July 2, 1940. K. M. McLAUGHLIN ET AL 2,206,511

ELECTRODE SUPPORT

Filed May 27, 1939

Fig. 1

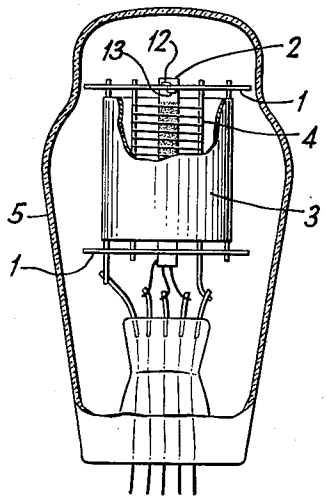


Fig. 2

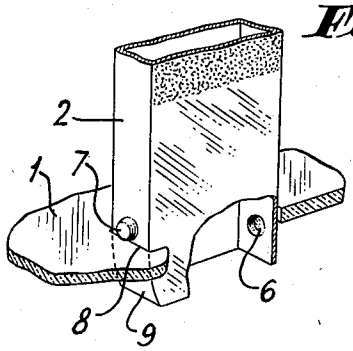


Fig. 3

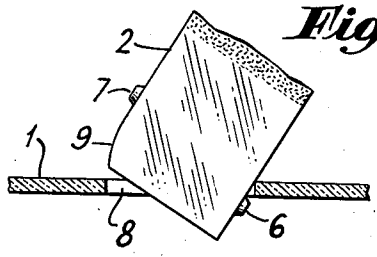


Fig. 6

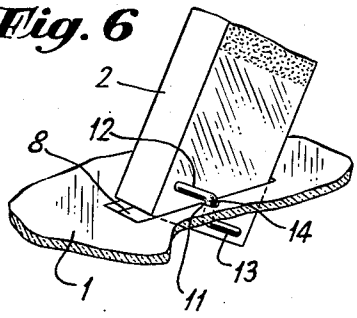


Fig. 4

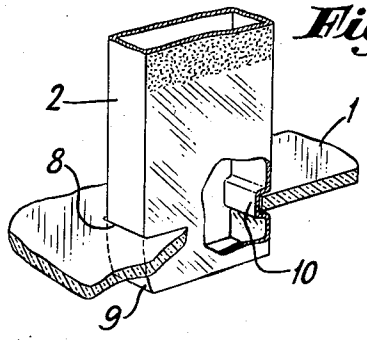


Fig. 7

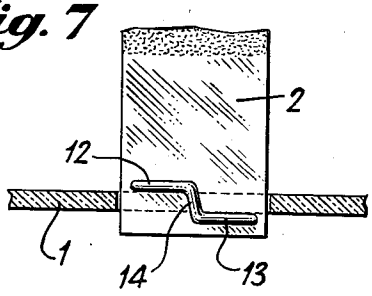
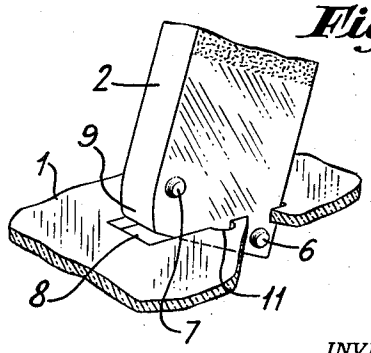


Fig. 5



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ELECTRODE SUPPORT

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5 Claims. (Cl. 250—27.5)

Our invention relates to electrode assemblies for electron discharge devices, particularly to means for supporting heated cathode sleeves in such assemblies.

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 coated cathode sleeve containing an insulated heater is particularly difficult to firmly secure in the spacers. Metal tabs sometimes used for securing the sleeve in place distort the sleeve and are difficult to attach, and cathode sleeves secured at each end are not free to expand lengthwise and usually bow or buckle at the center.

An object of our invention is support means for a tubular cathode for electron discharge devices which positively locks the cathode against endwise movement, and permits free longitudinal expansion of the cathode without bowing or buckling and which is easy to make and assemble in such devices.

Our 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 our invention, Figures 2 and 3 are perspective and side views, respectively, of one cathode embodying our invention, Figures 4 and 5 show other cathodes embodying the characteristic features of our invention, and Figures 6 and 7 are perspective and side views, respectively, of still further embodiments of our improved cathode.

The tube shown in Figure 1 comprises an electrode assembly with sheet spacers 1 of insulating material such as mica engaging the ends of the cathode sleeve 2, which is exteriorly activated with the usual oxide coating and contains an insulating heating element, and also engaging 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.

The cathode 2 may be a sleeve of rolled and seamed sheet metal or a drawn seamless tube and, according to our invention, is embossed at one end with two spaced locking portions which overlie the edges of the hole in one spacer to lock the sleeve against endwise movement, the other end of the sleeve being free to slide in its spacer. By securing the cathode at one end only the sleeve is free to expand longitudinally and thus prevent bowing or buckling. In assembling, the sleeve is inclined at an angle less than 90° with the plane of the insulator to thread the embossed end of the sleeve through its hole in the insulator and the sleeve is then straightened to an upright position normal to the insulator to bring the locking portions of the sleeve into locking engagement with opposite sides of the insulator at the edge of the hole.

