

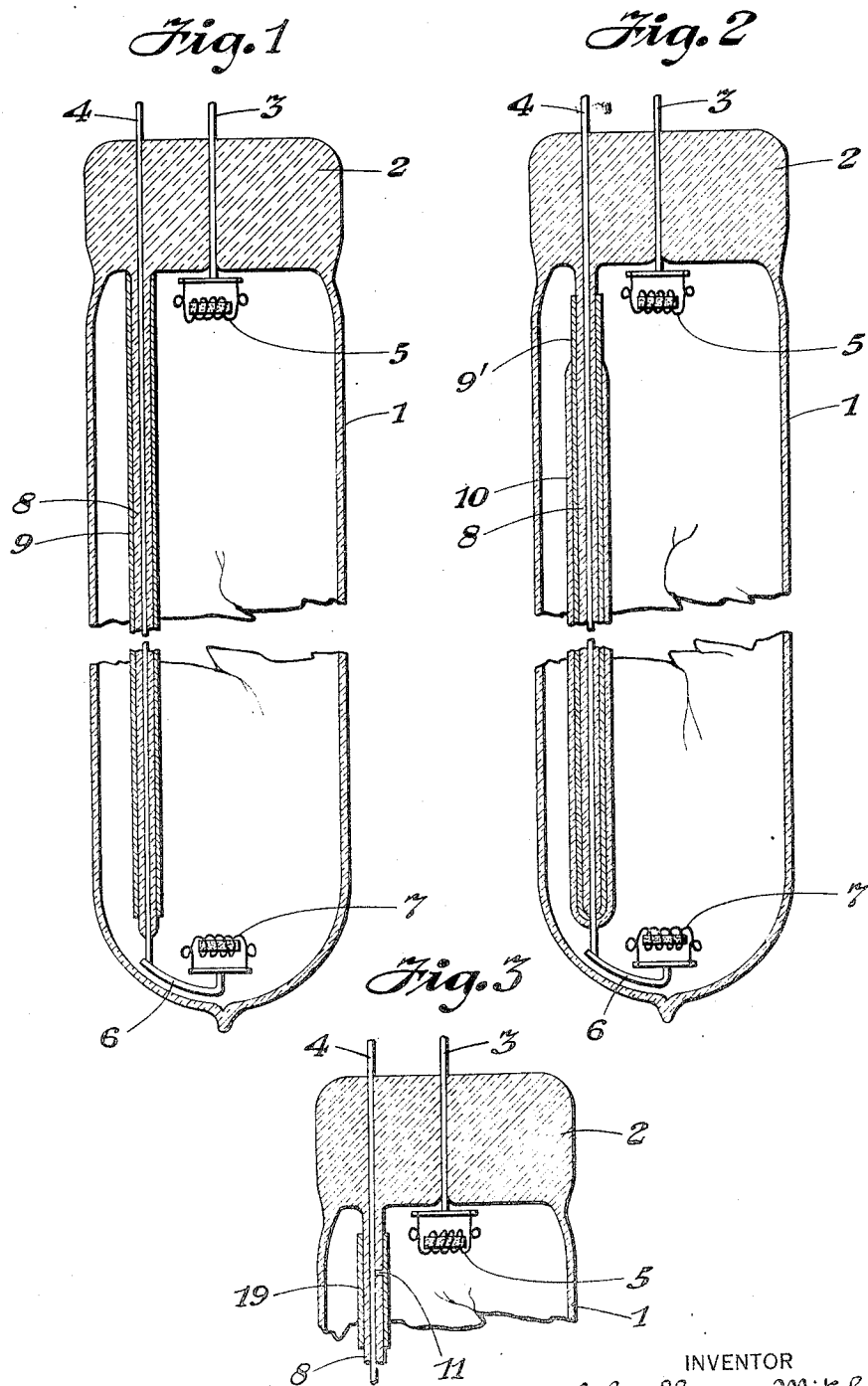
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ELECTRIC GASEOUS DISCHARGE DEVICE

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ELECTRIC GASEOUS DISCHARGE DEVICE

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The present invention relates to electric gaseous discharge devices, and particularly to those devices utilizing an auxiliary electrode to facilitate the starting of the main discharge.

A particular object of the invention is to simplify the structure of electric gaseous discharge devices, such as the high intensity mercury vapor arc lamps now going into extensive use, wherein an auxiliary electrode is employed to start the discharge between the main electrodes. A further object of the invention is to provide an impedance within the sealed envelope of the discharge device in series with said auxiliary electrode. Still other objects and advantages of my invention will appear from the following detailed specification or from an inspection of the accompanying drawing.

