July 4, 1939. N. R. SMITH 2,164,547

ELECTRODE SUPPORT

Filed April 30, 1938

Fig. 1

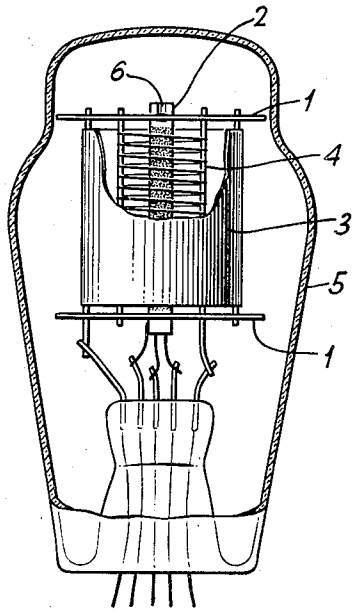


Fig. 3

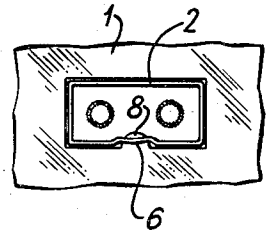


Fig. 4

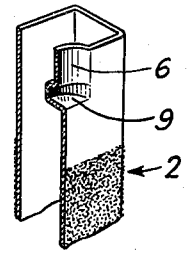
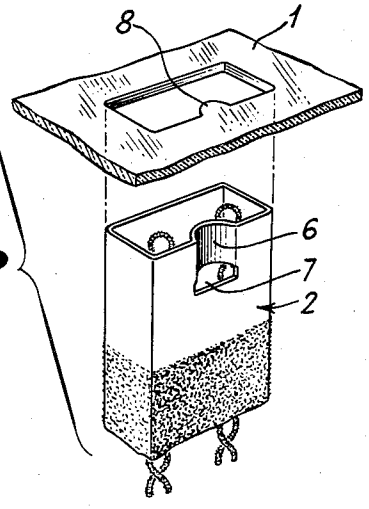


Fig. 2



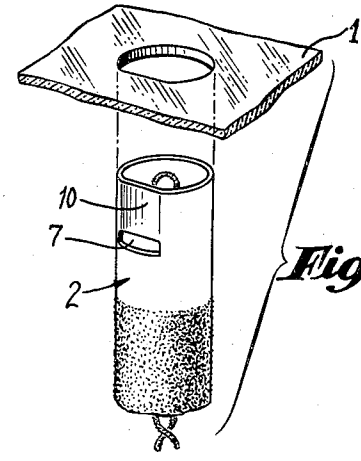


Fig. 5

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ELECTRODE SUPPORT

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Application April 30, 1938, Serial No. 205,206

6 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices, particularly to means for supporting tubular electrodes such as indirectly heated cathode sleeves for such devices.

The usual electrode mount for a radio tube with insulating spacers engaging in holes the ends of a cathode sleeve and electrode side rods is difficult to assemble so as to prevent lateral as well as lengthwise movement of the electrodes. An exteriorly activated cathode sleeve containing an insulated heater is particularly difficult to firmly secure in the spacers. The usual raised dimples or embossings on the ends of the sleeve to engage the insulator at the periphery of the hole through which the sleeve is inserted does not positively lock the sleeve to prevent lengthwise movement. Metal tabs sometimes used for securing the sleeve in place distort the sleeve and are difficult to attach. Cathode sleeves secured at each end are not free to longitudinal expansion and usually bow or buckle at the center.

An object of my invention is support means for a tubular electrode for electron discharge devices which may be positively locked against endwise movement, which is free to expand without bowing or buckling and which is easy to make and assemble in such devices.

My invention is defined with particularity in the appended claims and preferred embodiments are described in the following specification and are shown in the attached drawing in which Figure 1 shows an electron discharge device with a cathode embodying my invention, Figures 2 and 3 are perspective and top views, respectively, of one cathode embodying my invention, and Figures 4 and 5 show other cathodes embodying the characteristic features of my invention.

The tube shown in Figure 1 comprises an electrode assembly with insulating spacers 1 which engage the end of the cathode 2 exteriorly activated with the usual oxide coating and containing an insulated heating element, and also engage the ends of the side rods of anode 3 and grid 4. The assembly is mounted upon the stem of envelope 5, which may be exhausted, sealed off and based in the usual manner.

