May 28, 1946. W. W. EITEL ET AL 2,401,059

ELECTRONIC TUBE

Filed May 23, 1942 2 Sheets-Sheet 1

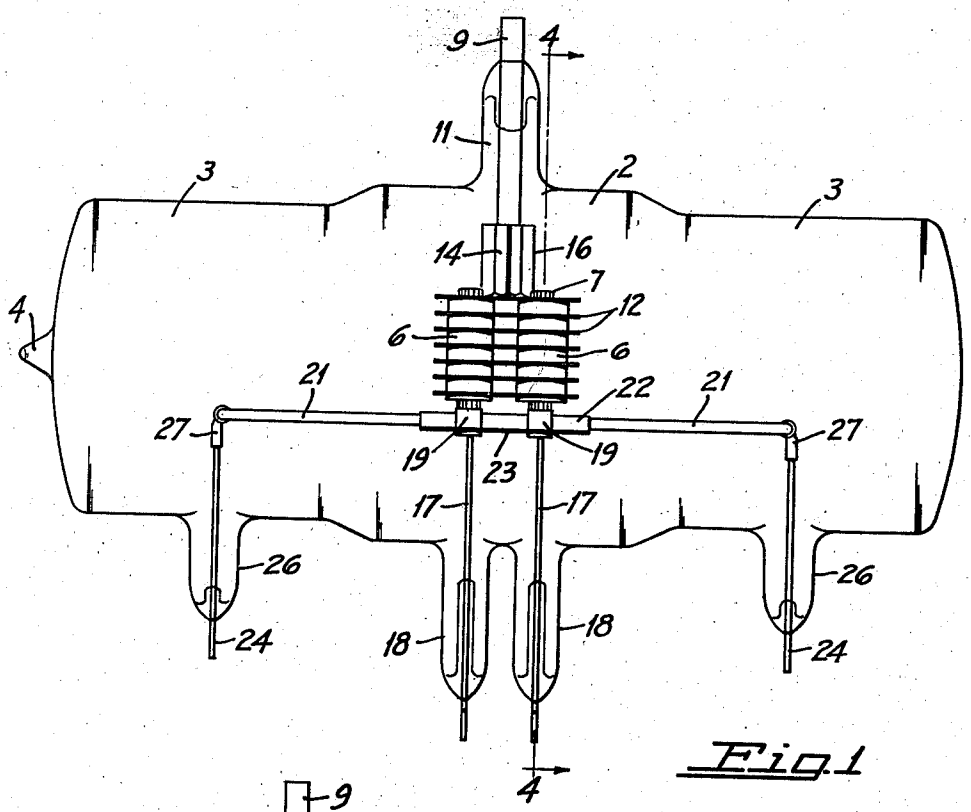


Fig. 1

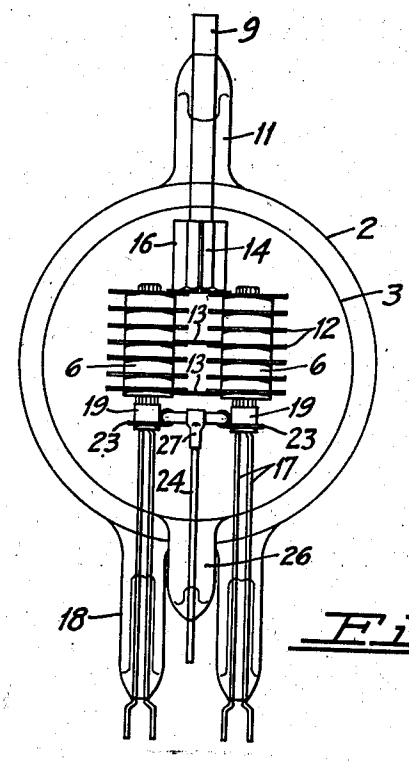


Fig. 2

INVENTORS
WILLIAM W. EITEL
JACK A. McCULLOUGH
BY Clarke D. Ewell
THEIR ATTORNEY

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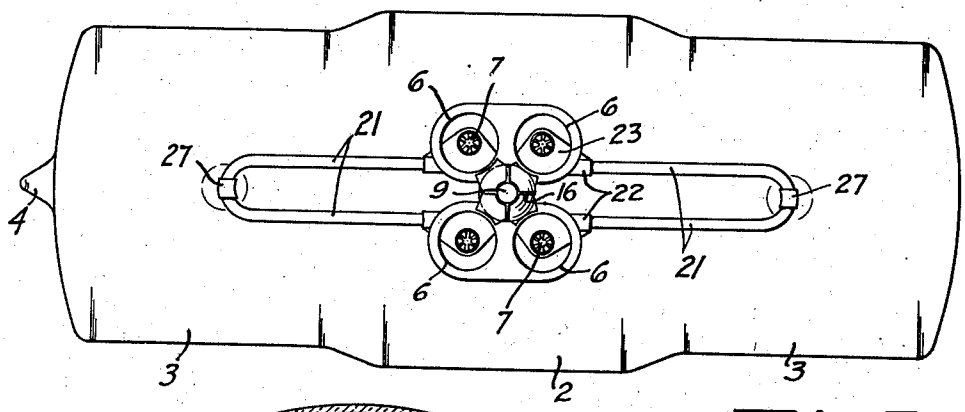


