Oct. 13, 1942. R. PELLMANN 2,298,965

ELECTRICAL DISCHARGE DEVICE

Filed May 2, 1941

Fig. 1.

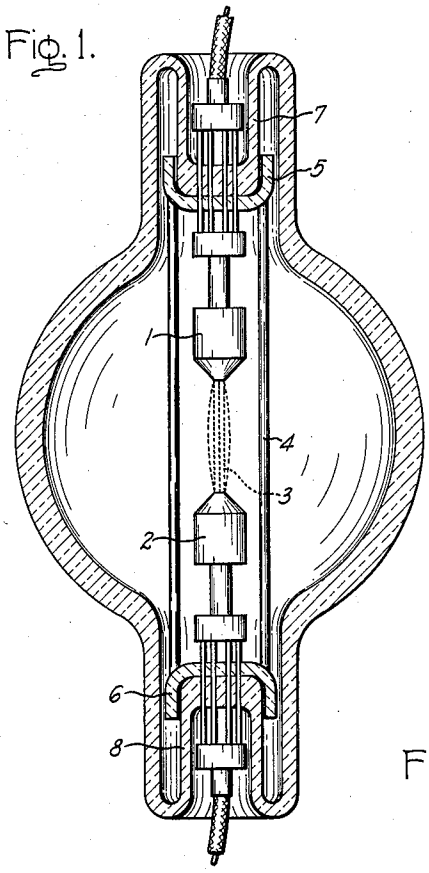


Fig. 3.

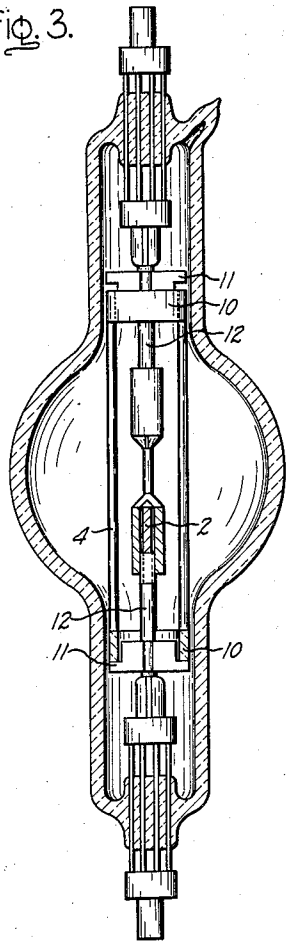


Fig. 2.

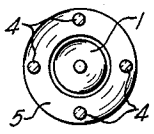


Fig. 5.

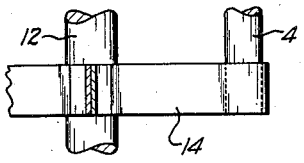


Fig. 4.

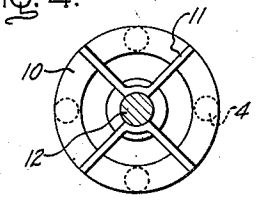
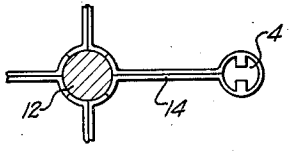


Fig. 6.



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UNITED STATES PATENT OFFICE

2,298,965

ELECTRICAL DISCHARGE DEVICE

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Application May 2, 1941, Serial No. 391,579
In Germany March 13, 1940

9 Claims. (Cl. 176—122)

This invention relates to gaseous discharge lamps and more particularly to those of the high pressure type which are designed for the production of either visible or invisible radiation.

Gaseous discharge tubes operating at very high pressures and heavy currents, possess the disadvantage that the arc, owing to the thermal movement of the gaseous atmosphere as well as to the nonuniform cathode emission, may burn unsteadily, have its terminals move about, and follow a roundabout path between its terminals. I have found that these drawbacks can be avoided by mounting a row of parallel rods around the discharge path at a distance from a few millimeters to about 15 millimeters. These rods are made of a highly heat-resisting material, preferably an insulating material, for example of quartz or ceramics, because of the heat developed by the arc. The use of a material which is transparent to the radiation reduces radiation losses through absorption. The diameter of the rods is from 2 to 6 mm. depending upon their distance from the discharge path.

It is accordingly an object of my invention to provide a gaseous discharge lamp in which the arc stream is relatively stationary.

It is a further object of my invention to provide a gaseous discharge lamp of the aforesaid type which is simple in construction and in which the aforesaid rods also serve as convenient spacers for correctly spacing the electrodes during and after manufacture.

Other objects and advantages of the invention will become apparent from the following detailed description and the accompanying drawing in which like numerals indicate like parts throughout and in which Figures 1 and 3 show alternative constructions for supporting the rods of my invention within a gaseous discharge lamp. Fig. 2 is a cross-sectional view of the rod and electrode system of Fig. 1 taken at the central point of the arc while Figs. 4 through 6 demonstrate alternative forms of the rod supports shown in Fig. 3.

Referring to the drawing, the electrodes 1 and 2, of which at least one is activated by an electron-emitting substance, support discharge 3 which may be either continuous or intermittent. In order to stabilize any random movement of the discharge, there are provided, in accordance with the invention, three or more rods 4, of heat-resisting material, preferably quartz or hard glass, mounted in parallel with the discharge path. In the example of Figs. 1 and 2, the ends of these rods are fused to two rings or collars 5 and 6 of the same or similar material, which surround with sufficient play the stems 7 and 8 in which the current leads are fused. If the rings 5 and 6, as shown in the figures, are concave and provided with a hole in the center, they may be used for fixing the desired predetermined distance between the various tube elements during the process of manufacture of the discharge tube. In any event, care must be taken to provide sufficient play between the individual parts to prevent damage in operation as a result of nonuniform heating or differences in expansion coefficients.

