May 3, 1938. H. GOOSKENS 2,116,429

ASSEMBLY FOR DISCHARGE DEVICES

Filed May 26, 1936

Fig. 1.

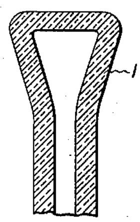


Fig. 2.

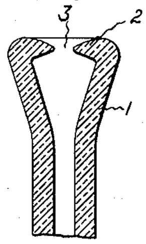


Fig. 3.

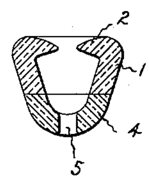


Fig. 4.

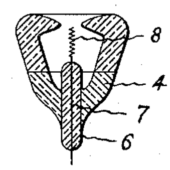
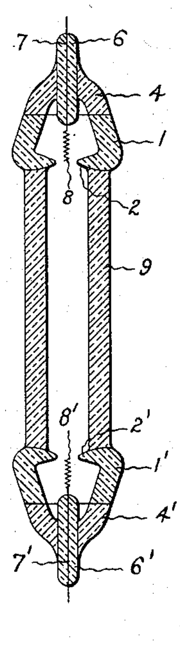


Fig. 5.



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UNITED STATES PATENT OFFICE

2,116,429

ASSEMBLY FOR DISCHARGE DEVICES

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Application May 26, 1936, Serial No. 81,860
In Germany October 14, 1935

7 Claims. (Cl. 176—126)

The present invention relates to an improved construction of and method of making discharge devices, and more particularly such devices as are adapted during operation to contain an ionizable medium at superatmospheric pressure.

It has previously been known in connection with metal vapor discharge devices having heated electrodes to arrange apertured insulating shields before these electrodes in order to catch the particles which are thrown from their surfaces. However, in high pressure lamps of the type disclosed and claimed in Patent #2,094,694 of Bol, Elenbaas and Lemmens, the dimensions of the envelope are so small that it is difficult to arrange such shielding means within the discharge enclosure.

It is an object of this invention to provide in connection with high pressure discharge tubes whose inside diameter is of the order of seven millimeters or less an improved assembly of such nature that particles ejected by the electrodes during operation are intercepted without the need of separate shields being fastened in the tube.

According to the invention, the electrode enclosure is separately fused to the discharge vessel in such a way that one of the fused parts is provided at the union with a transverse wall having a central opening therein. The nature of this construction and the manner in which it may be produced will best be understood by reference to the drawing, in which Figs. 1, 2, 3 and 4 illustrate progressive steps in the manufacturing procedure, while Fig. 5 shows a complete discharge tube constructed in accordance with the invention.

In Fig. 1 there is shown the first step in the production of the electrode enclosure. As shown, the part 1 comprises a small diameter translucent tube, which for the particular use contemplated should be of a highly heat resistant material, such as quartz. The tube is fused shut at one end and then is blown up or otherwise expanded in such a manner that an enlarged divergently tapered portion is formed at the closed end. The central part of the transverse closure of this vessel is then heated and blown through or pierced in such a manner that a thin septum 2 with a central opening or aperture 3 (Fig. 2) is formed. This opening should be of smaller diameter than the main bore of the discharge device.

As a next step the tube 1 is severed adjacent the apertured end and a closure applied to the severed portion. This closure is accomplished by means of a cap 4 of a glass, other than quartz, which is adapted to act as a transition material between the quartz tube 1 and a metal lead-in conductor to be later fused into the wall of the cap. A suitable transition glass is described, for example, in copending application Serial No. 43,230, filed October 2, 1935, by Cornelis Bol, Hendricus Lemmens and Gottfried V. Jonas, and assigned to the assignee of the present application. The glass therein described is of the following composition:—

	Per cent
SiO_2	88.3
B_2O_3	8.4
Al_2O_3	2.9
CaO	.4

An opening 5 is then formed in the cap 4 into which a lead-in wire (Fig. 4) coated with an elongated bead 6, also of the transition glass, is inserted, whereupon the cap is fused into sealing contact with the glass bead. In order to insure a good seal with the transition glass described above, the lead-in wire 7 should preferably consist of tungsten, although molybdenum, which is characterized by a closely similar coefficient of expansion, may alternatively be employed. The part of the lead-in wire 7 projecting inside of the enclosure is spirally overwound with a second thin wire, appropriately of tungsten, and is then coated with a strongly electron-emitting material as, for example, strontium or barium oxide. The overwound portion 8 forms a thermionic electrode which is brought to a high temperature by passage of discharge current during operation of the tube.

Finally, as shown in Fig. 5, the electrode enclosure or envelope end portion described in the foregoing is fused in abutting relation with a central tubular quartz portion 9, the assembly being such that the transverse septum 2 is at the union between the central portion and the electrode enclosure. The opening 3 is arranged to register with the bore of the central envelope portion. The discharge tube is completed by providing the other end of the main vessel 9 with a second electrode enclosure similar to that already described. It will be understood, however, that as an intermediate step the discharge tube is thoroughly exhausted and provided with a small amount of mercury or other vaporizable material capable of acting as an ionizable medium during the operation of the lamp.