One end of the tubular cathode 2, embodying my invention and shown in detail in Figures 2 and 3, is provided with a short longitudinal groove 6 terminating in a notch such as a window or cut-out portion 7, the height of the notch being approximately equal to the insulating spacer thickness. The insulating spacer is provided with the usual perforations to receive the ends of the side rods, and an opening for the upper end of the cathode sleeve is so cut out as to leave a short tongue or lug 8 extending radially into the hole from one side. The insulating spacer is lowered over the end of the sleeve, permitting the end of the sleeve to slide through its opening with the tongue 8 travelling along groove 6 into notch 7. That portion of the sleeve comprising the wall of the groove 6 is then straightened out so that the bottom portion of the groove wall overlies tongue 8 and locks the sleeve and spacer together. Upon assembly, the edge of the opening extends inwardly past the outer surface of the sleeve. While the one end of the cathode is positively locked against movement in either an upward or a downward direction the other end of the sleeve is preferably free to slide longitudinally in its spacer.

While the particular electrode selected for illustrating my invention is a cathode sleeve, it is obvious that any tubular electrode may be mounted according to my invention where one end of the electrode must be locked against movement and the other end slidably guided to permit thermal expansion.

The embodiment of my invention shown in Figure 4 comprises a cathode with the groove 6 terminating in an indentation 9. The length of the tongue 8 may be chosen so as to slide with some friction along groove 6 so that it will snap into the indentation 9 and lock the cathode and spacer together.

The notch, such as the window 7 or indentation 9, may conveniently be formed or blanked out in flat sheet metal, such as nickel, and the metal then rolled into tubular sleeves with rectangular or round cross section and seamed as by welding to complete the sleeve. The round sleeve shown in Figure 5 is provided with a flattened or slightly indented groove or secant 10 terminating in window 7. The spacer opening is made to snugly fit the formed end of the sleeve so that it may be locked in place when the wall at 10 is pulled out over the spacer.

In assembling an electrode mount with my improved cathode the side rods of the several electrodes are inserted at their lower ends in the lower spacer with the aid of a jig, the cathode is lowered into place, and the upper spacer is pressed over the upper ends of the cathode and the side rods, bringing the tongue 8 into registry with the notch 7 or 9, and the wall of the sleeve drawn out to overlie the spacer by inserting one tong of a pair of tweezers into the end of the sleeve and pressing.

A cathode constructed according to my invention is easy to assemble in a mount so that it cannot move out of place. My improved cathode is positively locked against lengthwise movement yet is free at one end to expand when heated and is easy to make and assemble in electron discharge devices.

I claim:

1. An electron discharge device comprising a cathode sleeve, an insulating spacer having an opening to receive the end of said sleeve, a notch in said sleeve spaced inwardly from the end of the sleeve with the opposed edges of said notch bearing against opposite sides of said spacer at said opening to prevent longitudinal movement of the sleeve through the opening.

2. An electron discharge device comprising a plate-like insulating spacer having an opening, a cathode sleeve extending through said opening, said spacer at the edge of the opening extending inwardly past the outer surface of said sleeve for holding the sleeve against movement through the opening.

3. An electron discharge device comprising an anode, a tubular cathode in cooperative relation with said anode, means for insulatingly spacing said anode and cathode comprising a sheet of insulating material engaging the end of said cathode and attached to said anode and having an opening to receive the end of said cathode, a notch in said cathode inwardly from said end of said cathode, and a tongue on said sheet in the side of said opening extending into said notch.

4. An electron discharge device comprising an envelope, a tubular electrode with a notch near one end in said envelope, means for supporting said one end of said electrode comprising a spacer with an opening, opposed edges of said notch bearing against opposite sides of said spacer at said opening to prevent longitudinal movement of the electrode through the opening, and means for preventing lateral displacement of the other end of said electrode.

5. An electron discharge device comprising an envelope, a plurality of electrodes in said envelope, one of said electrodes being tubular and with a notch spaced inwardly from the end of the electrode, means for insulatingly spacing the electrodes comprising a spacer having an opening to receive the end of said one electrode, the edge of the opening extending inwardly past the outer surface of said one electrode for holding the electrode against longitudinal movement through the opening, and means at the other end of said one electrode for slidably guiding said other end.

6. In an electron discharge device the method of assembling a plate-like insulating spacer having an opening and a tubular cathode sleeve with a notch spaced from one end and a groove communicating at one end with the end of said sleeve and at the other end with said notch, comprising inserting said end of the sleeve in said opening to bring a portion of the edge of the opening into registry with said notch, and drawing the wall of said groove outwardly to overlie said spacer.

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