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ELECTRON TUBE STRUCTURE

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Fig. 1.

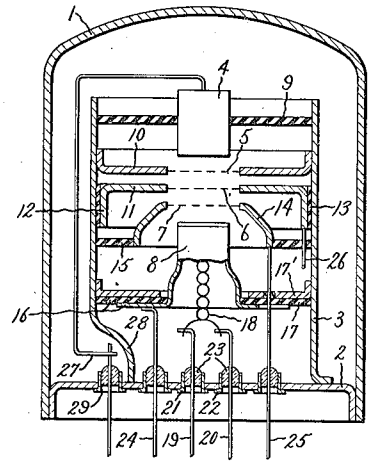
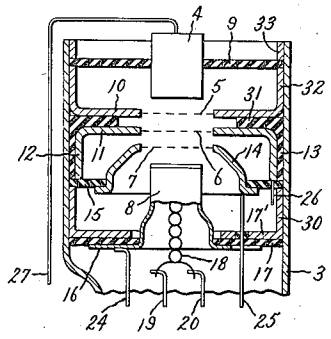


Fig. 2.



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ELECTRON TUBE STRUCTURE

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The present invention relates to the construction of electronic tubes and it has for its primary object the provision of a new and improved electronic tube structure whose physical dimensions are critical in one direction only.

In the construction of electronic discharge devices by prior art methods, the active electrodes are arranged as coaxial cylinders so that the spacings in two different dimensions or directions at right angles to each other are critical. In accordance with the present invention, the active electrode surfaces are planar surfaces and arranged in substantially parallel relation so that critical spacing is held to close tolerances in one direction only.

It is another object of the present invention to provide a new and improved construction of electronic discharge devices in which interelectrode capacitances are kept at relatively small values.

It is a further object of the present invention to provide a new and improved electron tube structure which permits the obtaining of high trans-conductance while retaining relatively small interelectrode capacitances.

It is a still further object of the present invention to provide a new and improved electron tube structure in which feedback between the connections to input and output circuits within the tube is kept to a very low value.

One of the features of the present invention is the employment within an electron tube of a conductive cylinder which functions both as a support for electrodes having planar active electrode surfaces and as a shield to reduce feedback between leads connected with the anode circuits and those connected with the control grid circuits.

For a better understanding of my invention, reference may be had to the following description taken in conjunction with the accompanying drawing and its scope will be pointed out in the appended claims. Fig. 1 of the drawing diagrammatically illustrates an electron discharge tube structure embodying the invention, and Fig. 2 shows a modification of the structure of Fig. 1.

Referring to Fig. 1, there is shown in cross section an electron discharge device which comprises an enclosing envelope which includes a top portion 1 and a base portion 2. Supported within the envelope is a conductive member 3 substantially cylindrical in cross-section and which may be secured, as by welding, to the base part 2. The electron discharge device illustrated is of the pentode type and the electrodes thereof are supported within the conductive cylinder 3. These electrodes, comprising in their order of spacing