Fig. 3

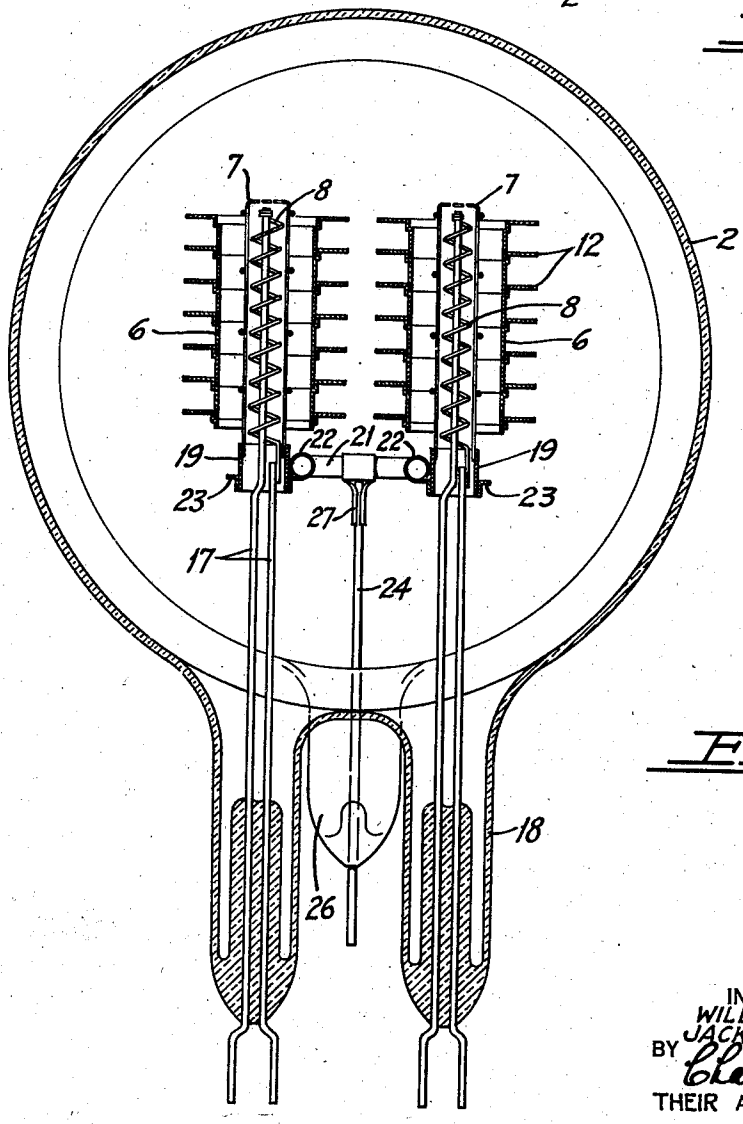


Fig. 4

INVENTORS
WILLIAM W. EITEL
JACK A. Mc CULLOUGH
BY Charles O. Evans
THEIR ATTORNEY

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ELECTRONIC TUBE

William W. Eitel, San Bruno, and Jack A. McCullough, Millbrae, Calif., assignors to Eitel-McCullough, Inc., San Bruno, Calif., a corporation of California

Application May 23, 1942, Serial No. 444,242

10 Claims. (Cl. 250—27.5)

Our invention relates to an electronic tube for ultra high frequency work; and more particularly to a tube in which a plurality of electronic units, such as triode units, are enclosed within the same envelope together with a resonant circuit for certain of the electrodes.

It is among the objects of our invention to provide a tube of the character described having an improved anode structure.

Another object is to provide a tube having a linear type resonant circuit within the envelope for the grids, and embodying an improved structure for the circuit and grid mounting thereon.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of our invention. It is understood that we do not limit ourselves to this disclosure of species of our invention, as we may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawings:

Figure 1 is a side elevational view of a tube embodying the improvements of our invention; and

Figure 2 is an end view of the same.

Figure 3 is a plan view of the tube.

Figure 4 is a transverse vertical sectional view of the tube on somewhat larger scale, taken in a plane indicated by line 4—4 of Figure 1.

In terms of broad inclusion, our tube comprises an envelope enclosing a plurality of operative units, each including an anode and cathode and grid. The anodes are of sectional construction with transversely extending interconnecting fins, providing an anode structure which is strong mechanically and radiates heat efficiently. A resonant circuit is arranged in the envelope for the grids, and further improvements are provided in the circuit structure and in the grid mounting thereon. The various electrodes and circuits are supported on the inner ends of leads sealed to the envelope.

