

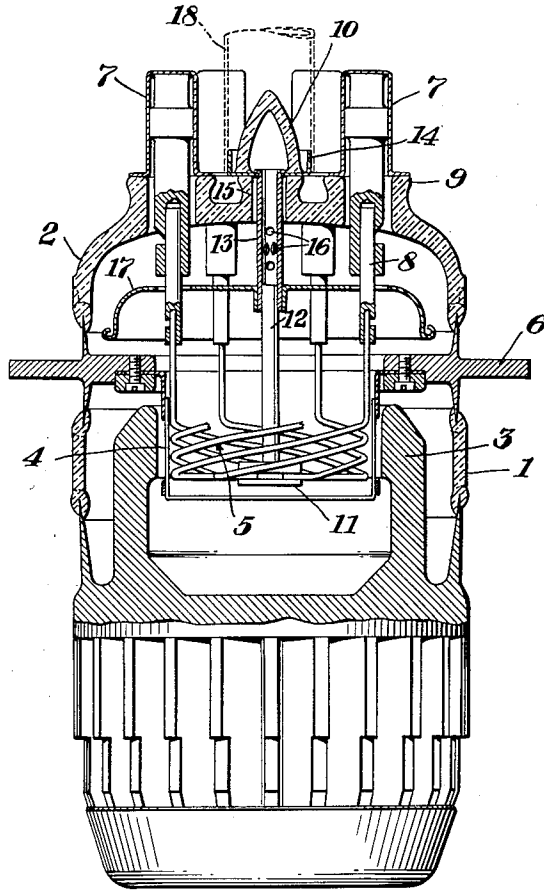
April 2, 1946.

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2,397,854

ELECTRON DISCHARGE DEVICE

Filed May 28, 1945



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2,397,854

ELECTRON DISCHARGE DEVICE

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Application May 28, 1945, Serial No. 596,149

12 Claims. (Cl. 250-27.5)

My invention relates to electron discharge devices, and particularly to electrode supports in such devices.

In medium and high power short wave transmitting tubes, a glass dish shaped header or stem is commonly employed for carrying the lead-in conductors and for closing the end of the envelope bulb. It has, heretofore, been impractical to attach electrode support rods directly to the header. The cathode center support rod, for example, has generally been indirectly supported by insulated brackets or braces bridged between two or more of the lead-in conductors, but such structures are electrically inefficient and are costly. Yet the support rods cannot easily be connected directly to the header because the usual lead-in circle will not permit further crowding. The center position of the header has of course been universally reserved for the exhaust tubulation, and asymmetrical glass-to-metal seals cause troublesome glass strains. Further, tubes heretofore proposed for ultra high frequency operation do not provide a balanced radio frequency return path since it is difficult to obtain an electrically centered return connection with respect to the filament leads.

An object of my invention is to provide an improved header and electrode assembly.

A more specific object of my invention is to provide an improved electrode-to-header attachment having a radio frequency return path centrally disposed with respect to the electrode assembly.

Still another object of my invention is to provide a direct electrode-to-header connection which does not disturb the symmetrical lead-in arrangement, and which utilizes the exhaust tubulation for the location of a center filament supporting rod which also functions as a center return lead for radio frequencies.

The invention is defined with particularity in the appended claims and one embodiment thereof is described in the following specification and shown in the accompanying drawing in which the single figure is an elevational view partly in section of one electron discharge device, or tube, to which my invention may be applied.

The specific bulb and electrode assembly chosen for illustration of my invention is of the character disclosed in the copending application of Paul G. Chevigny, Serial No. 474,085, filed January 30, 1943, which is typical of tubes to which my invention may be applied. The envelope includes a cylindrical bulb portion 1 and a dish-shaped header portion 2. The electrode assembly

bly includes an anode 3, grid 4 and cathode 5, the grid 4 being supported from a grid ring 6 sealed between the envelope portions 1 and 2. The cathode 5 is made up of a plurality of filaments, preferably of thoriated tungsten, having lead-in cup and conductor structures 7, 8 disposed in a circle concentric with and hermetically sealed through the header. The lead-in structures shown comprise deep drawn metal cups 7 with flanges joined to the rim of molded eyelets 9 of the header. The cups conveniently mount the conductor posts 8, as well as serve as terminals or base pins. For symmetry of the glass parts of the header, the exhaust opening and tubulation 10 is placed at the center of the header.

The cathode filaments are connected in a spiral between their respective lead-in conductors 8 and a castle element 11 carried by a center support rod 12. The support rod must be mechanically rigid to assure permanent electrode spacings, and must withstand, without bowing or buckling, the incandescent temperature of the cathode filaments. For this rod, solid drawn tungsten has been found suitable.

