Nov. 1, 1927. 1,647,238

W. H. MANTHORNE

ELECTRON DISCHARGE DEVICE

Filed June 18, 1925

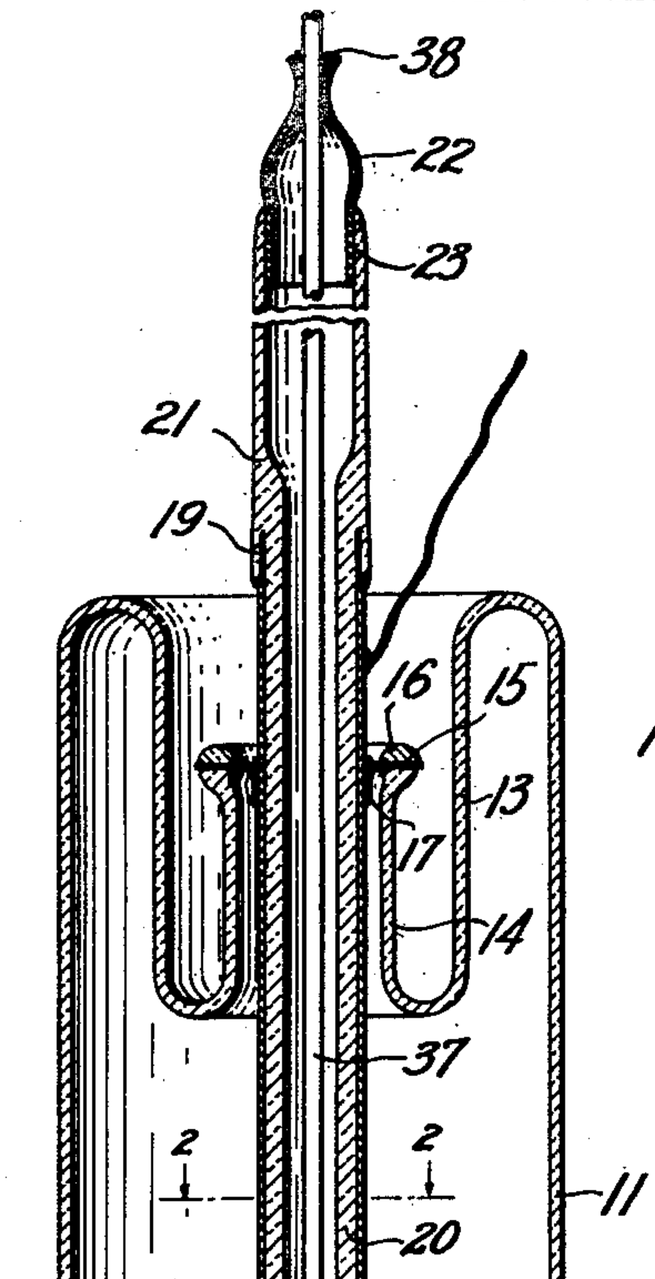
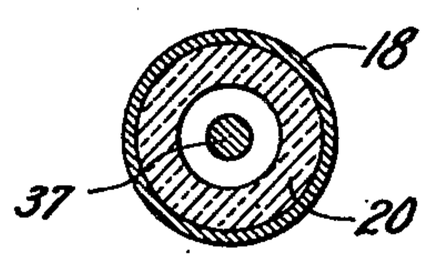


Fig. 1

Fig. 2



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ELECTRON-DISCHARGE DEVICE.

Application filed June 18, 1925. Serial No. 37,890.

This invention relates to electron discharge devices and has for an object a unitary electrode structure which may be supported from a small portion of the wall of the vessel.

This object is accomplished by providing a tubular metal member with an inner glass wall, one end of the wall extending beyond the tubular member and carrying a perforated metal cap. A metallic sleeve joined to the tubular member supports an electrode within the vessel and is in electrical contact with one end of the electrode. A wire conductor attached to the other end of the electrode passes centrally through the tubular member and is soldered to the perforated cap. This arrangement provides an easily assembled structure in which one leading-in conductor is surrounded by a tubular leading-in conductor which also serves the dual purpose of supporting an electrode and acting as a distributed potential shield whereby arcing is reduced. This unitary structure is sealed to the glass portion of the device through a single disc seal.

Referring to the drawings, Fig. 1 illustrates in section an electron discharge device embodying this invention.

Fig. 2 is an enlarged detail taken on the line 2—2 of Fig. 1 showing the relative position of the conductors.

The invention is illustrated in connection with a high power water-cooled tube of the external anode type and consists of a cup-shaped metal portion 10, and a glass portion 11, welded together as at 12, in accordance with the disclosure in W. G. Houskeeper's Patent 1,294,466 of February 18, 1919. An inwardly projecting stem 13 is attached to the glass portion 11 and carries a tubular glass portion 14 which extends outwardly with respect to the stem 13. An apertured metallic disc 15 preferably of copper, is sealed to the rim of the tubular glass portion 14, in a manner disclosed and claimed in W. G. Houskeeper Patent 1,293,441, dated February 4, 1919. A retaining ring 16 of glass is fused to the outer surface of the disc 15. The copper disc 15 is provided with a right-angle tubular portion 17 on the inner edge thereof, to provide a large supporting surface. A tubular metal member 18, preferably of copper, and having a circumference which fits easily into the portion 17 of the disc 15 is soldered or fused to the tubular wall 17 of the disc in any desirable manner. The rim of the copper tubular member 18 extending outside of the vessel is sharpened to a knife edge as at 19 to provide an air-tight seal with the glass. A glass wall 20, preferably in tubular form, is inserted within the metal member 18 and either wholly or partially fused to the inner wall thereof. A tubular extension 21 also of glass projects for a distance beyond the member 18 and has a portion extending around the outer surface of the knife edge 19. This type of seal provides an air-tight connection between the glass portion 21 of the wall 20 and the tubular member 18. Attached to the outer end of the glass extension 21 is a perforated metal cap 22. This cap is sealed to the glass portion 21, as at 23, in the same manner as disclosed in Houskeeper Patent 1,294,466, referred to above.

