June 22, 1937. W. L. KRAHL 2,084,734

ELECTRON DISCHARGE DEVICE

Filed Nov. 11, 1935

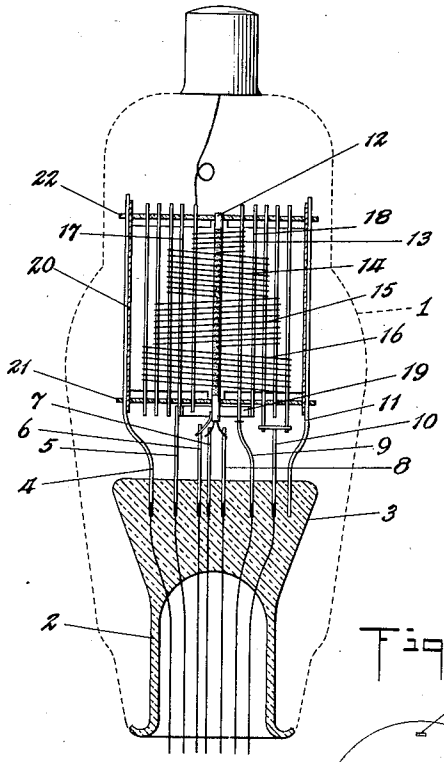


Fig. 1.

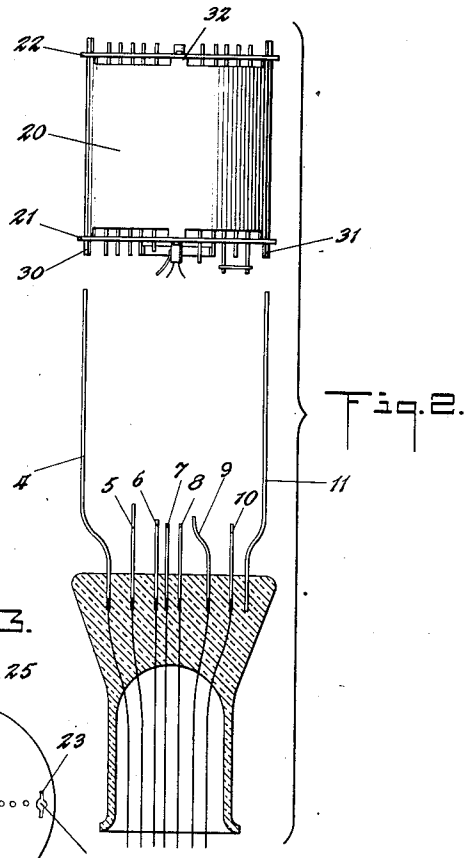


Fig. 2.

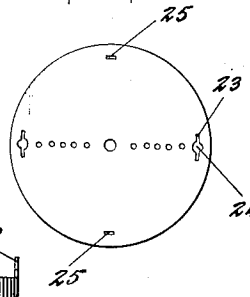


Fig. 3.

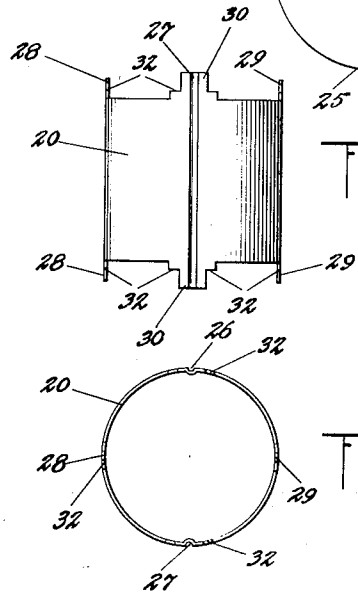


Fig. 5.

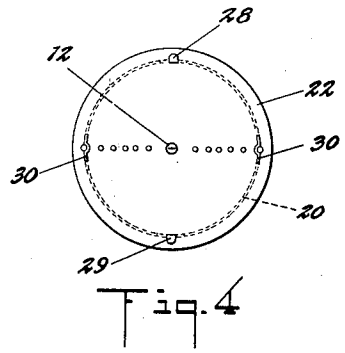


Fig. 4.

Fig. 6.

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ELECTRON DISCHARGE DEVICE

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4 Claims. (Cl. 250—27.5)

This invention relates to electron discharge tubes and more particularly to tubes of the multi-electrode type.

An object of the invention is to provide an improved form of mount whereby tubes having closely spaced electrodes may be accurately and rapidly assembled.

In certain types of radio tubes particularly in tubes of the multi-grid electrode type wherein very little spacing is provided between the tubular plate and the next adjacent grid, it is very difficult to assemble the various grids in the mount after the plate has been welded to its support rods. One of the reasons for this is that the spacing between the plate and the next adjacent grid is usually so small that there is insufficient room to insert the welding electrode. Accordingly one of the features of the present invention relates to an improved form of plate structure for radio tubes whereby this and other difficulties may be overcome.

Another feature of the invention relates to a tubular plate structure for radio tubes and the like, whereby the plate may be assembled and welded to the plate support rods subsequently to the assembly of the cathode and grids.

A further feature relates to a plate structure which is specially adapted to so-called "unitary" radio tube mounts.

A still further feature relates to the novel organization, arrangement and relative location of parts which go to make up an improved form of tubular plate structure for radio tubes and like devices.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims.

While the invention will be disclosed herein as embodied in one particular form of radio tube it will be understood that this is done merely for explanatory purposes and not by way of limitation. In the drawing,

Fig. 1 is an elevational view, partly in section, of a tube embodying features of the invention.

Fig. 2 is an exploded view to explain the method of assembly of the unitary mount,

Fig. 3 is a plan view of one of the electrode spacers.

Fig. 4 is a top plan view of the assembled mount of Fig. 2.