In greater detail, and referring to the drawings, our tube comprises an elongated cylindrical envelope having a somewhat enlarged central portion 2 and reduced end portions 3. The envelope is initially formed with an open end to permit installation of the internal parts, after which the end is closed by spinning the glass inwardly. A tubulation is applied to this end; and, after evacuating the envelope, the tube is sealed off the pump at point 4.

The envelope contains a plurality of say four operative units, preferably triodes, each including an anode 6, grid 7 and cathode 8 arranged coaxially. These units are disposed centrally of the tube, spaced about a vertical axis extending transversely of the envelope. The anodes or plates 6 are mounted on a common terminal or lead 9 sealed in a horn 11 projecting from the top of the envelope.

An important feature of our tube resides in the anode structure. Each anode is made of cylindrical or drum-like sections disposed end-to-end. These sections are preferably provided with an annular recess or seat at one end so that the sections are nested as seen in Figure 4. After assembly the nested sections are secured together, as by welding. A section of one anode is integrally connected with that of another anode by a flange 12 which also functions as a heat radiating fin. These fins lie in parallel planes disposed transversely of and spaced along the electrode axes. The other pair of anodes is of similar construction.

The pairs of anodes are then joined together by cross plates 13 welded to the flanges; and the whole assembly is mounted on the inner end of lead 9 by a bracket 14 having flanges 16 extending along the lead to provide additional heat radiation surfaces. The final anode structure is a rigid body of light weight which is strong mechanically, resists warpage, and radiates heat efficiently.

Cathodes 8 are preferably of the filamentary type, each comprising a helical wire connected at top and bottom to a pair of leads 17 extending downwardly and sealed in a horn 18 projecting from the bottom of the envelope. The four horns of the cathode leads are spaced about the transverse axis of the tube in line with the individual operative units.

