Nov. 1, 1927. 1,647,617

T. R. GRIFFITH

ELECTRON DISCHARGE DEVICE

Filed July 7. 1925

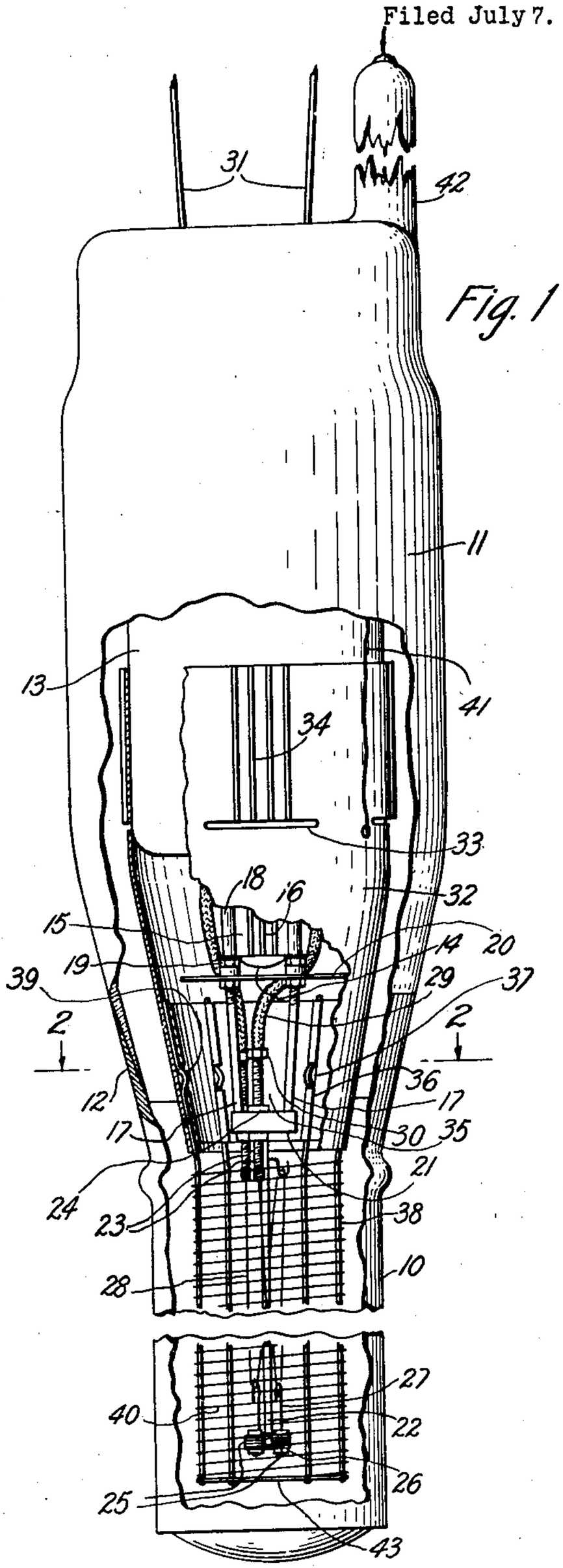


Fig. 1

Fig. 2

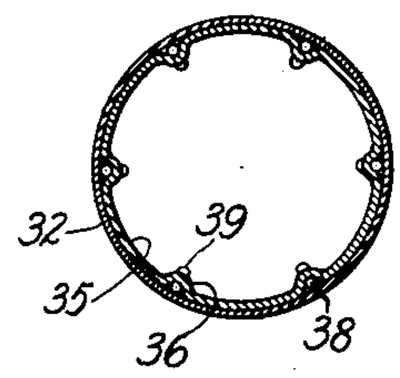


Fig. 3

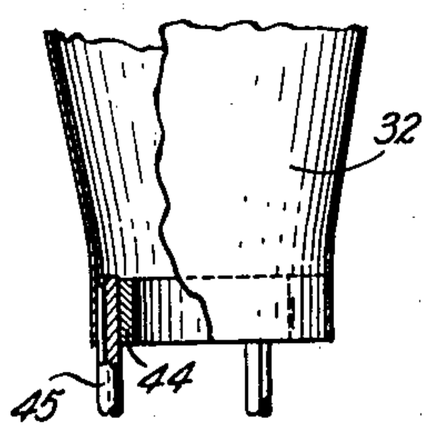
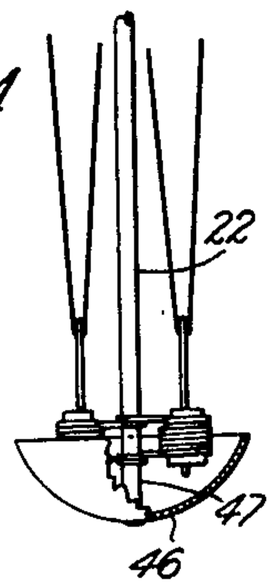


Fig. 4



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UNITED STATES PATENT OFFICE.

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ELECTRON-DISCHARGE DEVICE.

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This invention relates to electron discharge devices and more particularly to such devices capable of handling high voltage.

The object of the invention is to prevent arcing between the electrodes due to the large differences of potential between them.

This object is attained in an external anode device by providing a closed tapered metal shield around the cathode supporting structure, the upper portion being fitted over the glass stem and the lower portion carrying a ribbed metal insert. A plurality of supporting rods are rigidly held in the ribbed insert and support the helical wire grid. The end of the cathode support within the helical grid is protected by a metal shield supported on the grid supporting rods to prevent any arcing path between the anode and the cathode support. This arrangement provides an easily assembled structure in which one electrode support forms a smooth metallic surface to completely shield another electrode structure from arc discharges and corona effects.

