Aug. 19, 1958 R. E. PETERSON ET AL 2,848,641

VAPOR ELECTRIC LAMP

Filed May 13, 1953

Fig. 1.

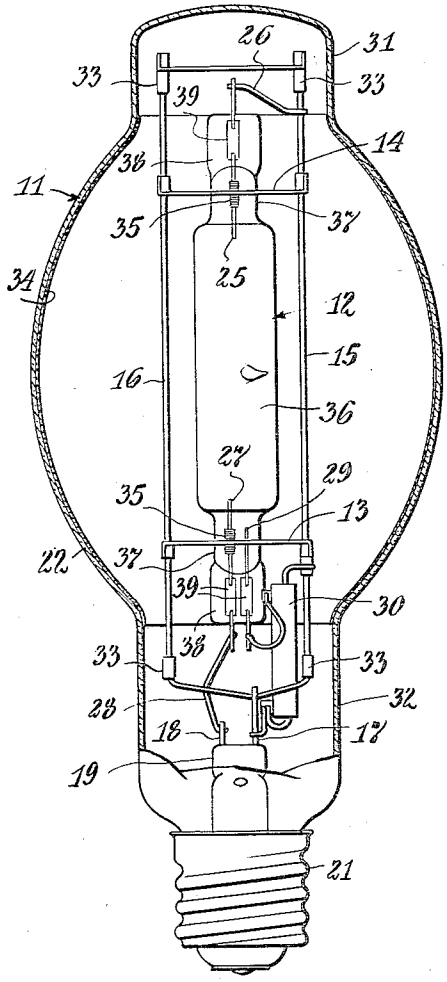


Fig. 2.

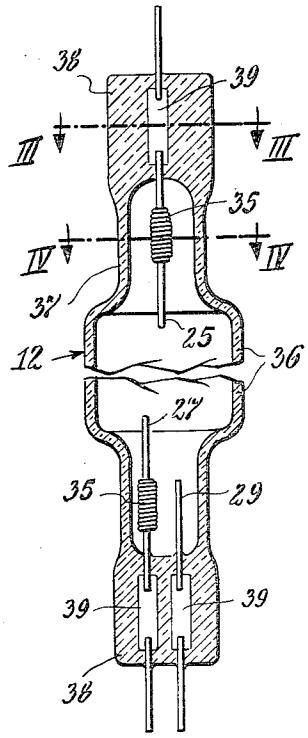


Fig. 5.

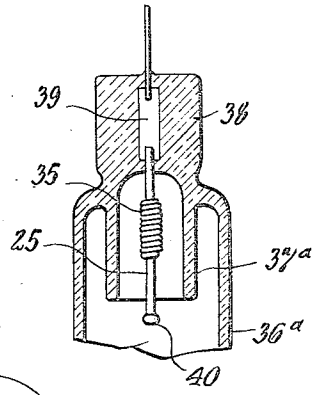


Fig. 3.

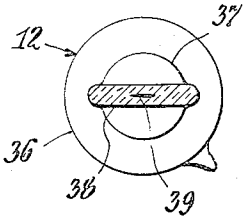
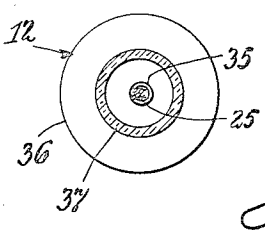


Fig. 4.



INVENTORS
R. E. PETERSON,
M. C. UNGLERT and
E. A. JENKINS.
BY
ATTORNEY

United States Patent Office

2,848,641

Patented Aug. 19, 1958

2,848,641

VAPOR ELECTRIC LAMP

Robert E. Peterson, Cedar Grove, Melvin C. Unglert, Wyckoff, and Edward A. Jenkins, Chester, N. J., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application May 13, 1953, Serial No. 354,713

3 Claims. (Cl. 313—184)

This invention relates to vapor electric lamps and for illustrative purposes is shown in a dual envelope color correction lamp.