In order to demonstrate clearly the nature and arrangement of my improved discharge tube assembly, I have shown in Fig. 5 a complete high pressure lamp constructed in accordance with my invention. The utility of the construction will be more readily appreciated when it is understood that the inside diameter of the quartz tube 8 may be as small as about 4 millimeters, the thickness of the walls being about 1½ millimeters. With these dimensions it would be extremely difficult, if not impossible, to position a separate shield in the discharge path. On the other hand, by following the procedure which I have specified, it is entirely practicable to provide a septum integrally formed with the envelope walls and having a central opening of from 1.5 to 2 millimeters diameter. Furthermore the thickness of the septum may be considerably less than 2 millimeters as compared with a total length of discharge path of about 20 millimeters.

In operating the tube at a mercury vapor pressure of about 25 atmospheres the voltage between the electrodes should be in the neighborhood of 230 volts with a power input of 70 watts. Under these condition it has been found that the transverse wall contributes appreciably to protecting the longitudinal walls of the discharge vessel against blackening by material ejected from the hot electrodes.

Due to the large potential gradient (voltage drop per centimeter of length of the discharge path) a thin transverse septum is extremely advantageous in comparison with a constriction of greater longitudinal extent such as might be formed by reducing the diameter of the discharge tube for a portion of its length. With a contraction of the tube wall itself the voltage drop through the constricted section would form an appreciable part of the total impressed voltage, thus making a much smaller voltage available for the useful part of the discharge path.

In addition, a transverse wall formed in the manner described above is capable of being arranged practically perpendicular to the tube axis, which ensures a very effective interception of material particles moving from the electrode surface. Once these are caught by the transverse wall they will not be readily released as might be the case with a smoothly tapered contraction produced by constricting the tube.

It is also possible and my invention contemplates that the transverse wall may be formed at the end of the discharge vessel and the assembly thereafter completed by fusing on an electrode enclosure. However, it is technically more advantageous to form the transverse wall on the electrode enclosure as I have specified in the foregoing.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The method of producing a sectional discharge tube assembly which comprises forming a flattened septum at the end of one of said sections, producing a central aperture in said septum, fusing said septum in abutting relation with the end of another of said sections and closing the free end of said first-named section with an electrode supporting cap of transition glass.

2. In a discharge device, an elongated quartz envelope including a pair of tubular sections, a transverse septum closing the end of one of said sections, said septum having an aperture therein and being joined to the other of said sections with said aperture in alinement with the bore of the section, a cap of transition glass fused to one of the sections at the end remote from said septum, a thermionic electrode supported within the enclosure formed by the last-named section, the cap and the septum, said electrode being appreciably spaced from the septum, and a lead-in connection for said electrode sealed through said cap.

3. The method of fabricating a discharge envelope having a tubular central portion which comprises forming a substantially enclosed end portion having an opening in one wall thereof of smaller diameter than the bore of said central portion, supporting an electrode within the said end portion, and fusing said end portion to said central portion so that said opening registers with the bore of the central portion.

4. The method of fabricating a discharge device comprising a quartz envelope having a central tubular portion, which method includes forming a quartz end portion having openings at the opposite extremities thereof, one of said openings being of smaller diameter than the internal bore of said central portion, closing the other of said openings with an electrode-supporting cap of transition glass and fusing said end portion to said central portion so that said one of said openings registers with the bore of the central portion.

5. In a method of fabricating a quartz discharge envelope the steps which comprise closing one end of a quartz tube, expanding said closed end, forming a small aperture in the closed end, severing said tube adjacent said apertured end to form a short envelope portion, closing the severed end of said portion with an electrode supporting cap of transition glass, and fusing the enclosure thus formed to another tubular quartz portion so that the said opening registers with the bore of said tubular portion.

6. A high pressure lamp comprising an elongated quartz envelope having an internal diameter on the order of 7 millimeters, a quantity of ionizable material enclosed in said envelope, a thermionic electrode at each end of the envelope, each electrode having a coating of electron-emitting material, and an apertured septum positioned before each electrode, each of said septa being formed integrally with the wall of the envelope and comprising a substantial wall area transverse to the axis of the envelope for effectively intercepting particles of emitting material freed from its corresponding electrode.

7. A discharge device comprising an elongated envelope of vitreous material, a thermionic electrode positioned at each end of the envelope, each electrode comprising a coating of electron emitting material, and a transverse apertured septum positioned before each electrode, each septum being formed integrally with the wall of the envelope and the solid wall portion of each septum being at least as large as the aperture therein so as to assure the effective interception of particles of emitting material freed from the electrode nearest to the septum.

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