The invention consists in the new and novel structure which is hereinafter set forth and claimed.

In order to facilitate the striking of a discharge on the same potential as that on which a discharge device efficiently operates many of these discharge devices have been equipped with an auxiliary electrode, either internal or external to the device, the high intensity mercury vapor arc lamps of the type now going into extensive use being an excellent example of this practice. In some of these lamps all of the leads are brought in at one end of the tubular envelope, the lead to the electrode at the remote end of this envelope being suitably sheathed in insulating material throughout its length within the envelope. When an internal auxiliary starting electrode is employed with this structure it has heretofore been customary to seal a third lead through the end of the envelope, and to provide the necessary high series impedance for this electrode at some point external to the envelope, as in the attached base, for instance. I have now discovered that both this third lead and the external impedance can be eliminated, and the lamp thereby greatly improved structurally and in compactness by a novel structure of my invention. In this novel structure the auxiliary electrode is formed on the long lead within the envelope to the electrode at the remote end thereof, and the necessary series impedance is likewise incorporated in the connection between this auxiliary electrode and said lead.

In the preferred form the auxiliary electrode is formed as a coating on the insulating sheath about this lead, said sheath serving as the dielectric of a condenser having the coating and

the lead as plates. The auxiliary electrode is thus connected to this lead through a capacitance the impedance of which is easily made of the desired value through control of the thickness of the insulating sheath and of the area of the surface coating. Said coating is, of course, exposed at a point adjacent to the electrode of opposite polarity, where it provides a short gap which is easily broken down by the applied potential, while the remainder of this coating is either exposed to the discharge or suitably sheathed in insulating material, as desired. In some cases better starting is obtained, however, by leaving the entire coating exposed.

In an alternative form the surface coating forming the electrode is made very thin and is connected to the lead itself at the end remote from the seal. In this case the film itself offers sufficient resistance, due to the long path of small area to a point opposite the other electrode, to limit the discharge to the auxiliary electrode to the desired small value. In this case the coating is likewise either left exposed or coated with insulating material except at a point adjacent to the electrode of opposite polarity, although in general the latter construction is preferred.

As a further variation on this structure the auxiliary electrode which is located on the long lead as before is connected to said lead through the insulating sheath on said lead by a high resistance path, such as is produced by coating a tiny aperture in said sheath with a conducting film of platinum, silver, aquadag, said aperture then being suitably closed so that a discharge cannot take place directly to said lead there-through.

For the purpose of illustrating my invention I have shown several embodiments thereof in the accompanying drawing, in which

Fig. 1 is a sectional elevation of a high intensity mercury vapor arc lamp having the auxiliary starting electrode mounted on one of the main electrode leads,

Fig. 2 is a similar view of a modification of the structure of Fig. 1, and

Fig. 3 is a similar view of a part of a lamp showing a modification of the structure of Fig. 2.

As shown in these figures this novel lamp has a tubular sealed envelope 1 of any suitable vitreous material having a pinch seal 2 at one end thereof through which are sealed a pair of inleads 3 and 4 of tungsten or the like. The inlead 3 extends only a short distance into said envelope from the pinch 2, and on its end supports a thermionic cathode 5 of any suitable

type. As here shown said cathode consists of a tungsten helix within which there is a cylindrical pellet consisting at least in part of alkaline earth compounds. Such cathodes are well known, and since they form no part of the present invention further description thereof appears unnecessary. The inlead 4 extends along the envelope 1, preferably along one side thereof to a point close to the other end of said envelope. To the end of said inlead 4 there is welded a transverse lead 6 of tungsten which in turn supports a thermionic cathode 7 which is a duplicate of the cathode 5. The inlead 4 is entirely enclosed in a vitreous or other suitable insulating sheath 8 from the pinch 2 to the transverse lead 6 in order to prevent the discharge striking thereto instead of to the cathode 7. On the surface of this sheath 8 there is a coating 9 of any suitable conducting material such as silver, platinum, graphite, aquadag or the like. This material may be painted or sprayed on, electrolytically deposited, or produced by any of the other methods of platinizing or silvering, for example. This coating may be limited to a band adjacent to the cathode 5, if desired, but in general is extended from that point over a considerable portion of the sheath 8, as shown, in order to increase the capacity with respect to the inlead 4. In cases where it is desired all of this coating 9 is enclosed within a suitable insulating coating except for the band adjacent to the cathode 5 so as to limit the discharge to said coating as an auxiliary electrode to this area, although in general it is preferred to leave the entire coating exposed, as shown.