Lamps of the character indicated have an inner envelope and an outer envelope, both of which are sealed with respect to the outer atmosphere. Within the inner envelope are appropriate electrodes for obtaining a discharge within a gaseous atmosphere across a path which is made conductive by ionization of a gas. The initial voltage required to instigate ionization along the path mentioned would be much higher than the voltage required to maintain the discharge after ionization is once promoted. It is therefore common practice to provide a starting electrode in proximity to one of the main electrodes and obtain a discharge therebetween to create the initial ionization. A higher voltage is applied across the main electrodes and consequently when the ionization is instigated, the discharge transfers from the starting electrode to the path between the main electrodes. In order to obtain emission, the main electrodes have an emissive material applied thereto, such as thorium. The thorium has a pronounced propensity to sputter and as a result the efficient light producing life of lamps of this character has been limited by blackening of the wall of the inner envelope from the deposit of thorium thereon.

In its broad aspect, the present invention is directed to means for overcoming the objectionable blackening of the envelope wall from sputtering of thorium.

Of similar nature, the invention proposes the increase of light maintenance during the life of the lamp.

Somewhat more specifically, the invention proposes confining the thoriated portion of the electrode so as to intercept the sputtered thorium and keep it from reaching the light transmitting portion of the envelope.

A further object of the invention is to position the thoriated portion of the electrode at a greater distance from the light transmitting portion of the envelope than the arc-striking portion of the main electrode.

A further object of the invention is to provide an appropriate shield in close proximity to the thoriated portion of the electrode.

A further object of the invention is to catch the sputtered thorium at a part of the envelope where it may condense and deposit without deleterious effect and by means obtaining maximum interception of the sputtered material.

Still another object of the invention is to provide a structure enabling use of quartz glass for the shield and at a location enabling a tight seal to be made therewith by the glass constituting the light transmitting portion of the envelope.

An additional object of the invention is to provide a structure wherein the shield is relatively cool so that none of the sputtered material will be driven onto the light transmitting portion of the wall of the envelope.

Other objects and advantages of the invention will appear to persons skilled in the art to which it appertains as the description proceeds, both by direct reference thereto and by implication from the context.

Referring to the accompanying drawing, in which like numerals of reference indicate similar parts throughout the several views:

Figure 1 is an elevation of a dual envelope color correction lamp, wherein our invention is utilized;

Figure 2 is a longitudinal sectional view of the inner envelope and showing the electrodes therein;

Figures 3 and 4 are cross-sectional views, taken on lines III—III and IV—IV respectively, of Figure 2; and

Figure 5 is a longitudinal sectional view of a modified construction of inner envelope and electrode.

In the specific embodiment of the invention illustrated in said drawing, and first considering the embodiment of our invention illustrated in Figs. 1 to 4, there is shown a color-corrected high pressure mercury vapor lamp 11, comprising a quartz inner envelope 12, the ends of which are supported by metal plates 13 and 14, through which pass supporting wires 15 and 16, welded to a lead-in 17 projecting from press 19, adjacent the base 21 of the outer bulb 22.

The lamp 11 has a main electrode 25 at its outer end connected to support wire 15 by a transversal 26, and a main electrode 27 at its inner end connected to lead 18 by flexible conductor 28. A starting electrode 29 is provided, connected through a resistor 30 to lead 17. The envelope 12 encloses a quantity of mercury and inert gas at a presure such that it is normally below atmospheric, but will be above atmospheric when the lamp is in operation, as is customary in lamps of this character.

The outer envelope 22, in the persent embodiment, is generally ellipsoidal with its long axis, coaxial with that of the inner envelope 12, so that the lamp will operate as nearly isothermally as possible. The outer end portion 31, however, opposite the base 21, as well as the neck portion 32, are formed generally cylindrical about the axis of the envelope 12 and of a relatively small diameter, so as to be engaged by spring fingers 33 on the supporting wires 15 and 16 for positioning said envelope 12 in the outer envelope 22. The space between the envelopes 12 and 22 is evacuated, if desired, or may be filled with inert atmosphere. The inner surface of the outer envelope 22 is coated with a selected color-correcting phosphor 34. For an approximate optimum operating temperature of the phosphor 34, assuming the phosphor to be the preferred magnesium fluorogermanate, the length of the ellipsodial portion of the bulb 22, when enclosing a 400 watt lamp, is about 8", and its maximum transverse dimension is about 6".