Fig. 5 is a detailed side view of the plate electrode of Figs. 1 and 2.

Fig. 6 is a top plan view of the plate electrode of Fig. 4.

Referring to the drawing, the numeral 1 designates in dotted outline any well-known form of bulb or enclosing envelope such as is customarily employed in modern radio tubes and the like. The bulb is sealed to a re-entrant stem 2 which terminates in the usual press 3 wherein are sealed the various lead-in and support wires 4 to 11 inclusive. The particular electrode assembly as shown, is of the pentagrid type and comprises a central electron emitting cathode surrounded by a series of grids 13, 14, 15, and 16. Each grid may be of any well-known construction consisting preferably of a pair of metal uprights or side-rods around which is helically wound and fastened a fine grid wire. Interposed between the grids 13 and 14 are a pair of metal uprights 17 and 18 which are joined together at their lower ends by a U-shaped metal strap 19. Surrounding the cathode and grids is the plate or main anode 20 which will be described in detail hereinbelow.

For the purpose of maintaining the various electrodes in their proper spaced relation there are provided a pair of insulator spacer members 21, 22 which are preferably of mica or similar insulating material although if desired a ceramic material may be employed. These insulator spacers may be of any suitable shape and as indicated the particular spacers in the embodiment shown are circular. Each spacer member is provided with a row of perforations to receive the grid side-rods, the members 17 and 18, and the cathode. In alignment with these perforations and disposed at opposite sides are specially-shaped openings in the form of arcuate slots 23 provided intermediate their ends with circular cut out portions 24. In addition each spacer member is provided with a pair of oppositely disposed rectangular slits 25.

As shown more clearly in Figs. 5 and 6, the plate is in the form of a cylinder provided with oppositely disposed longitudinal channels 26, 27 to receive the corresponding plate side-rods 4 and 11. The upper and lower edges of this plate are each provided with two sets of diametrically disposed lugs or projections 28, 29, 30 and 31, each projection being provided with a shoulder 32 against which rest the spacer members 21, 22 as shown more clearly in Figs. 1 and 2. The projections 30 and 31 are adapted to pass through the corresponding openings 24 in the spacer members while the projections 28, 29 are adapted to pass through the corresponding openings 25. When the electrodes and spacer members are assembled, the upper ends or tabs of projections 28, 29 are bent back upon themselves at right angles as

shown in Figs. 2 and 4 to retain the spacer members in place.

The manner of assembly of the mount is substantially as follows. The cathode 12 and the grids 13, 14, 15, and 16 as well as the members 17 and 18 are assembled on the lower insulator member 21. The plate 20 is then assembled so that the projections 28, 29, 30 and 31 pass through the corresponding openings in the member 21. The tabs on projections 28 and 29 are then bent back upon themselves, after which the upper insulator member 22 may likewise be assembled and the corresponding tabs 28 and 29 bent back to form a unitary electrode assembly as shown in the upper part of Fig. 2. This unitary assembly is then slipped over the plate side-rods 4 and 11 which rest in the longitudinal grooves or channels 27 in the outer face of the plate electrode. Preferably the plate side-rods are sufficiently long so that their upper ends protrude beyond the upper member 22, whereupon the plate side-rods may be welded to the associated projections 30 and 31 below the member 21 and above the member 22. To effect this welding it is not necessary to insert the welding electrode between the plate side-rod and the adjacent grid side-rod. When the electrodes have been thus assembled and welded to the plate side-rods the various lead-in wires 5 to 10 inclusive may be welded to the corresponding electrodes as shown in Fig. 1. With the above-described arrangement, it is possible to assemble the various electrodes to form a unitary electrode assembly and to effect the welding of the plate to its side-rods after the assembly of the various grids and the welding of the plate side-rods does not disturb the alignment between the plate and the next adjacent grid. Furthermore the provision of the longitudinal channels 27 in the plate and the provision of the side-rods 4 and 11 in the press, enable the electrode unit to be accurately assembled on the press with the assurance that the various lead-in wires 5 to 10 are in position to be welded to the corresponding electrodes.

While one particular embodiment of the invention has been disclosed herein, it will be understood that various changes and modifications may be made therein without departing from the spirit and scope of the invention.

What I claim is:

1. In an electron discharge device the combination of a pair of side-rod supports, and a unitary electrode assembly adapted to be telescoped as a unit on to said side-rods said assembly including a cathode and an anode, a pair of integral projections on opposite edges of said anode, a pair of insulator spacer members mounted at opposite ends of said anode, and means for fastening said spacer members to said anode, said spacer members having openings to receive said projections and said side-rods, and said supports being welded to said integral projections above the upper spacer and below the lower spacer.

2. An electron discharge device according to claim 1 in which the anode is also provided on opposite edges with a pair of shouldered tabs and said spacer members are provided with corresponding openings to receive said tabs, said tabs being bent back at right angles to fasten the spacer members to said anode.

3. In an electron discharge device the combination of a pair of side-rod supports, a unitary electrode assembly arranged to be telescoped as a unit over said supports said assembly including a tubular anode having on opposite edges pairs of arcuate projections, a pair of insulator spacer members mounted at the ends of said anode said members having a pair of arcuate openings corresponding to the shape of said arcuate projections each of said openings in said spacer members having an enlargement intermediate its ends for passage of the side-rods therethrough, said side rod supports being welded to said arcuate projections above the upper spacer and below the lower spacer.

4. In combination a pair of side-rod supports, an upper spacer disc, a lower spacer disc, a tubular anode having on opposite edges four integral projections two of said projections being channelled to receive said supports, said supports being welded to said projections above the upper disc and below the lower disc and two of said projections having bendable fastening tabs.

WALTER L. KRAHL.