Grids 7 are of the cage type, each comprising vertical wires terminating at the bottom in a base ring 19. These grids are connected to a circuit structure comprising a pair of parallel legs 21 joined at the ends to form a pair of oppositely extending loops. The circuit legs preferably extend longitudinally of the tube in a horizontal plane disposed transversely of the electrode axes. From the mechanical standpoint the circuit structure is formed by a pair of U-shaped rods welded in the ends of centrally located connector sleeves 22. These sleeves have outwardly extending flanges 23 carrying the grids, one pair of grids being supported on one of the flanges and the other pair on the other flange. The flanges preferably have necks drawn therefrom for embracing the grid base

rings 19 to which they are welded. See Figure 4. This circuit and grid mounting structure is readily fabricated, and constitutes an important feature of our invention.

It will be recognized that the circuit structure forms a pair of resonant circuits of the linear or standing wave type, each connected at the center of the tube to a pair of the grids. Each circuit is tuned to predetermined wave length, say ¼ wave, and the length of the circuits will of course depend upon the frequency desired; these factors being well understood by those skilled in the art.

Connections with the outer ends of the resonant circuits or lines are established by leads 24 sealed in horns 26 projecting from the bottom of the envelope adjacent the end portions of the tube. Straps 27 welded to the upper ends of leads 24 and to the ends of the circuits complete the connections.

We claim:

1. An electronic tube comprising an envelope, electrodes in the envelope, a U-shaped circuit member in the envelope, flanged sleeves on the ends of said member, and means supporting certain of said electrodes on the sleeve flanges.

2. An electronic tube comprising an envelope, electrodes in the envelope, a pair of oppositely disposed U-shaped circuit members in the envelope, flanged sleeves connecting ends of said members, and means supporting certain of said electrodes on the sleeve flanges.

3. An electronic tube comprising an envelope, a plurality of anodes in the envelope, heat radiating fins on said anodes, a grid adjacent each anode, anode conductor means projecting into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

4. An electronic tube comprising an envelope, a plurality of anodes in the envelope, heat radiating fins on said anodes, a grid adjacent each anode, anode conductor means projecting transversely into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope comprising a pair of parallel legs extending longitudinally of said envelope, means supporting the grids on the intermediate portions of said circuit legs, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

5. An electronic tube comprising an envelope, a plurality of anodes in the envelope, a grid adjacent each anode, an anode lead projecting into the envelope, means unitarily supporting the anodes on said lead, a grid circuit structure in the envelope, means supporting the grids on the circuit structure, other leads projecting into the envelope, and means supporting said circuit structure on the last mentioned leads.

6. An electronic tube comprising an envelope, a plurality of pairs of anodes in the envelope, heat radiating fins on the anodes, certain of the fins being common to a pair of the anodes and others of the fins being common to another pair of anodes, a grid adjacent each anode, anode conductor means projecting into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

7. An electronic tube comprising an envelope, a plurality of pairs of anodes in the envelope each comprising a plurality of sections, heat radiating fins on the anodes and integral with sections thereof, a grid adjacent each anode, anode conductor means projecting into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

8. An electronic tube comprising an envelope, a plurality of pairs of anodes in the envelope each comprising a plurality of sections disposed end-to-end, parallel heat radiating fins on the anodes and integral with sections thereof, a grid adjacent each anode, anode conductor means projecting into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

9. An electronic tube comprising an envelope, a set of at least four anodes in the envelope, means interconnecting as a unit all of the anodes in said set, a grid adjacent each anode, anode conductor means projecting into the envelope, means supporting the anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

10. An electronic tube comprising an envelope, a set of at least four anodes in the envelope, means interconnecting as a unit all of the anodes in said set, a grid adjacent each anode, a single anode conductor projecting into the envelope, means unitarily supporting said set of anodes on said conductor means, a grid circuit structure in the envelope, means supporting said grids on the circuit structure, other conductor means projecting into the envelope, and means supporting said circuit structure on the last mentioned conductor means.

WILLIAM W. EITEL.
JACK A. McCULLOUGH.