The general organization described above and appropriate phosphors and method of applying the same are described in greater detail in prior applications Serial No. 126,506, filed November 10, 1949, in the name of Luke Thorington, now U. S. Patent No. 2,748,303, dated May 29, 1956, and Serial No. 244,344, filed August 30, 1951, in the names of George H. Lockwood and Robert E. Peterson, now U. S. Patent No. 2,707,687, dated May 3, 1955, both being assigned to the same assignee as the present application.

The present invention inheres more particularly in the construction of inner envelope 12 and the electrodes therein. Suffice it to say, for purposes of the present invention, that the outer envelope 22 has an inner coating of phosphor 34 which is affected by the light from the inner envelope and gives a desired color-corrected light exterior to the outer envelope.

As described above and also indicated in the above-noted patents, the inner envelope provides two main electrodes at opposite ends of the envelope and each of these

electrodes has a coil 35 thereon and preferably includes thorium between the coil and the electrode, the coil serving to some extent to confine sputtering of the thorium. In the patents referred to the thoriated portions of the electrodes are shown next to the ends of the electrodes that are directed toward each other and which, for convenience, will be herein referred to as the "inner ends" of said electrodes. An essential feature of the present invention is to locate the thoriated portion of each of these main electrodes as remote from each other as possible and spaced rearwardly from said inner ends of the main electrodes. Preferably, the thoriated portion is at a distance back from the open end of the shield greater than radial distance between the electrode and shield.

In addition to the foregoing feature, the present invention contemplates shielding the thoriated portion of the electrode in a part of the envelope not required for light transmitting purposes, but at the same time locating the inner ends of the main electrodes within the light transmitting portion of the envelope. According to the showing in Figs. 1 to 4, the mid-section 36 of the inner envelope has a larger diameter than end portions 37, and said end portions 37 constitute the shields referred to above. The thoriated portion of the main electrodes are well within and relatively close to the closed ends of the shield portions 37 and at a considerable distance from the transition or junction between the shield portion and the light transmitting or mid-portion of the envelope. In view of the fact that the electrodes are thus relatively close to the shield portions of the envelope, the heat radiating from the electrode is severe on the shield portion of the envelope, and it consequently is necessary to utilize quartz glass or another heat resisting ceramic to constitute the shield. A structure is therefore required enabling the use of such a material for the shield and at the same time enabling it to be sealed vacuum-tight to the light transmitting portion of the envelope. As shown in Figs. 1 to 4, inclusive, this desideratum is accomplished very conveniently by the construction above described with the utilization of reduced diameter end portions 37 for the envelope projecting axially from the ends of the light transmitting portion 36 of the envelope, enabling the seal to be accessible during fabrication at the exterior of both the large and small portions of the envelope. Beyond the shield portion at each end of the envelope, the glass thereat is formed into a press 38 which seals the respective lead-in wires vacuum-tight through the compressed glass. According to the present showing, the particular seal is made by utilization of a flat section 39 in the lead-in connection which is flatwise with respect to the flattened faces of the press to obtain a leak-proof seal thereat.

It may be pointed out that the starting electrode 29 is likewise well within one of the shields and that the initiating electron discharge from the adjacent thoriated portion of the main electrode is at a distance well below the junction between the shield and the light transmitting portion of the envelope. According to the present showing, the reduced or shield portion 37 of the envelope is not required for light transmitting purposes as the discharge is between the ends of the main electrodes and therefore within the larger or light transmitting portion 36 of the envelope. The shield is relatively close to the thoriated portion of the main electrode and much longer than said portion so that the sputtering of thorium will be quickly intercepted by the shield as a result of which the sputtering will not extend into the light transmitting portion of the envelope. Therefore said envelope will remain substantially free from any such sputtering of the thorium throughout the life of the lamp, whereas heretofore the usefulness of the lamp was impaired by the blackening of the light transmitting portion and the blackening was under those conditions a limiting factor as to the life of the lamp.

