April 13, 1926. 1,580,850

R. M. OTIS ET AL

ELECTRON DISCHARGE DEVICE

Filed June 29, 1925

Fig. 1.

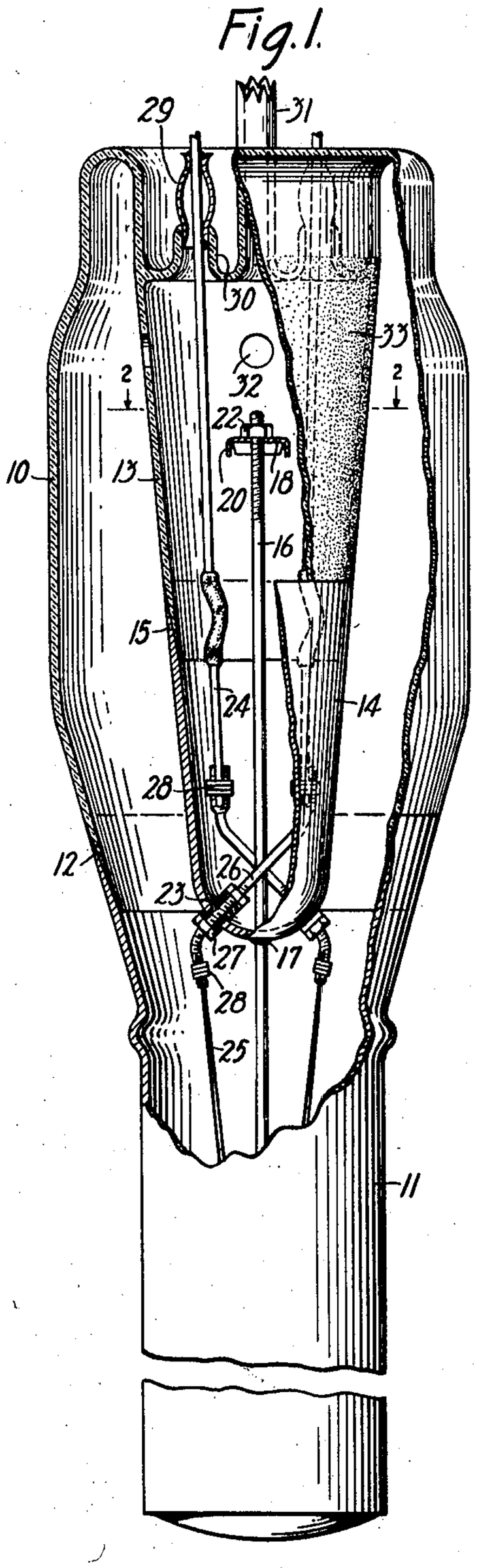


Fig. 2.

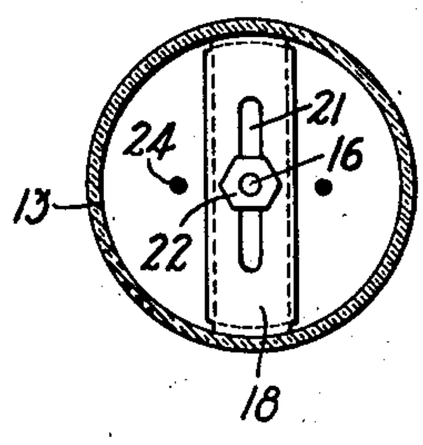
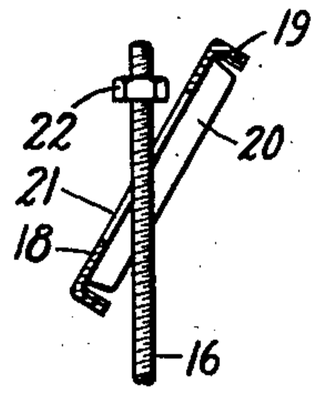


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE DEVICE.

Application filed June 29, 1925. Serial No. 40,185.