One end of the tubular cathode 2, which may be of any desired cross sectional configuration such as round, elliptical or rectangular, is provided as shown in Figure 2 with bosses or beads on opposite sides of the sleeve, one boss 6 being at the end of the sleeve and the boss 7 on the opposite surface of the sleeve being spaced inwardly from the end of the sleeve a distance approximately equal to the thickness of the insulating spacer in which it is mounted. In assembling, the sleeve is inclined at an angle to the spacer and the corner of the sleeve with the end boss 6 is passed through the hole 8 in the spacer. As the sleeve pivots about its point of contact with the edge of the hole 8 in the spacer and comes into an upright position the two bosses are brought into firm engagement with opposite faces of the insulator and when the opposite end of the sleeve is inserted in the spacer at the other end of the mount the sleeve is effectively locked in place. By rounding the end of the sleeve at 9 opposite boss 6, the sleeve may freely pivot at the edge of the hole at 8 and wedge the sleeve in the hole as it is straightened up.

According to one embodiment of our invention, a notch or indented embossing 10 may be provided near one end of the sleeve as shown in Figure 3. By rounding the end of the sleeve at 9 opposite the indentation the sleeve may be inclined and inserted in its insulator hole and straightened to lock it in place in the manner described in connection with Figure 2.

The bosses may, if desired, be each formed on one side wall of the sleeve as shown in Figure 5. A notch 11 in the side of the hole in the spacer is provided to receive and pass the end embossing 6 as the end of the inclined sleeve is inserted in the hole. As the sleeve is straightened to its upright position bosses 6 and 7 come into contact with opposite sides of the spacer and the sleeve is effectively locked in place.

The bosses 6 and 7 on the side of the sleeve shown in Figure 5 may, if desired, be joined in one continuous ridge as shown in Figures 6 and 7

with two parallel portions 12 and 13 of the ridge longitudinally offset along the sleeve and a short lengthwise connecting ridge 14 substantially equal in length to the thickness of the spacer. When the sleeve is inclined and its end inserted in the spacer hole, the boss 13 is threaded through the notch in the side of the hole and when the sleeve is straightened to its upright position bosses 12 and 13 come into contact with opposite sides of the spacer and the sleeve is effectively locked in place. For convenience in assembly the length of the spacer hole in Figures 6 and 7 may be made greater than the maximum diameter of the sleeve, transverse movement of the sleeve along the hole being effectively prevented by the boss ridge 14 in the notch.

The embossed portions of the cathode sleeve may be formed inwardly or outwardly from the metal of the sleeve with mandrels fitted in the end of the sleeve, or the bosses may be conveniently pressed in the metal stock of the sleeve before it is rolled into the sleeves and seamed in the usual manner. Alternatively, the interlocking bosses of the sleeve may be small pieces of metal spot welded to the side of the sleeve. Good results have been obtained in mounting cathode sleeves in electrode assemblies according to our invention with cathode sleeves of conventional sizes, such as tubing .020 by .050 inch in cross section rolled from .002 inch sheet nickel stock. A cathode constructed according to our invention is easy to assemble in a mount so that it cannot be easily dislodged. Our improved cathode is positively locked against endwise movement yet is free at one end to expand when heated and is easy to make and assemble in electron discharge devices.

We claim:

1. An electron discharge device comprising a cathode sleeve, an insulating spacer having an opening to receive the end of said sleeve, two embossed portions on said sleeve spaced inwardly from one end of the sleeve with the opposed sides of said portions 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 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, two spaced bosses on said cathode near said end of said cathode, said bosses being out of alignment and displaced longitudinally along said cathode and bearing against opposite sides of said sheet.

3. An electron discharge device comprising an envelope, a tubular electrode with two spaced bosses near one end in said electrode, means for supporting said one end of the electrode comprising a spacer with an opening, said bosses 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.

4. An electron discharge device comprising an envelope, a plurality of electrodes in said envelope, one of said electrodes being tubular and with spaced beads at one 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 extremities of said beads for holding the tubular electrode against longitudinal movement through the opening, and means at the other end of said one electrode for slidably guiding said other end and for spacing said other end from the other electrodes.

5. An electrode assembly comprising a metal cylinder, a sheet of insulating material with a hole to receive the end of said cylinder, and a notch in the side of said hole, said cylinder having near one end a boss extending outwardly from the side of the cylinder, said boss comprising two ridges longitudinally offset along the cylinder and a connecting ridge extending lengthwise of the cylinder, said end of the cylinder being locked in said opening with the offset ridges of the boss bearing against opposite sides of the spacer and with the connecting ridge in said notch.

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