In the modified construction of Fig. 5, the shield 37*a* has its outer or far end joined or sealed to the end of the envelope 36*a* rather than to the rear or inner end as in the other figures. Consequently, in Fig. 5 the shield 37*a* projects into the envelope 36*a* instead of projecting outwardly, but in both instances, the shield is coaxial with the envelope, the main electrode 25 or 27 projects from the shield within the envelope and the light-transmitting portion of the envelope is that part thereof in the region defined by the spacing between the opposed inner ends of the shields. Furthermore, in either construction the inward ends of the electrodes 25, 27 may have a knob or enlargement 40, if so desired, to better withstand erosive effects of the arc thereat. Likewise, in both forms of the invention herein disclosed, the thoriated portion of the main electrode is deep in the shield, thus effecting a recessed positioning of the emissive material and providing a shield which is relatively close to the emissive area for prompt interception of sputtered material and for keeping the light-transmitting portion of the envelope clear of sputtered materials.

We claim:

1. A high pressure discharge lamp having an envelope with a light-transmitting portion and an integrally-formed constricted portion co-axially disposed at each end thereof, said constricted portions each having an end open to the interior of said envelope, an electrode sealed in each end of said envelope and extending longitudinally through said constricted portions into said envelope, each of said electrodes having an arc-supporting portion and an electron-emissive portion remote from said arc-supporting portion, said electrode arc-supporting portions projecting into said envelope light-transmitting portion a substantial distance beyond the open ends of said constricted portions of said envelope to serve as discharge terminals and define a discharge path, and said electrode electron-emissive portions disposed outwardly from said electrode arc-supporting portions entirely within the said constricted portions of the envelope and more remote from the open ends thereof than the radial distance between said constricted portions and said electrodes whereby substantially all the sputtered electron-emissive material is intercepted by and deposited on the said constricted portions of the envelope during the operation of said lamp.

2. A high pressure discharge lamp having a tubular envelope with a light-transmitting portion and an end-closing and integrally-formed constricted portion co-axially disposed at each end thereof, an electrode sealed in each of said constricted end-closing portions and extending longitudinally into said envelope, each of said electrodes having an arc-supporting portion and an electron-emissive portion remote from said arc-supporting portion, said electrode arc-supporting portions projecting into said envelope light-transmitting portion a substantial distance beyond the said constricted end-closing portions of said envelope to serve as discharge terminals and define a discharge path, and said electrode electron-emissive portions disposed outwardly from said electrode arc-supporting portions entirely within said constricted end-closing portions of the envelope and more remote from the junctures thereof with the said envelope light-transmitting portion than the radial distance between said constricted end-closing portions and said electrodes whereby substantially all the sputtered electron-emissive material is intercepted by and deposited on the said constricted end-closing portions of the envelope during the operation of said lamp.

3. A high pressure discharge lamp having an envelope with a light-transmitting portion and an integrally-formed constricted portion co-axially disposed at each end thereof, each of said constricted portions protruding into said light-transmitting portion and having an end open to the interior of said envelope, an electrode sealed in each of said constricted portions and extending longitudinally through said constricted portions into said envelope, each

of said electrodes having an arc-supporting portion and an electron-emissive portion remote from said arc-supporting portion, said electrode arc-supporting portions projecting into said envelope light-transmitting portion a substantial distance beyond the open ends of said constricted portions of said envelope to serve as discharge terminals and define a discharge path, and said electrode electron-emissive portions disposed outwardly from said electrode arc-supporting portions entirely within the said constricted portions of the envelope and more remote from the open ends thereof than the radial distance between said constricted portions and said electrodes whereby substantially all the sputtered electron-emissive material is intercepted by and deposited on the said constricted portions of the envelope during the operation of said lamp.

References Cited in the file of this patent

UNITED STATES PATENTS

2,007,947	Braselton	July 9, 1935
2,116,429	Gooskens	May 3, 1938
2,177,714	Hagen	Oct. 31, 1939
2,453,118	Buckingham	Nov. 9, 1948