The envelope 1 may contain any suitable gaseous atmosphere, such as argon at a pressure of the order of 5 m. m. of mercury, together with enough mercury to give a pressure of the order of an atmosphere when it is all vaporized, this being the preferred filling for a high intensity mercury vapor arc lamp.

When this device is connected to a suitable source of potential, such as 220 volts A. C., through the usual impedance (not shown) a discharge immediately occurs across the short gap between the cathode 5 and the coating 9, which thus serves as an auxiliary electrode. This discharge is limited by the impedance of the condenser formed by this coating, the sheath 8 and the inlead 4 to a value of the order of a few milliamperes, this current being sufficient to ionize the gaseous atmosphere, and thus to cause the main discharge to start between the cathodes 5 and 7, without materially reducing the high luminous efficiency of the device.

The structure of Fig. 2 is similar to that of Fig. 1 except that the coating 9' is here extended down into actual electrical contact with the inlead 4 at a point beyond the end of the sheath 8. In this case it is essential that this coating should be extremely thin so as to provide the desired high resistance between this point of connection with the inlead 4 and a point opposite the cathode 5. A sheath 10 of insulating material, such as glass, is preferably placed over all of the coating 9' except for the band at the end thereof adjacent to the cathode 5.

With this modified structure the device starts as before with a discharge across the short gap between the cathode 5 and the coating 9' as an auxiliary electrode, but in this case the discharge current is limited by the resistance offered by the film-like coating 9', since this current must

flow throughout the length thereof before entering the inlead 4.

In the structure of Fig. 4 this ballasting resistance is provided in a different manner. In this case the sheath 8 has a pin hole 11 formed therein opposite the cathode 5. The walls of this opening are then platinized or otherwise coated with a thin film of electrically conducting material, or the hole is filled with aquadag, liquid silver, liquid platinum or the like, to form a path of high resistance from the inlead 4 through the sheath 8. In case this opening 11 is not entirely filled with the material it should be closed as by fusion, or by covering it with the conducting coating 19, as shown, in order to prevent a discharge taking place within said opening. The area of this opening is, of course, so chosen that the resistance of this path is sufficient to ballast the auxiliary discharge and limit it to the desired small value.

With this lamp at starting a discharge first occurs between the cathode 5 and the coating 19, this current then passing through the high resistance path within the opening 11 to the inlead 4. Otherwise this lamp operates in the same manner as those previously described.

In each of these structures it will be noted that a special lead for the auxiliary electrode has been eliminated, thus simplifying the seal structure, through the use of an internal impedance. While I have illustrated these impedances in each case as being incorporated in the inlead structure to the remote cathode 5, it is to be understood that this is not essential, since a separate impedance within the envelope 1 can likewise be used. A special advantage is obtained, however, with the structures illustrated in that the already existing structure of these lamps is utilized in a novel manner to form this impedance, with a great simplification of the resulting novel structure. Likewise with this novel structure the light from the arc is but slightly interfered with.

It is likewise to be understood that the structures shown and described are merely illustrative of my invention, and that various changes, omissions and substitutions, within the scope of the appended claims, may be made therein without departing from the spirit thereof.

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

1. An electric gaseous discharge device comprising a sealed envelope containing a gaseous atmosphere, a pair of inleads sealed therein, each of said inleads supporting an electrode, one of said inleads having a portion thereof adjacent to the electrode supported by the other inlead, a sheath of insulating material on said inlead and an auxiliary electrode comprising a coating of an electrically conducting material on said sheath adjacent to said other electrode, said coating having an appreciable area in electrostatic relation to said lead whereby it is capacitively coupled therewith.

2. An electric gaseous discharge device comprising a sealed envelope containing a gaseous atmosphere, a pair of inleads sealed therein, each of said inleads supporting an electrode, one of said inleads having a portion thereof adjacent to the electrode supported by the other inlead, a sheath of insulating material on said inlead, an auxiliary electrode comprising a surface of conducting material mounted on said inlead adjacent said other electrode, and a high

resistance path between said surface and said inlead.

5 3. An electric gaseous discharge device comprising a sealed envelope containing a gaseous atmosphere, a pair of inleads sealed therein, each of said inleads supporting an electrode, one of said inleads having a portion thereof adjacent to the electrode supported by the other inlead, a

sheath of insulating material on said inlead, and an auxiliary electrode comprising a surface of conducting material on said sheath, said coating extending from a point adjacent said other electrode to a point remote therefrom and being 5 connected to said inlead at said remote point.

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