June 12, 1928. 1,673,789

H. J. NOLTE ET AL

ELECTRON DISCHARGE DEVICE

Filed Nov. 13, 1923

Fig. 1.

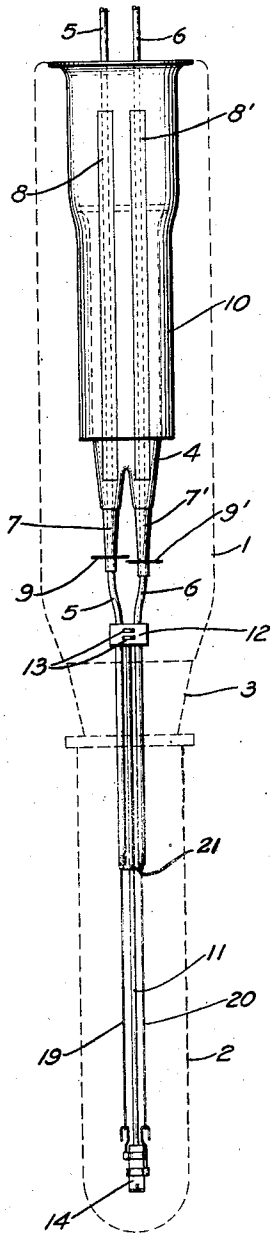


Fig. 2.

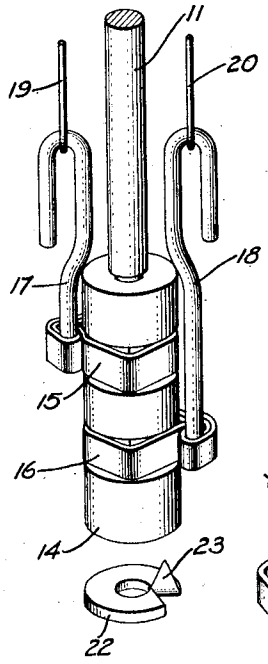


Fig. 3.

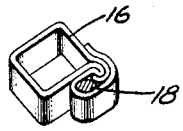


Fig. 4.

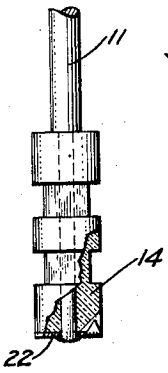
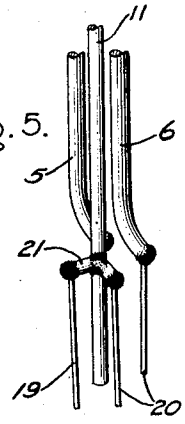


Fig. 5.



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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE DEVICE.

Application filed November 13, 1923. Serial No. 674,549.

The present invention relates to the construction of high powered electron discharge devices containing an incandescent cathode, and its object is to increase the energy capacity and ruggedness of these devices.

Our invention relates in particular to the construction of the parts supporting the cathode. In high powdered electron tubes as heretofore constructed the cathode has been constituted either by a straight filament connected at its ends to conductors sealed into opposite ends of the container, or it has consisted of a single V-shaped filament. In the case of either type of construction an increase of size or length of the filament introduces difficulties and complications which are out of proportion to the advantage gained thereby.

In accordance with our present invention we have provided an improved construction comprising a pedestal or supporting member consisting of refractory metal at the extremity of which is provided an anchor of highly refractory insulating material, such as quartz, or lava, for holding a plurality of cathode members in fixed relation. The refractory metal pedestal also provides at another point a series connection between said members which forms an integral part of the pedestal. These and other details of our invention will be explained with greater detail in the following specification and set forth with particularity in the appended claims.

Fig. 1 of the accompanying drawing is a front elevation of our new cathode assembly cooperating tube members being indicated by dotted lines; Fig. 2 is an enlarged view of the anchoring device; and Figs. 3, 4 and 5 are detail views of features of construction.

