July 4, 1939. W. ESPE 2,164,507

DISCHARGE TUBE

Filed July 3, 1936

FIG. 1

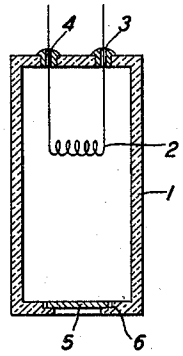


FIG. 2

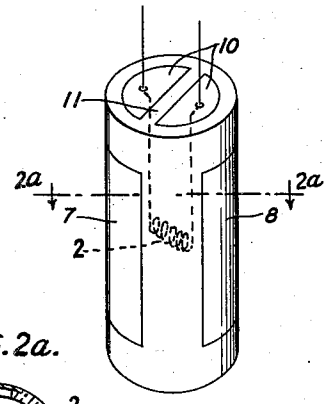


FIG. 2a.

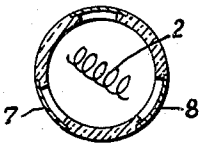


FIG. 4

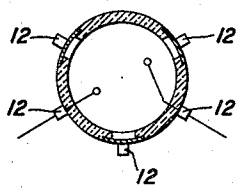


FIG. 3

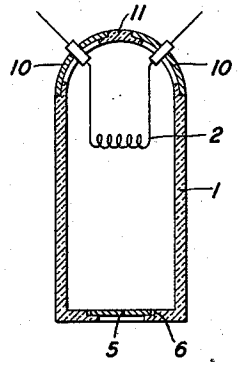


FIG. 5

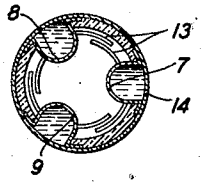


FIG. 6

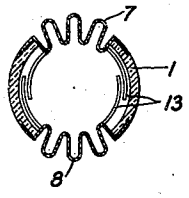
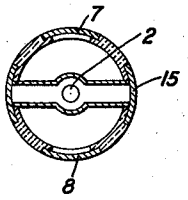


FIG. 7



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DISCHARGE TUBE

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Application July 3, 1936, Serial No. 88,757
In Germany September 19, 1935

9 Claims. (Cl. 250—27.5)

Discharge tubes have already been manufactured whose walls consist wholly or partially of ceramic materials. The present invention relates to improvements in such discharge tubes.

In accordance with the invention in an electrical discharge tube whose walls consist at least partially of ceramic materials, the walls are provided with window-type apertures in which the electrodes are set, for example soldered in. It is thereby immaterial whether the window-type apertures serving to receive the electrodes are provided on the front or side walls of the tube. It is recommended to employ as ceramic materials for tubes in accordance with the invention those materials having a low angle of loss and a high vacuum density, for example calite or calan. Quartz would also be suitable for this purpose.

Experience has shown that it frequently happens that with movable and transportable apparatus in which electrical discharge tubes are employed, the latter get loose or fall out of their sockets. Soldering, however, is unsuitable, particularly because the rapid interchangeability of the discharge tubes thereby becomes impossible. Therefore bayonet valve sockets have already been suggested whose lateral surfaces are provided with individual pins serving for contact making and for leading into the appurtenant bayonet socket. With discharge tubes in accordance with the present invention such pins can easily be arranged on the lateral limiting surfaces of the tube whereby they are adapted for insertion in bayonet sockets.

The invention will be clear from the drawing. Figs. 1, 2, 2*a*, 3 to 5, 5*a*, 6 and 7 show some examples, that is Fig. 1 shows a single anode rectifier whose portion 1 is made of a ceramic material. 2 is the cathode whose lead wires enter the tube at the points 3 and 4. 5 is the anode which is connected in the window-type aperture at 6 with the ceramic portion 1 in accordance with one of the well-known methods of soldering.

Figs. 2 and 2*a* show an example of a three-anode rectifier in which the anodes 7 and 8 and the third anode not shown in Fig. 2 of the drawing are inserted in the window-type apertures which are situated in the jacket surface of the cylindrical vessel. 10 are window-type metal portions through which the lead wires to the cathode enter the tube. 11 is a bridge of ceramic material for the purpose of giving the front of the tube greater stability and insulating the windows 10 from each other. The front of such a discharge tube can also be constructed convexly as shown in Fig. 3 in order to increase the security against the pressing in of these wall portions when the tubes are evacuated.