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an anode 4, a suppressor grid 5, a screen grid 6, a control grid 7 and a cathode 8, have planar active electrode surfaces which are arranged in spaced substantially parallel relation. The cylindrical anode 4 is supported within the cylinder 3 by an insulating disk 9. The suppressor grid 5 is conductively connected to a metallic disk 10 which is conductively connected to the cylinder 3, being secured thereto in any desirable manner, such as by welding. The screen grid 6 is supported by a metallic disk 11 having a flange portion 12 which is insulated from the inner surface of the cylinder 3 by an insulating washer 13. The control grid 7 is conductively united to a metallic punching or eyelet 14 which is supported within the cylinder 3 by an insulating washer 15. The cathode 8 is formed as a hollow cylindrical member having a flanged base portion 16 which is attached to and underlies a dielectric washer 17 secured to the inner surface of the cylinder 3. A metallic washer 17' in contact with the inner surface of cylinder 3 overlies the base portion 16. The opposed surfaces of parts 16, 17' separated by insulating washer 17 forms a capacitance connecting the cathode to the cylinder 3 for alternating currents. A heating element or filament 18 is disposed within the cathode cylinder 8 and is supported by a pair of lead-in conductors 19, 20 which pass through eyelets 21, 22 in the base member 2, being insulated therefrom by glass seals 23. Lead-in conductors 24, 25, 26 are conductively connected to the cathode 8, the control grid 7 and the screen grid 6 respectively, passing through similar eyelets and glass-to-metal seals in the base member 2. All the foregoing lead-in conductors are disposed within the metallic cylinder 3. The lead-in conductor 27 to the anode 4, however, is disposed within the region between the outside surface of the cylinder 3 and the inner surface of the cover 1 in order to shield this lead-in conductor from the other electrodes of the device and the conductors associated therewith. The cylinder 3 has a re-entrant part 28 which permits positioning of the eyelet 29 in the base member 2.

In the foregoing tube construction, the cylinder 3 is conductively connected to the base member 2 so that this member affords an external connection for the suppressor grid 5. In the customary radio frequency circuits which employ a suppressor grid and a screen grid, the suppressor grid operates at ground potential so that, in the construction outlined, this potential for the suppressor grid 5 is automatically obtained without the requirement of any additional external con-

nections. At the same time, in the usual circuit, the screen grid 6 is provided with a by-pass capacitance to ground. One of the advantages of the tube structure described is the fact that the flange 12 of the screen grid disk 11, in conjunction with the metallic cylinder 3 and the insulating washer 13, forms a by-pass capacitance which is built into the tube structure thus eliminating the requirement of an external capacitance. Similarly, the flange 16 of cathode 8, in conjunction with washer 17' and insulator 17, forms a by-pass capacitance for the cathode which is built into the tube structure.

An important advantage of my improved electron tube structure is the separation of the input and output circuits to reduce feedback between these circuits through the inductance of the leads connected with the electrodes of the tube. Shielding of the anode lead-in conductor 27 by the metallic cylinder 3 isolates the output circuit of the tube from the input circuits and reduces any feedback within the tube structure.

Another important advantage of the tube structure described is the planar active electrode surfaces which are arranged in substantially parallel spaced relation. Such a structure, by reducing spacing requirement to one dimension, namely, the axial dimension, permits the construction of tubes in which the interelectrode capacitances are kept to a relatively low value. In the resultant tubes, the ratio of transconductance to interelectrode capacitance has a large value.

In the partial cross-sectional view of the electron discharge device shown in Fig. 2, the electrodes and the members supporting them within the conductive cylinder 3 are so proportioned that they are mutually supporting and may be assembled in the cylinder 3 by being pressed together. In this construction, the cathode washer 17' is provided with a flange part 30 which may be secured within the cylinder 3, as by welding. Preferably, the cathode 8 and the washer 17 are previously supported from the washer 30. The dielectric washer 15 attached to the grid ring 14 rests upon the upper end of the flange 30. The insulating washer 13 for the screen grid is provided with an inwardly directed flange portion 31 which lies between the suppressor grid disk 10 and the screen grid washer 11. The supporting washer 9 for the anode lies upon an upwardly directed flange 32 formed integral with the suppressor grid ring 10. Finally, the metallic ring 33 is pressed down upon the assembled electrodes and supporting elements to secure them in position and may be fastened within the cylinder 3, as by spot welding. The composite electrode structure is thus formed of elements within the cylinder 3 which are mutually supported and which, after once being assembled in position, are firmly held within the cylinder, the complete construction of the electronic tube being facilitated by the ease of assembly of the composite elements.