Referring to the drawings Fig. 1 shows an electron discharge device with a part broken away to clearly illustrate the invention. Fig. 2 is a cross section of the grid support on the line 2—2 of Fig. 1. Fig. 3 is a partial view of a modified form of grid support and Fig. 4 is a modified cathode shield for a two electrode device.

The electron discharge device, shown in Fig. 1, consists of a cup-shaped metal anode 10 which forms a part of the enclosing vessel and a glass portion 11 which is joined to the tapered end of the anode at 12. A glass stem 13 is fused to the end of the glass portion 11 and projects within the enclosing vessel. A concentric tubular glass extension 14 is joined to the inner end of the glass stem 13. A metallic collar 15 is frictionally supported on the glass extension 14 by means of longitudinal corrugations 16. This collar is provided with perforated tabs through which the cathode supporting rods 17 extend. A spacing sleeve 18 and nuts 19 rigidly support the rods 17 from the collar. A metallic heat radiating shield 20 is supported on the rods 17 and completely shields the glass extensions 14 from the excessive heat generated in the device. A metallic block 21 is supported on the ends of the rods 17 and carries a central supporting rod 22 and a pair of threaded connectors 23. These connectors are insulated from the metal base by "lavite" insulating bushings 24. Supported from the end of the rod 22 is a pair of molybdenum wire nests 25 which carry insulating inserts 26, preferably of lavite. Molybdenum wire suspension hooks 27 are supported in the lavite inserts and project toward the metallic block 21. A tungsten filament 28 is strung between the threaded connectors 23 and molybdenum hooks 27. A length of braided copper conductor 29 is connected to the other end of each threaded connectors 23 by means of nuts 30, these lengths of braid being connected to copper leading-in wires 31.

Since the voltages applied to the anode are considerably higher than the voltages applied to the cathode, this large difference of potential creates arcing paths between the anode and the sharp points of the various elements contained in the cathode structure, and results in puncturing the glass and consequently destroying the tube. This effect is counteracted in accordance with this invention by a tapered metal shield 32, preferably of sheet molybdenum, which surrounds the cathode supporting structure. One end of the shield is cylindrical in form and is provided with a series of slots 33 parallel with the edge of the shield. A number of longitudinal corrugations 34 between the slot 33 and the edge of the shield provide clamping means whereby the shield may be frictionally supported from the glass stem 13. The tapered end of the shield 32 is provided with a corresponding tapered metal insert 35, having inwardly projecting longitudinal ribs or grooves 36. Intermediate the ends of the insert 35 a portion of the grooves is cut out to form apertures 37. A plurality of of molybdenum rods 38 extend into the grooves 36 between the wall of the shield 32 and the insert 35 and are provided with projections 39 which fit into the apertures 37. When the supporting rods 38 are properly located in the grooves 36, the insert 35 is wedged into the tapered end of the shield 32 and is spot welded or otherwise securely fastened to the shield. This provides an efficient and easily assembled structure for the grid supporting rods. A helical wire grid 40 surrounds the rods 38 and is concentric with respect to the anode 10 and cathode 28. A

leading-in wire 41 attached to the shield 32 extends through glass tubulation 42 and is sealed thereto at the outer end.

To prevent any injury to the lavite insulators on the cathode supporting structure due to corona discharges from the anode, a molybdenum disc 43 is welded to the grid supporting rods 38, thereby forming a shield between the cathode support and the end of the anode.

Fig. 3 shows a modified form of support in which the shield 32 is welded to a molybdenum ring 44 into which the grid supporting rods 45 are fastened in any suitable manner.

While the invention has been disclosed with respect to a three electrode device, it is apparent that the features of the invention may be applied to two electrode or rectifier devices. For instance, in Fig. 4 the cathode shield 46 is formed of drawn molybdenum and is welded to an extension 47 on the supporting rod 22. This forms an umbrella type of shield around the cathode supporting insulators and prevents any injury to them due to arcs from the anode.

What is claimed is:

1. An electron discharge device comprising an enclosing vessel having a glass portion and an anode portion, a reentrant stem on said glass portion, a tubular metal shield, engaging said stem, a metallic insert having longitudinal ribs, a plurality of metallic rods projecting through said ribs, and an electrode carried by said rods.

2. An electron discharge device comprising an enclosing vessel having a glass portion and an anode portion, a reentrant stem on said glass portion, a tubular metal shield frictionally engaging said stem, a metallic insert within said shield, said insert having apertured grooves, a plurality of metallic rods positioned in said grooves, each of said rods having a bent portion projecting from said grooves, and a wire helix supported by said rods.

3. An electron discharge device comprising an enclosing vessel having a glass portion and an anode portion, a reentrant stem on said glass portion, a concentric tubular extension on said stem, a support projecting within said anode from said extension. a cathode carried thereby, a tubular metal member enclosing said support, and a control electrode supported from said member.

4. An electron discharge device comprising an enclosing vessel having a glass portion and an anode portion, a reentrant stem on said glass portion, a concentric tubular extension on said stem, a support projecting within said anode from said extension, a cathode carried thereby, a tubular metal shield enclosing said support, a plurality of metal rods carried by said shield, a wire helix supported by said rods and surrounding said cathode, and a metallic shield carried by said rods.

In witness whereof, I hereunto subscribe my name this 6th day of July, A. D. 1925.

THOMAS R. GRIFFITH.