To all whom it may concern:

Be it known that we, RUSSELL M. OTIS and WILBUR F. FUNK, citizens of the United States of America, residing at East Orange, in the county of Essex and State of New Jersey, and at Midland Beach, in the county of Richmond and State of New York, respectively, have invented certain new and useful Improvements in Electron-Discharge Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to electron discharge devices and more especially to devices of this character capable of operating on high voltages.

In devices of this character, particularly the exterior anode type in which the anode forms a part of the enclosing vessel, the extremely high potential applied to the anode results in a discharge from the anode to any corner or sharp edge that may be present in the cathode supporting structure.

An object of this invention is a filament supporting structure having no sharp edges or corners, thereby preventing the discharges.

This object is attained by mounting on the stem of the enclosing vessel a conical metal cap from which the cathode is supported. A supporting rod centrally affixed to the metal member and carrying a bridge member or spider engages the inner surface of the glass stem. The conical member supports the cathode through suitable insulators and forms a smooth surface, corona shield which protects the low fusing metal parts and glass stem from the high potential applied to the anode. The glass stem is also provided with a metallic coating to form a continuation of the conical metal shield, thereby reducing the amount of metal contained in the device.

Referring to the drawings, Fig. 1 shows an electron discharge device with portions broken away to clearly illustrate the invention. Fig. 2 is a cross-sectional view of the stem on the line 2—2 of Fig. 1, and Fig. 3 is a detailed view of the bridge member.

The electron discharge device comprises a glass portion 10 and a metal cup-shaped portion 11, which is welded to the glass portion at 12, in a manner disclosed and claimed in W. G. Houskeeper Patent No. 1,294,466, issued February 18, 1919. Extending within the glass portion 10 is a tapered stem 13, which is joined to the outer end of the glass portion 10. A cup-shaped metal member 14, preferably of molybdenum, and having the rim thereof sharpened to a knife edge 15, fits over the glass stem 13. A molybdenum rod 16 passes centrally through the metal member 14 and is welded thereto at 17 intermediate the ends of the rod 16. The end of the rod 16 projecting within the glass stem 13 is threaded and carries a bridge member or spider 18, which is adapted to engage the inner wall of the stem 13. This bridge member is provided with right angular bends 19 at each end, and reenforcing side members 20. An elongated slot 21 in the bridge member provides an easy means for assembling the supporting unit and inserting the unit in the glass stem. A nut 22 holds the bridge member on the central rod 16 and provides means for rigidly clamping the bridge member to the glass stem. The crown of the metal member 14 is hemispherical to provide a surface which does not present any sharp edges to the potential applied to the anode 11. An aperture provided in the crown of the metal member 14 on either side of the central rod 16 provides means whereby an insulating sleeve 23 may be positioned in the member 14, through which leading-in wires 24 may be connected to the tungsten filament 25, by a threaded metal connector 26, which passes through the insulator 23 and is rigidly attached thereto by nuts 27. The connections between the leading-in wires and the connector and the filament and the connector is accomplished by threading a closed wire helix 28 over the wire and the threaded end of the connector 26. The leading-in wires 24 extend through the stem on either side of the central supporting rod 16 and bridge 18 and are soldered to tubular caps 29, hermetically sealed to glass tubes 30, projecting outwardly from the stem wall. The central tube 31 provides means for evacuating the space within the stem 13 and metal member 14, while the space surrounding the stem and support is evacuated through peripheral openings 32 surrounding the lower portion of the glass stem 13.

While it is within the spirit of this invention to extend the cup-shaped metal member 14 the full length of the stem to provide a complete shielding effect for the glass and interior metal parts, it is preferable to provide a metallic coating 33 such as silvernitrate, which may be sprayed or painted on the stem, thereby materially reducing the amount of metal in the device. This arrangement provides an easily assembled structure in which the metallic electrode supporting frame forms a smooth surface to any corona discharges in the device and completely shields the low melting point metal parts enclosed within the glass stem.

