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2,343,849

RADIO TUBE WITH FLATTENED ELEMENTS

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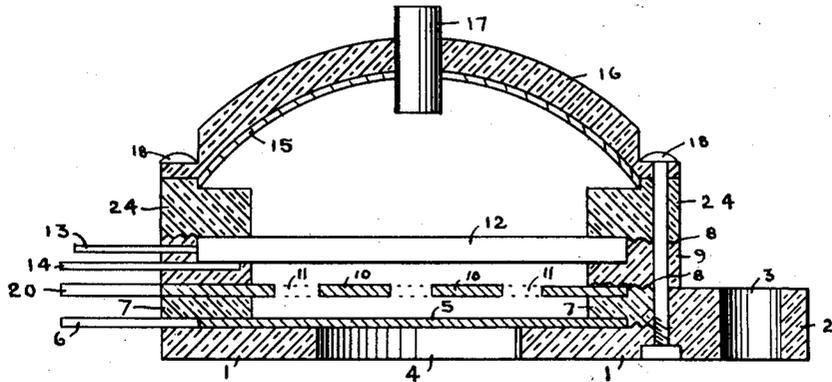


Fig. I.

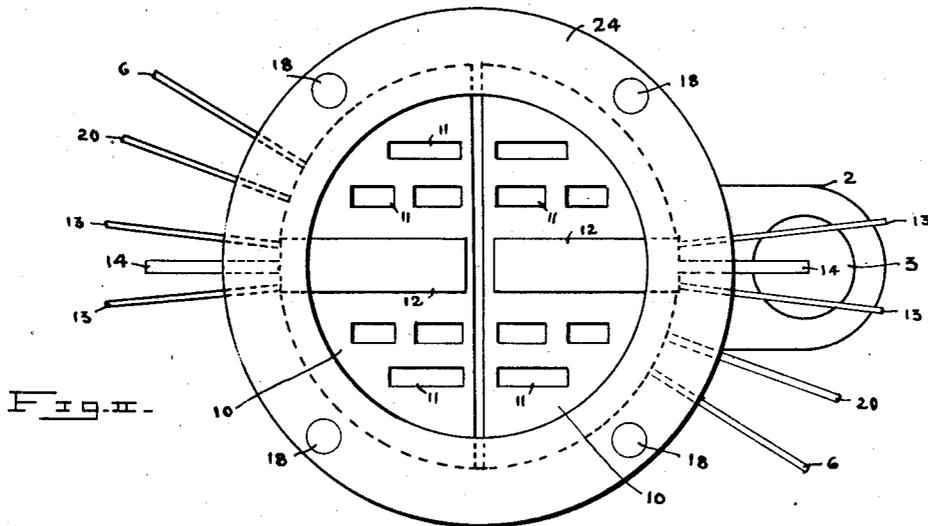


Fig. II.

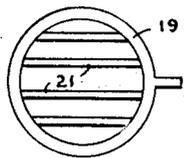


Fig. III.

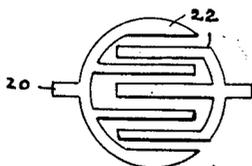


Fig. IV.

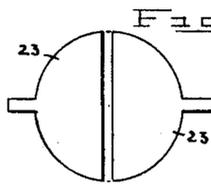


Fig. V.

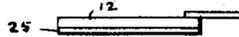


Fig. VI.

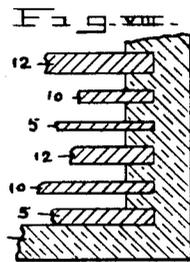


Fig. VII.

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RADIO TUBE WITH FLATTENED ELEMENTS

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7 Claims. (Cl. 250—27.5)

My invention relates to improvements in radio tubes and the object of my improvement is to provide a vacuum tube for general radio purposes having flattened or slightly curved, superimposed plate, grid and cathode elements within a strong dielectric case. Other objects are to provide a tube consisting of disks and plastic rings clamped together by bolts, or other means, in such a manner as easily to be taken apart for the exchange or replacement of parts; to provide a design and arrangement of elements suitable for very high frequency oscillation; and to provide radiating low inductance connections for the various elements. A still further object is to provide a tube with two plates, grids, and cathodes within the same envelope—each pair of elements arranged to lie edge to edge in the same plane and so to have low electric capacity. Other objects will appear from the following description and drawing.

Figure I is a vertical section of a tube with single elements. Figure II is a top view of a tube with double elements and with the cap removed. Figures III and IV are top views of different forms of grids. Figure V is a side view of a flattened cathode, Figure VI is a top view of a double plate element, Figure VII is a side view of the same and Figure VIII is a fragmental section showing an optional arrangement.

The base 1 is a disk of hard plastic, porcelain or other dielectric material, having a projection 2 with a perforation 3 for attachment to a radio cabinet. In the center of the base is a large circular opening 4. Upon the base 1, within a depression, lies a metal disk 5 having a plate lead 6. This plate element 5 may be air or water-cooled through the opening 4, and is tightly sealed to the base 1 by a ring of soft plastic or cement 7. Grooves 8 in the porcelain or hard plastic ring 9 serve more tightly to seal the joint between it and the soft plastic or cementing material 7, and to reduce the capacity effect between grid 10 and ring 9. Grid 10 is a circular metal plate to control the flow of electrons between cathode 12 and plate 5 through perforations 11. The cathode 12 may be a cylindrical or flattened tube with ends embedded in a porcelain, or hard plastic ring 9, and containing the usual heater filament with leads 13. Conductors 14 provide electric connections with the cathodes, and conductors 20 with the grids.

