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INCANDESCIBLE CATHODE DISCHARGE TUBE HAVING A GASEOUS FILLING

Original Filed May 15, 1933

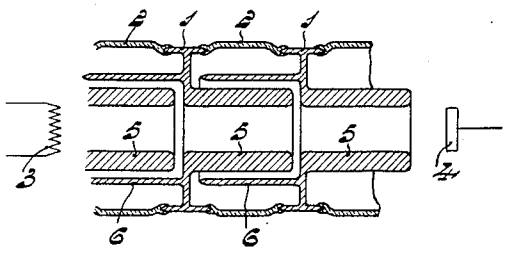


Fig. 1

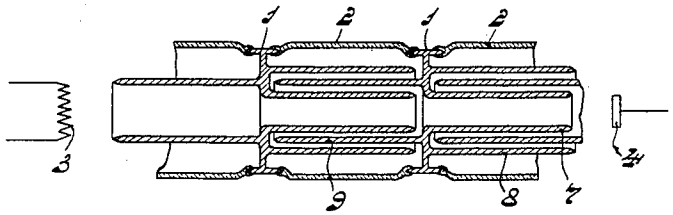


Fig. 2

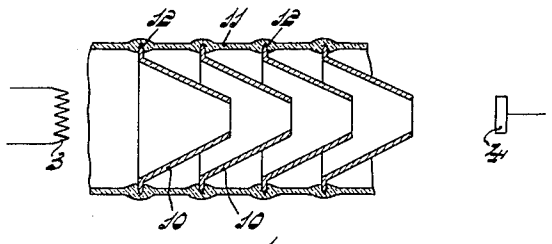


Fig. 3

INVENTOR

ALFRED KUNTKE

By Alex B. Stevens.

Attorney.

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INCANDESCIBLE CATHODE DISCHARGE TUBE HAVING A GASEOUS FILLING

Alfred Kuntke, Eindhoven, Netherlands, assignor, by mesne assignments, to N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands, a Dutch company

Detached from application Serial No. 671,240, May 15, 1933. This application October 28, 1933, Serial No. 695,700. In Germany May 13, 1932

6 Claims. (Cl. 250—27.5)

The present invention relates to gas-filled incandescible cathode discharge tubes and more particularly to such tubes as described and claimed in the copending application of J. G. W. Mulder and myself, Serial Number 671,240, filed May 15, 1933, from which application the subject-matter of this application has been taken.

These tubes have a plurality of metal bodies disposed between their anode and cathode, which bodies surround the discharge path. These metal bodies have the effect that the voltage across the discharge path is sub-divided. In order that the bodies have always the right potential, they may be interconnected by impedances, for example, condensers which are thereby connected in series across the terminals of the tube and maintain the proper voltage distribution throughout the path of the discharge.

The conductive bodies have small mutual distances and the diameter of the glass wall surrounding the spaces between the bodies are considerably larger than the path of the discharge confined by the conductive bodies, so that electric charges on the glass wall do not affect the course of the discharge.

One object of the present invention is to entirely eliminate any influence of wall charges on the discharge path.

A further object of my present invention is to provide for a better distribution of the voltage.

A still further object is to avoid the use of external impedances for the division of the voltage.

My invention comprises using metal bodies having portions that project within or telescope with portions of adjoining bodies, thus shielding the discharge path from the wall of the tube. The distance between the overlapping portions preferably does not exceed a few millimeters.

These overlapping portions form together a condenser and consequently there are a number of condensers at least one less than the number of conductive bodies connected across the discharge path. These condensers act as the impedances above referred to. The impedances externally mounted may therefor be smaller or if the capacity of the internal condensers is large enough may be dispensed with altogether. In order to enhance the capacity between the adjoining bodies the overlapping may be bilateral.

Preferably the innermost portion of the conductive bodies is turned towards the anode. This appears to result in a somewhat greater back ignition voltage.

In a very simple form the bodies have the shape of open ended truncated cones, which partly overlap each other and have their wider edges supported by the wall of the tube.

My invention will be more clearly described by reference to the accompanying drawing representing by way of example three embodiments thereof. Each of the figures is a section through a portion of a discharge tube showing a number of conductive bodies surrounding the path of the discharge.

In Fig. 1 the bodies overlap each other at one side only.

In Fig. 2 the overlapping is made bilateral.