What is claimed is:

1. An electron discharge device comprising a glass vessel having a stem, a tubular metal member on said stem, a rod attached to said member and passing centrally within said member and stem, clamping means carried by said rod, and an electrode supported by said rod.

2. An electron discharge device comprising a glass vessel having a stem, a tubular metal member on said stem, a rod attached to said member and passing centrally within said member and stem, a bridge member carried at one end of said rod, and an electrode supported on the other end of said rod.

3. An electron discharge device comprising a glass vessel having a stem, a tubular metal shield on said stem, a central rod attached to said shield, a portion of said rod extending within said shield and stem, clamping means carried by said rod within said stem, a portion of said rod projecting through said shield, and an electrode supported by said second portion.

4. An electron discharge device comprising a glass vessel having a stem, a tubular metal shield on said stem, a central rod attached to said shield, a portion of said rod extending within said shield and stem, a bridge member carried by said portion, said member engaging the inner surface of said stem, and an electrode supported on the other end of said rod.

5. An electron discharge device comprising a glass vessel having a stem, a tubular metal shield on said stem, a rod centrally positioned with respect to said shield and attached thereto intermediate the ends of said rod, means carried on one end of said rod to rigidly hold said shield on said stem, and a cathode supported by said shield and rod.

6. An electron discharge device comprisa glass vessel having a stem, a metal shield on said stem, means carried by said shield within said stem to frictionally engage the inner wall of said stem, and electrode supporting means carried by said shield.

7. An electron discharge device comprising a glass vessel having a stem, a shield, a concentric member passing through said stem, and shield, a bridge arm having an elongated slot attached to said member, said arm engaging the inner surface of said stem, and means on said member for tensioning said arm.

8. An electron discharge device comprising a glass vessel having a stem, a conical shield, a concentric member passing through said stem and shield, a bridge arm attached to said member, said arm having reenforcing side portions, said arm engaging the inner surface of said stem, and means on said member for tensioning said arm.

9. An electron discharge device comprising a glass vessel having a stem, a conical shield on said stem, a central member passing through said shield and stem, a bridge arm having an elongated slot attached to said member, said arm engaging the inner surface of said stem, and tensioning means carried by said member, the contacting edges of said stem and shield being oppositely tapered to a knife edge.

10. An electron discharge device comprising a glass vessel having a stem, a cupshaped metal shield, means carried by said shield to securely clamp said shield on said stem, said means being internal with respect to said shield and stem, and an electrode insulatingly supported by said shield.

11. An electron discharge device comprising a glass vessel having a stem, a cupshaped metal shield attached to said stem, clamping means internal to said stem and shield, an electrode insulatingly supported by said shield, and leading-in wires within said shield and stem and connected to said electrode, said stem and shield forming a closed chamber for said leading-in wires and clamping means.

12. An electron discharge device comprising a glass vessel having a stem, a metallic shield on said stem, and a metallic coating on said stem, said shield and coating forming a smooth continuous metal surface.

13. An electron discharge device comprising a glass vessel having a stem, a conical shield for said stem, a concentric rod passing through said stem and shield, a bridging arm carried by said rod, an electrode supported by said shield, leading-in wires enclosed by said stem and shield, and a metallic coating on said stem, said coating and shield forming a smooth protective surface for said leading-in wires, rod and bridging arm.

14. An electron discharge device comprising a glass vessel having a stem, a cupshaped metal shield on said stem, an electrode insulatingly supported by said shield, and communicating ports around the circumference of said stem, said ports comprising an outlet from said vessel.

15. An electron discharge device comprising a glass vessel having an inwardly projecting stem, a cup-shaped metal shield on said stem, clamping means internal to said stem and shield, an electrode supported by said shield, said stem and shield forming a closed chamber, communicating ports in said stem, and means for evacuating said chamber and vessel through a single opening.

In witness whereof, we hereunto subscribe our names this 27 day of June A. D., 1925.

RUSSELL M. OTIS.
WILBUR F. FUNK.