A dome 15 of any suitable pressed material provides a form for the final cap 16 of plastic or cement material. Tube 17 either threaded, cemented or welded into the plastic or metal cap

16 provides a means for exhausting the tube of air. Bolts 18 removably clamp together the successive disks, and rings of mica, cement, porcelain or plastic material which form the tube.

5 The cementing material may be soft or hard depending upon whether the seal is to be temporary or permanent. If a permanent seal is desired bolts 18 may be supplanted by reinforcing wires. The tube is built up of successive layers of 10 plastic or cement material or of alternate layers of preformed material and of cementing or sealing material.

15 Exhaust tube 17 may be long enough to pinch off, cut, and pinch off again after a second exhausting of the air, or replaceable if threaded into the cap. If the exhaust tube is metal, it can be flattened and soldered or welded.

20 The grid may be a perforated plate as shown in Figure II or a circle of wire 19 with cross wires 21 welded to it as shown in Figure III. Cathode 12 may be provided with an activated coat 25 on the side toward the grid, as shown in Figure V.

25 The tube may be provided with a single cathode, grid and plate as shown in Figure I, or could obviously be built up to contain as many successive sets of such elements, one above the other or in one plane as desired—all within the same tube, as shown in Figure VIII.

30 Another arrangement is shown in Figure II, where double elements are shown in the same plane on opposite sides of the tube. The arrangement is especially effective for ultra high frequency purposes, since the edges of like elements present small capacity area.

35 Figure IV shows another double grid arrangement having prongs 22; and Figure VI a double plate with semicircular halves 23. The cathode could also be divided longitudinally or otherwise if desired. A retaining ring of soft plastic or other material acts as a gasket 24 to hold in place the cathode 12. The two parts into which the flat plate is divided need not be of the same size. The grid of Fig. III could also be divided 40 into two parts, usually of such size as to properly cooperate with corresponding plate parts. When a divided plate is used, two openings in the under part of the case are provided, one for each plate part; or there could be a series of small holes with a slight space at the inside of each plate part, between plate and lower case, so the plate, or the plate parts, could serve for microphone purposes.

45 Any desired number of leads can be brought out from each of whatever elements are employed. Changing the leads, or changing the elements

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employed, will change the highest frequency at which the tube will oscillate.

The inside of the case could have vertical grooves or be cut away so that not so much material holds, for example, a flat grid. The under side of the case could also be grooved for better plate cooling if necessary. The exhaust tube could be a vertical metal tube welded to the exposed plate at the bottom of the tube, and welded closed after exhausting.

Having described the invention, I claim:

1. A radio tube having a flat base, grooved rings superimposed upon said base and sealed tightly together, plate, grid and cathode elements held in spaced relation by said grooved rings, a cap above the uppermost of said rings, and clamping means tightly holding together said base, rings, and cap to form an air-tight tube.

2. A radio tube having a flat insulating base, a flat plate upon said base, cementing material tightly sealing together said base and said plate, a flat perforated grid above said plate, cementing material at the edges of said grid tightly sealing together in spaced relation said plate and said grid, a flattened cathode above said grid, an insulating ring holding said cathode in spaced relation to said grid, a retaining ring above said insulating ring, a cap above said retaining ring, and bolts clamping together all of said flattened plate, grid, and cathode elements, said rings and said cap to form a sealed tube.

3. A radio tube having a casing, pairs of plate, grid, and cathode elements within said casing, means holding in spaced relation edge to edge the members of each pair, and means holding in superimposed spaced relation said pairs.

4. A radio tube having a flat base, flat plate,

grid, and cathode elements superimposed in succession above said base and above each other, retaining means for holding said elements in spaced insulated relation and forming a sealed lateral wall, a sealing cap above said elements, and bolts clamping together said base, said retaining means and said cap to form a sealed compartment.

5. An electron discharge tube having a flat base, flat semicircular anodes upon said base in spaced relation to each other and in the same plane, an insulating ring above said anodes, forked meshing grids supported by said ring and in spaced relation to each other, a second insulating ring above said grids, a flattened cathode above said second ring, a third insulating ring above said cathode, a cap above the uppermost of said rings, and clamping and cementing means holding together said base, rings and cap to form an air-tight compartment.

6. An electron discharge tube having a flat insulating base, multiple flat and spaced anodes upon said base, an insulating ring above said anodes, multiple flat spaced grids above said ring, a second insulating ring above said grids, a cathode above said second ring, a cap above said cathode, and clamping means bringing together said base, rings, and cap to form an air-tight compartment.

7. An electron discharge tube having a base, an aperture in said base, a sheet anode covering said aperture, an insulating ring above said anode, a perforated sheet grid above said ring, a second insulating ring above said grid, a cathode above said second ring, a cap above said cathode, and means clamping together said base, rings, and cap to form an air-tight tube.

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