While I have shown and described my invention as applied to particular systems embodying various devices diagrammatically shown, it will be obvious to those skilled in the art that changes and modifications may be made without departing from my invention and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electron discharge device comprising an envelope member, a hollow metallic member supported within said envelope member, a cathode, a control grid, a screen grid, a suppressor grid, and an anode supported within said hollow metallic member, said electrodes having planar active electrode surfaces mounted in the order named, conductive means connected respectively with said suppressor grid and said screen grid and supported in spaced insulated relation to provide a capacitive coupling between said suppressor grid and said screen grid, and externally accessible conductive means connected to said hollow metallic member.

2. An electron discharge device comprising an envelope, a conductive cylinder supported within said envelope, an anode, a control electrode and a cathode having planar active electrode surfaces supported by said cylinder in spaced relation, lead-in conductors extending through said envelope and connected to said respective electrodes, said cylinder being interposed between the lead-in conductor to said anode and said control electrode and its lead-in conductor to reduce feedback of energy therebetween.

3. An electron discharge device comprising a hollow metallic shield member, a plurality of electrodes including an anode and a cathode having opposed planar surfaces, and a planar grid supported between said cathode and said anode, said electrodes being supported within said member, an envelope enclosing said member and said electrodes, lead-in conductors extending through said envelope and connected to the respective ones of said electrodes, the lead-in conductor to said anode being shielded by said member from said grid and its associated lead-in conductor to prevent feedback of energy thereto.

4. An electron discharge device comprising an envelope including a base member, a metallic cylinder enclosed within said envelope and supported by said base member, a plurality of electrodes supported within said cylinder comprising an anode, a cathode, and a control grid, said electrodes having planar surfaces in parallel spaced relation, conductors extending through said base member and connected to said electrodes, the conductor connected with said anode being separated from the remainder of said electrodes and the conductors connected therewith by said cylinder.

5. An electron discharge device comprising an envelope including a base member, a metallic cylinder enclosed within said envelope and supported by said base member, a plurality of electrodes supported within said cylinder comprising an anode, a cathode, a control grid, and a screen grid, said electrodes having planar surfaces in opposed spaced relation, conductors extending through said base member and connected to said electrodes, the conductor connected with said anode being separated from the remainder of said electrodes and the conductors connected therewith by said cylinder, and said screen grid being connected to said cylinder through a by-pass capacitance.

6. An electron discharge device comprising an envelope, a metallic cylinder supported within said envelope, a plurality of electrodes supported within said cylinder including a suppressor grid and a screen grid, said suppressor grid being directly connected to said cylinder and said screen grid being connected to said cylinder through a capacitor provided by spaced insulated

conducting portions of said screen grid and said cylinder.

7. An electron discharge device comprising an envelope, a metallic cylinder supported within said envelope, a plurality of electrodes supported within said cylinder including a cathode, said cathode being connected to said cylinder within said envelope through spaced insulated conductive surfaces providing a by-pass capacitor, and conductors extending through said envelope and connected to the respective ones of said electrodes.

8. An electron discharge device having an envelope, an anode, a cathode, and a grid electrode structure supported within said envelope, and a by-pass capacitor connected between said grid electrode structure and said cathode within said envelope comprising a metallic member supporting both said grid electrode structure and said cathode, said grid electrode structure having a portion in parallel spaced relation with said metallic member, and insulating means disposed between said portion and said member.

9. An electron discharge device having an envelope, an anode, a cathode and a grid electrode supported within said envelope, and a capacitor connected between said grid electrode and said cathode within said envelope comprising a metallic member supporting both said grid electrode and said cathode, said member and said cathode having conductive means connected to each other respectively, said conductive means having portions in parallel spaced relation, and insulating means interposed between said portions.

10. An electric discharge device including a

header, a metallic cylinder supported directly on said header with the axis thereof substantially perpendicular to the plane of said header, a plurality of electrodes and spacing elements stacked within said cylinder to position said electrodes in mutually spaced insulated relation, a plurality of lead-in conductors connected to the various electrodes and sealed through said header, and an enclosing member surrounding said cylindrical member and sealed to said header.

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