Attached to the inner end of the tubular member 18 is a metal tubular sleeve 24, preferably of nickel. This sleeve may be attached to the tubular member 18 in any desirable manner, for instance, by fusing or braising. The free end of the nickel tubular member is provided with interior threads 25 to accommodate a threaded metal disc 26. Affixed to the disc 26 are threaded connectors 27 and 28, the connector 27 being fastened to the disc by means of nuts 29 while the connector 28 passes through an insulating eyelet 30 and is fastened thereto by nuts 31. A rod 32 is centrally supported in the metal disc 26 by insulating eyelets 33 and nuts 34. A V shaped tungsten filament 35 is supported by the connectors 27 and 28 and the rod 32. Connected to the threaded terminal 28 is a short length of braided conductor 36 which is connected at its other end to a cylindrical conductor 37 extending centrally through the glass wall 20 and projecting through the apertured cap 22. This conductor is preferably silver-soldered to the cap 22. This arrangement provides a unitary electrode structure in which one of the current carrying conductors supports the electrode and is in electrical contact with one end thereof while the other conductor is centrally positioned within the supporting conductor but insulated therefrom by a glass wall. This arrangement also provides a structure which may be wholly assembled be-

fore inserting within the device and may be supported through a single opening in the glass wall by means of a flange carried by the tubular supporting conductor. Furthermore, the concentric arrangement of the conductors provides an enclosing wall of metal which acts as a distributed potential shield and considerably reduces the tendency of arcing between the electrodes which are maintained at a large difference of potential.

Although a particular arrangement has been described with respect to the electrode structure, it is apparent that various modifications may be made without departing from the scope of the invention, as defined in the appended claims.

What is claimed is:

1. An electron discharge device comprising a glass vessel having a tubular stem, an apertured disc sealed to the edge of said stem, a pair of concentric conductors carried by said disc, and an electrode carried by one of said conductors, the inner conductor being insulatingly sealed to the outer conductor.

2. An electron discharge device comprising a glass vessel having a stem, an apertured metal disc sealed to said stem, a tubular member carried by said disc, an insulating wall within said member, a tubular insulating extension joined to said wall, a conductor sealed to said extension and passing centrally through said wall, and an electrode carried by said member, said electrode being electrically connected to said member and conductor.

3. An electron discharge device comprising a glass vessel having a stem, a support extending from said stem, an electrode carried by said support, said support having a metal tubular portion and a flange portion, means for supporting said flange from the edge of said stem, an insulating lining within said tubular portion, and a metal member extending through said lining and sealed to one end thereof, said tubular member and metal member being the leading-in conductors for said electrode.

4. An electron discharge device comprising a glass vessel having a tubular stem, an apertured metal disc sealed to the edge of said stem, a tubular member attached to said disc, a portion of said member projecting within said vessel and a portion extending outside thereof, an insulating wall within said member, a portion of said wall extending beyond said member, a metallic cap sealed to said wall portion, a wire attached to said cap, and extending through said insulating wall, a cathode supported from said tubular member, and means for connecting said wire to one end of said cathode.

5. In an electron discharge device, an electrode unit comprising a tubular conductor, a central conductor, an insulating wall between said conductors, means for holding said central conductor to said wall and an electrode supported from said tubular conductor, one end of said electrode being in electrical contact with said tubular conductor and the other end in contact with said central conductor.

6. In an electron discharge device, an electrode unit, comprising a tubular conductor, a central conductor, a glass sleeve between said conductors, one end of said sleeve extending beyond said tubular conductor, a metallic cap fused to said sleeve, a wire sealed to said cap and extending through said sleeve, a metallic block carried by said tubular conductor, and an electrode supported from said block.

7. In an electron discharge device, an electrode unit, comprising a tubular conductor, a central conductor, a glass sleeve between said conductors, one end of said sleeve extending beyond said tubular conductor, a metallic cap fused to said sleeve, a wire sealed to said cap and extending through said sleeve, a metallic block carried by said tubular conductor and an electrode supported from said block, one end of said electrode being in contact with said tubular conductor and the other end being insulatingly supported from said block and connected to said wire.

8. In an electron discharge device, an electrode support comprising a glass tubular member, a metallic cap fused to said member, a conductor passing centrally through said cap and member, a cathode, and a shield surrounding said glass member and conductor, said shield being the supporting means for said cathode.

9. In an electron discharge device, an electrode support comprising a glass tubular member, a metallic cap fused to said member, a conductor passing centrally through said cap and member, a cathode, a closed metallic shield enclosing the greater portion of said tubular member, and means for connecting the ends of said cathode respectively to said shield and conductor.

10. In an electron discharge device, an electrode support comprising a glass tubular member, a metallic cap fused to said member, a conductor passing centrally through said cap and member, a cathode, and a tubular current carrying member exterior to said glass member, said member supporting said cathode and shielding said conductor.

In witness whereof, I hereunto subscribe my name this 12th day of June, A. D., 1925.

WILLIAM H. MANTHORNE.