In the device shown in Fig. 1 the elongated container shown in dotted outline consists of a glass member 1, a metal member 2 and an intermediate sealing cone 3. The cathode assembly is supported upon a reentrant glass stem 4 and comprises leading-in conductors 5, 6 which are joined to sealing cones 7, 7′ and are preferably provided with insulating sleeves 8, 8′ consisting of quartz, or other suitable insulation. Upon the cones 7, 7′ are mounted shields 9, 9′ for protecting the seals from ion bombardment. A tubular glass sheath 10 surrounds the stem 4. Upon the stiff conductors 5, 6, which preferably consist of tungsten is mounted an elongated pedestal 11 which consists preferably of tungsten or other suitable refractory metal. The means for rigidly mounting the pedestal 11 is a clamp 12 consisting of small plates of refractory metal provided with interposed insulation of mica or the like (not shown) and held together by the wires 13.

At the opposite end of the pedestal 11 is mounted a support or anchor 14 consisting preferably of a sleeve of quartz. As shown on a magnified scale in Fig. 2, this anchor 14 is provided with transverse grooves having an angular surface and being surrounded by bands 15, 16 of refractory metal, for example, molybdenum. Frictionally secured to these bands are hooks 17, 18, the bands being wrapped both around the anchor 14 and the shanks of the hooks, as shown in Fig. 3. Each of the cathode filament sections 19, 20 are secured preferably by welding at one extremity to the leads 5, 6 and at the opposite extremity to a short cross piece 21 (Fig. 5), which in turn is welded to the pedestal 11, thus connecting the two sections in series. The bight or closed end of each of these filaments is held by the hooks 17, 18.

To prevent any tendency for the filament sections to be twisted during use by any rotation of the support 14, with respect to the pedestal, the tip of the pedestal is provided preferably by welding, with a plate 22 having a spur 23, which engages an indentation in the quartz sleeve, as shown in Fig. 4.

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

1. An electron discharge device containing a pedestal consisting of refractory metal, an anchor consisting of refractory, insulating material affixed to one end of said pedestal, and provided with transverse grooves, hooked supports strapped into said grooves in insulating relation to each other, terminal conductors and a plurality of cathode members connected to said conductors and engaging with the hooked supports of said anchor.

2. A cathode structure for electron discharge devices comprising leading-in conductors, a pedestal consisting of refractory metal supported by said conductors, an an-

chor consisting of refractory, insulating material affixed to said pedestal at a point remote from said conductors, a plurality of cathode sections connected at one end to said leading-in conductors, and engaging with said anchor, a conductor affixed upon said pedestal for connecting said cathode sections in series.

3. A cathode structure for electron discharge devices, a plurality of leading-in conductors, a metal pedestal mounted upon said conductors, a clamp holding said conductors and pedestal in fixed relation, a plurality of cathode filaments each connected respectively at one end to said leading-in conductors, a series connection for said filaments mounted upon said pedestal, and an anchor of insulating material for said filaments also mounted upon said pedestal.

4. An electrode structure for electron discharge devices comprising a stem adapted to be sealed into a container, a plurality of electric leads sealed into and projecting beyond said stem, a plurality of electrode members connected to said leads, an elongated support consisting of refractory metal supported by said leads, and refractory insulating anchoring means engaging with said electrode members and affixed to said support at a point remote from said stem.

5. A support for a filamentary cathode comprising a stem, lead wires sealed therein, a pedestal of metal supported by said wires, an anchor of insulating material mounted upon said pedestal, means engaging with both said pedestal and anchor for preventing relative displacement thereof, and means mounted upon said anchor for engaging with a filamentary cathode.

6. A cathode in an electron discharge device comprising a glass stem, lead wires sealed therein, a pedestal of metal fixedly supported by said wires, an anchor of insulating material having a plurality of transverse grooves, metal bands engaging with said grooves, hooks frictionally held by said bands, and a conductor welded transversely upon said pedestal at a place removed from said anchor, and V-shaped filament sections engaging with said hooks and connected at opposite ends respective to said lead wires and to said transverse conductor.

7. A support for a filamentary cathode comprising a refractory metal pedestal, a plate having a spur and being joined to the end of said pedestal, a refractory insulating sleeve having a notch engaging with said spur, holders mounted upon said sleeve, and means for conducting a heating current to filaments mounted upon said holders.

8. A support for the filamentary cathode of an electric discharge device, said device comprising a stem, leading-in conductors sealed therein and connected to the ends of said filamentary cathode, a pedestal of refractory material mounted upon and supported by said conductors and anchoring means for said cathode mounted upon said pedestal.

In witness whereof, we have hereunto set our hands this 12th day of November, 1923.

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RAYMOND B. PRINDLE.