According to my invention the cathode support rod 12 is joined to the end of a tubular support member or thimble 13 which in turn is carried in and coaxial with the exhaust opening. The upper end of the tubular member 13 is formed with a flange which overlaps with a cup 14 to which it is electrically connected. A glass-to-metal bond is made between the sides of the exhaust eyelet 15 and the cup 14. The end of the exhaust tubulation 10 is butted against and sealed to the bottom portion of the cup 14 in concentric relation with respect to member 13.

To permit evacuation of the envelope, or injection of gas, communicating passages or perforations 16 are provided through the sides of the tubular member 13. The perforations 16 have the added function of constricting the flow of heat lengthwise of the member 13.

A shield 17, of refractory metal, such as nickel, is rigidly attached preferable to the member 13 at the point of connection with rod 12 by a copper braze.

In manufacture, the dish shaped header 2 may be molded and the lead-in cups 7 and the return cup 14 sealed in place. The exhaust tubulation is then added to complete the "stem" assembly. The filament conductors 8 are then attached to the lead-in cups. The ring 6 as well as the grid 4, anode 3 and cylinder portion 1 are assembled in the usual manner. After evacuation the ex-

haust tubulation is heated locally and tipped off. The glass is preferably relatively hard with a high melting temperature and a low coefficient of expansion to match and seal well with metals of the type commercially known as "Kovar."

The electrical path provided by rod 12, tubular member 13 and cup 14 constitutes a centrally disposed return lead for radio frequency energy from the electrode assembly. This center return path insures balanced operation of the tube for ultra high frequencies. The connection to cup 14, for example, may comprise a tubular element adapted to telescope therewith as indicated at 18.

While I have described my invention in connection with a particular form of apparatus, it will be clear that such is given by way of example only and not as a limitation of the scope of the invention.

I claim:

1. An electron discharge device comprising an envelope having an exhaust opening therein and an exhaust tubulation sealed over said opening, a tubular support member coaxial with said opening, and means securing said member to the envelope, the interior of said member being open to the interior of the envelope.
2. In combination, an envelope provided with an opening therein, a perforated tube sealed in the opening and an exhaust tubulation sealed over the opening.
3. An electron discharge device comprising an envelope bulb, a round glass header closing one end of the bulb, circularly arranged lead-in conductors sealed in said header, said header being provided with an opening centrally located therein, a tubular electrode support member sealed in said opening, the interior of the support member being in communication with the interior of the envelope bulb, and an exhaust tubulation sealed over said central opening.
4. An electron discharge device comprising an envelope with a dish shaped header having an exhaust opening centrally located therein, a perforated support member sealed in said opening, an electrode attached to said support member, and an exhaust tubulation sealed over said opening.
5. An electron discharge device comprising an envelope, the wall of the envelope having an opening, an exhaust tubulation sealed over said opening, a cathode in said envelope, means for supporting said cathode directly on said envelope comprising a metal support member secured to said wall in said opening, the interior of the en-

velope being in communication with the interior of said tubulation.

6. An electron discharge device comprising a bulb, a round glass header hermetically closing the end of the bulb, lead-in conductors arranged in a circle concentric with and sealed in said header, a plurality of cathode filaments connected to the inner ends of said lead-in conductors, said cathode filaments having a center support rod, said header having an exhaust opening located centrally thereof, and a perforated tubular support member disposed in said opening, said support rod being connected to said support member.

7. The electron discharge device defined in claim 6 having a metal shield spaced from said header and attached to said tubular support member.

8. In an electron discharge device, an envelope including a wall having a return conductor and a plurality of lead-in conductors symmetrically arranged with respect to said return conductor, and an electrode comprising a plurality of filaments, each supported between one of said lead-in conductors and said return conductor.

9. In an electron discharge device according to claim 8 wherein the return conductor includes a tubular support member disposed coaxially of an exhaust tubulation in said wall, the interior of said member being in communication with the interior of said envelope and the interior of said tubulation.

10. In an electron discharge device, an envelope including a closed exhaust opening and a wall having a plurality of conductors sealed therein in a circular arrangement about said closed opening, conductor means disposed in said opening and extending through said wall to provide a centrally located conductor, and a plurality of electrode filaments each supported between one of said circularly arranged conductors and said centrally located conductor.

11. In an electron discharge device according to claim 10 wherein said conductor means includes a perforated tubular member sealed to the walls of said opening.

12. In an electron discharge device according to claim 10 wherein said conductor means includes a perforated tubular member sealed to the walls of said opening, a rod secured in one end of said member and means attaching said filaments to said rod.

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