium oxide. These oxides are put in the braid during manufacture in the form of a paste of carbonates which is substantially reduced by heat, the end of the coil is spaced from the tip **18** of the central rod. An auxiliary electrode **19** is provided at one end of the lamp being connected to a lead wire **20** through a molybdenum foil seal **21**.

The lamp is filled with mercury vapour and argon and may contain the iodides of sodium, scandium, thorium, indium, thallium and gallium. On starting the lamp, a glow discharge is initiated between the coils of the two electrodes **10** with the aid of the auxiliary electrodes **19**. The glow discharge is provided by the oxides held within the coils which are electron-emissive substances. The glow discharge rapidly transforms into an arc discharge between the tips of the electrodes.

The fact that the emitter is held within a tube of braided wires greatly reduces the sputter of emitter during the period of the glow discharge. Further the fact that the tube is hollow enables more emitter to be held in each electrode than is possible with a solid wire overwind. This increases lamp life and luminous performance through life. The fine wires which form the braid also improve field emission of the electrode so that lamp starting is better. In addition, because of the low thermal mass on the outer surface of the braid, the transition from a glow discharge to an arc discharge takes place in a shorter period of time.

What is claimed is:

1. In a high pressure discharge lamp, an electrode consisting of a tungsten rod, a tubular braid of tungsten wires coiled about said rod to form a coil thereon of several turns close together, and a filling of thermionically emissive material within the tubular braid.

2. An electrode as claimed in claim **1**, wherein the braid is coiled about the rod in two layers, each layer forming a coil on said rod of several turns close together.

3. In a high pressure discharge lamp as claimed in claim **1** a second electrode constructed in a similar manner to the first electrode, and an auxiliary electrode.

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