In Fig. 3 the bodies have a truncated conical shape.

A wall consisting of metal sleeves 1 and glass portions 2 sealed to the edges of the sleeves forms a tubular portion of the discharge tube in Figs. 1 and 2. At one end of the this portion an incandescible cathodes 3 is arranged and at the other end an anode 4.

The drawing represents only part of the tubular portion. The ends of the tube and the electrodes may be shaped as more fully described in the aforesaid application. The sleeves 1 form portions of metal bodies consisting in the modification shown in Fig. 1 of a narrower tubular portion 5 and a wider tubular portion 6, the latter being turned towards the cathode 3. The portions 5 are surrounded by the portions 6, thus the discharge path confined by the inner surface of the portions 5 is entirely shielded against the portions 2 of the tube wall. Electric charges on these glass portions cannot influence the discharge phenomenon since no electric line of force starting from these portions can penetrate into the discharge path. The adjoining portions 5 and 6 have a considerable surface and a very small mutual distance. Consequently they present a condenser of considerable capacity and as one metal body has a surrounded portion adjoining the preceding body and a surrounding portion adjoining the next body, all these condensers are connected in series and take each an equal portion of the voltage.

This voltage dividing effect is enhanced by making the usual distances of the metal bodies as small as possible (a few millimeters or even less) and by enlarging the surfaces of the condenser plates. Such an enlargement is shown in Fig. 2 in which the bodies have one portion consisting of a double cylinder (7, 8) between which extends the other portion (9) of the next body (as considered from the side of the cathode). The surface of each condenser is thereby made

nearly twice as large as in the embodiment shown in Fig. 1.

In Fig. 3 the tubular bodies 10 have the shape of open ended truncated cones, which partly overlap each other and which thereby provide for the desired capacity effect, and at the same time the smaller bases being turned towards the anode, provide for a reduction of the discharge path diameter in this direction which has proved to be more favourable with respect to the danger of back ignition than the reverse arrangement.

The edges 12 of the bodies 10 are flared outwards and sealed to the glass wall 11, thus forming partitions that divide the tube in a number of sections. The capacity between the metal bodies widely depends on the distance in axial direction; varying this distance causes both the adjoining surfaces and the mutual distance to be varied. Therefore this mode of realization is less reliable than the first ones, also because shielding off the discharge path is not so completely effected, but it is less expensive to make.

What I claim is:

1. A discharge tube for high voltages comprising a gaseous filling, an incandescible cathode and an anode disposed at the two ends of the tube, and a plurality of tubular metal bodies between said cathode and anode and surrounding the discharge path, portions of said bodies projecting within portions of adjoining bodies.

2. A discharge tube for high voltages comprising a gaseous filling, an incandescible cathode and an anode disposed at the two ends of the tube, and a plurality of substantially identical tubular metal bodies surrounding the discharge path, portions of said bodies telescoping with adjoining bodies, the distance between the opposing ends and the overlapping portions being of the order of a few millimeters.

3. A discharge tube for high voltages comprising a gaseous filling, an incandescible cathode and an anode disposed at the two ends of the tube, and a discharge path between same, a plurality of conducting cylindrical bodies surrounding the discharge path, said bodies having portions bilaterally overlapping adjoining bodies, the distance between the opposing ends and overlapping portions of adjoining bodies being of the order of a few millimeters.

4. An electric discharge tube for high voltages comprising, a vitreous envelope, a gaseous filling, an incandescible cathode and an anode, said cathode and anode being disposed at the two ends of the tube, and a discharge path between same, a plurality of open-ended truncated conical members disposed in said tube and surrounding the discharge path, and having their smaller bases turned towards the anode, said members protruding into each other.

5. A discharge tube for high voltages a vitreous envelope, having a cylindrical portion, a plurality of metal partitions in said cylindrical portion, said partitions having the shape of open ended truncated cones, disposed with their smaller bases turned in the same direction and having at their opposing bases a flared out rim sealed into the cylindrical wall portion.

6. An electric discharge tube for high voltages comprising a cylindrical envelope having insulating portions, an incandescible cathode, an anode and a gaseous filling therein, a discharge path between said cathode and anode, and hollow conducting bodies disposed between said cathode and anode and surrounding the discharge path, said conducting bodies being connected to the insulating portions of said envelope, said hollow conducting bodies telescoping with each other.

ALFRED KUNTKE.