Fig. 4 shows an example of a three-anode rectifier which is provided with pins which facilitate insertion in a so-called bayonet socket. The pins are designated by 12 and are conductively connected with the anodes or with the lead wires to the cathode. A device may hereby easily be made by means of which the discharge tube is locked in the socket and is then securely protected against falling out.

In Fig. 5 the anodes 7, 8 and 9 are constructed concave. Thereby the advantage is obtained that the ceramic parts of the wall for thermionic reasons are further away from the hot cathode than the metal anodes which on account of the discharge conditions must be arranged as near as possible to the cathode. 13 represents metallic screens which serve for screening the insulating surfaces against the rebounding electrons and to prevent secondary emission. Such a metallic screening of the ceramic walls can also be obtained by metallizing the ceramic walls with a metallic coating 16, as shown in Fig. 5*a* in accordance with one of the known methods and by grinding out suitable portions, taking care that a conductive connection no longer exists between this metal coating and the electrodes, for example the anodes.

With examples according to Fig. 5 an intensive cooling of the anodes 7, 8 and 9 can also very easily be obtained by surrounding the discharge vessel for example with a cylindrical sheath 14 and then moving a gaseous or fluid cooling means along the anodes.

In Fig. 6 by a corresponding construction of the anodes 7 and 8 their cooling is taken care of. The anodes can either be made corrugated or provided with cooling ribs.

Fig. 7 shows an example of a discharge tube according to the invention which in addition to the anodes and the cathode has a further grid type electrode 15, for example in the middle, which may be employed for example to control the discharge tube.

The inventive idea is not exhausted by the embodiments shown. A series of other embodiments are conceivable in accordance with the invention in which one or more electrodes of the discharge tube are inserted in window-type apertures of the ceramic walls.

What is claimed is:

1. An electron discharge device comprising a hollow enclosing vessel of ceramic material having apertures in one end thereof, metallic plate

terminals sealed in said apertures flush with the surface of said vessel, and an electrode within said vessel supported by said terminals.

2. An electron discharge device comprising an enclosing vessel of ceramic material having window-type apertures therein, metallic members sealed in said apertures in planar relation to the surface of said vessel and forming part of the wall of said vessel, and terminals projecting from some of said members.

3. An electron discharge device comprising an enclosing vessel of ceramic material having apertures formed in the side walls thereof, and metallic members sealed within said apertures and preserving the contour of said vessel.

4. An electron discharge device comprising an enclosing vessel of ceramic material having apertures quadrilateral formed in the side walls thereof, and electrodes sealed in said apertures flush with the surface of said vessel.

5. An electron discharge device comprising a cylindrical enclosing vessel of ceramic material having a window-type aperture therein, a metallic electrode sealed in said aperture flush with the exterior wall of said vessel, an electron emitter within said vessel, and terminals for said emitter sealed in the wall of said vessel.

6. An electron discharge device including an envelope of ceramic material, said envelope having a slot extending through its wall and a groove on a surface of the envelope superimposed on said slot, a thermionic cathode within said envelope, and another electrode supported in said groove and sealed to said envelope and closing said slot.

7. An electron discharge device including an envelope of ceramic material, said envelope having a plurality of slots extending through the wall thereof, an electrode positioned in the wall of and sealed to said envelope and closing one of said slots, a thermionic cathode within said envelope, and another electrode supported in the wall of said envelope in register with another of said slots and out of contact with said first mentioned electrode.

8. An electron discharge device including an envelope of ceramic material having a plurality of slots extending through the wall thereof, a groove on said envelope superimposed on each of said slots, an electrode constituting a part of the outer surface of said envelope positioned in a groove and hermetically sealed to said envelope over one of said slots, and another electrode supported by another of said grooves in spaced relationship and out of contact with said first-mentioned electrode.

9. An electron discharge device including an envelope of ceramic material having slots extending through the wall thereof, a metallic electrode in the wall of said envelope and hermetically sealed to said envelope over at least one of said slots, a thermionic cathode within said envelope, the wall of said envelope being provided with a groove on a surface of the envelope and superimposed on at least one of said slots, and another electrode supported in said groove out of contact with the first-mentioned electrode.

WERNER ESPE.