In the modification shown in Figs. 3 to 6, the rods 4 provided for stabilizing the discharge are fastened not to the part of the bulb wall containing the current leads, but to the electrode holders 12 themselves. In the example shown in Figs. 3 and 4, the rods 4 are provided at both ends with rings 10 which rest on metal fins 11 made preferably of thin sheet metal and fastened, by spot welding for example, to the electrode holder 12. By properly choosing the various dimensions and point of attachment sufficient play may be provided, even in this case, for nonuniform heat expansion.

In the arrangement of Figs. 5 and 6 the rods 4 are held by metal fins 14 attached to the electrode holders 12 and provided with small flanges shown in Fig. 6 to prevent the rod 4 from slipping through. This arrangement has the advantage that there is no need to fuse the rods 4, to the rings 5, 6 and 10. In this arrangement too, sufficient play must be provided to take care of nonuniform heat expansion.

I have found that the arc-discharge tube according to the invention has given very good service as a discharge lamp for very heavy currents as well as for short-current impulses of extremely large amplitude, for example repeated current impulses of 10,000 amperes and 10^{-4} seconds duration.

It will be understood that the described constructions are illustrative of but several forms of my invention and that many modifications in structural details within the scope of the appended claims will occur to those skilled in the art to which the invention appertains.

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

1. In an electrical discharge device, an envelope, a pair of operating electrodes capable of sustaining a discharge in said envelope, and means for stabilizing a discharge between said electrodes, said means consisting of a pair of

supports disposed between said electrodes and said envelope and a series of rod members equally spaced around and extending substantially parallel to the discharge path between said electrodes and overlapping said electrodes to engage said supports.

2. In a gaseous electrical discharge lamp, an envelope, a pair of operating electrodes capable of sustaining a discharge in said envelope, and means for stabilizing a discharge between said electrodes, said means consisting of a pair of supports disposed between said electrodes and said envelope and a series of light transmitting rod members equally spaced around and extending in substantially parallel relationship with the discharge path between said electrodes and overlapping said electrodes to engage said supports.

3. In a gaseous electrical discharge lamp of the type wherein the arc discharge path tends to be unstable in position during operation, an envelope, a pair of operating electrodes capable of sustaining a discharge in said envelope, and means for stabilizing a discharge between said electrodes, said means consisting of a pair of supports disposed between said electrodes and said envelope and a series of light-transmitting rod members equally spaced around and extending in substantially parallel relationship with the discharge path between said electrodes and overlapping said electrodes to engage said supports.

4. In a high pressure gaseous electrical discharge lamp, an envelope, a pair of operating electrodes capable of sustaining a discharge in said envelope and means for stabilizing a discharge between said electrodes, said means consisting of a series of light-transmitting rod members having transverse dimensions of the order of 2 to 6 millimeters equally spaced around and extending in substantially parallel relationship with the discharge path between said electrodes and overlapping said electrodes and means for supporting said rod members at a distance from about several millimeters to about 15 millimeters from said discharge path.

5. In an electrical discharge device, an envelope, stem portions on opposite ends of said envelope, operating electrodes capable of sustaining a discharge in said envelope and supported by said stem portions and means for stabilizing a discharge between said electrodes, said means consisting of a series of rod members equally spaced around and extending in substantially parallel relationship with the discharge path between said electrodes and overlapping said electrodes and collar members on said stem portions and attached to said rod members whereby said rods and collar member serve as spacer means between said stem portions during and after manufacture.

6. In an electrical discharge device, an envelope, operating electrodes capable of sustaining a discharge in said envelope, electrode supports extending into said envelope from opposite portions thereof and means for stabilizing a discharge between said electrodes, said means consisting of a series of rod members equally spaced around and extending in substantially parallel relationship with the discharge path between said electrodes and overlapping said electrodes, and supporting means for said rod members, said supporting means engaging with said electrode supports whereby said rods and the support means therefor serve as spacer means between said electrode supports during manufacture of said device.

7. A gaseous electric discharge device of the high pressure type having operating electrodes spaced apart a distance less than the diameter of the envelope part surrounding said electrodes, said device comprising electrode supports disposed between said electrodes and said envelope and means for accurately spacing said electrodes during the manufacture of said device and for stabilizing the discharge between said electrodes, said means consisting of rod members overlapping said electrodes, equally spaced around and extending substantially parallel to the discharge path between said electrodes and rod support members engaging said electrode supports.

8. A gaseous electric discharge lamp of the high pressure type having operating electrodes spaced apart a distance less than the diameter of the envelope part surrounding said electrodes, said lamp comprising electrode supports disposed between said electrodes and said envelope and means for accurately spacing said electrodes during the manufacture of said lamp and for stabilizing the discharge between said electrodes, said means consisting of light transmitting rod members overlapping said electrodes, equally spaced around and extending substantially parallel to the discharge path between said electrodes and rod support members engaging said electrode supports.

9. A gaseous electric discharge lamp of the high pressure type having operating electrodes spaced apart a distance less than the diameter of the envelope part surrounding said electrodes, said lamp comprising electrode supports disposed between said electrodes and said envelope and means for accurately spacing said electrodes during the manufacture of said lamp and for stabilizing the discharge between said electrodes, said means consisting of light transmitting rod members having transverse dimensions of the order of 2 to 6 millimeters, said rod members overlapping said electrodes, equally spaced around and extending substantially parallel to the discharge path between said electrodes and rod support members engaging said electrode supports and supporting said rod members at a distance from about several millimeters to about 15 millimeters from said discharge path.

RUDOLF PELLMANN.