June 24, 1947. W. W. EITEL ET AL 2,422,828

THERMIONIC TUBE

Filed Oct. 10, 1941

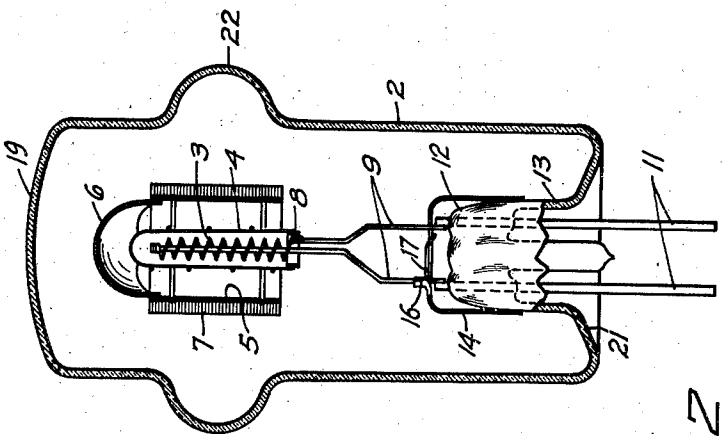

Fig. 2

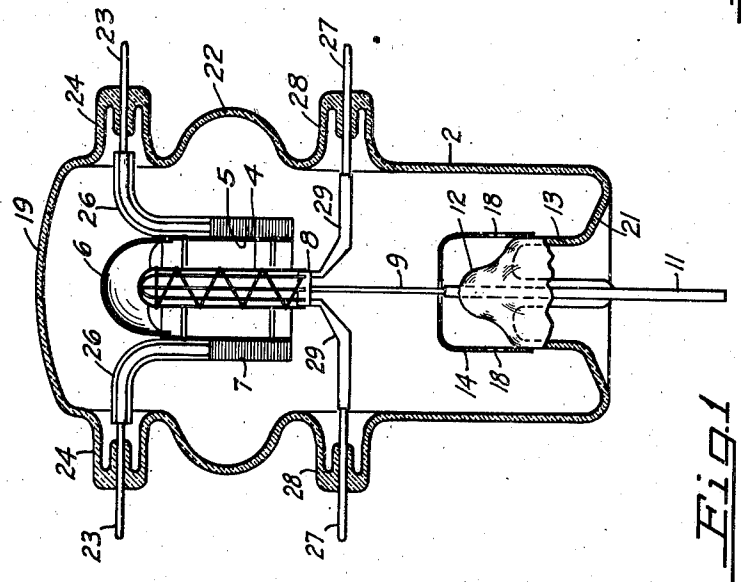

Fig. 1

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Patented June 24, 1947

2,422,828

UNITED STATES PATENT OFFICE

2,422,828

THERMIONIC TUBE

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Application October 10, 1941, Serial No. 414,504

2 Claims. (Cl. 250—27.5)

1

Our invention relates to a vacuum tube having a thermionic operating unit including electrodes such as cathode, grid and anode.

It is among the objects of our invention to provide an improved vacuum tube construction, particularly adapted for high frequency work.

Another object is to provide improved means for mounting and establishing electrical connections with the electrodes.

Another object is to provide an improved arrangement of leads for the electrodes, adopted for making dual connections with certain of the electrodes, and disposed to effect maximum spacing between the leads.

Still another object is to provide an improved envelope for keeping the leads short, yet providing the necessary spacing between the envelope walls and the anode.

A further object includes the provision of a tube in which the design of envelope and arrangement of leads facilitates the assembly and alignment of the electrodes.

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 to be 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 drawing:

Figure 1 is a vertical sectional view through the envelope of a tube embodying the improvements of our invention, parts of the internal structure being shown in section and parts in elevation; and

Figure 2 is a similar view taken in a plane through the envelope at right angles to that of Figure 1.

In terms of broad inclusion, our thermionic tube comprises an envelope containing coaxial electrodes including a cathode, grid and anode. Aligned leads extending through the sides of the envelope are disposed transversely of the electrode axis, and means are provided for supporting an electrode on the inner ends of the leads. Both the anode and grid are preferably provided with leads so arranged, and these leads preferably lie in the same plane with the electrode axis. The envelope is preferably cylindrical in shape and is provided with a circumferential bulge disposed about the anode.

In greater detail, and referring to the drawing, our preferred tube comprises an evacuated envelope 2 of glass enclosing a cathode 3, grid 4 and

2

anode 5. These electrodes may be of any suitable construction, preferably arranged coaxially in the envelope. Anode 5 is preferably cylindrical with a hemispherical end cap 6 to shield the upper end of the envelope from heat and electron bombardment. Corrugated fins 7 are arranged longitudinally of the anode for radiating heat. Grid 4 is preferably of ordinary cage construction having vertical wires terminating at a base ring 8 disposed adjacent the lower end of the anode.

Cathode 3 is of the coiled filament type connected at its ends to supporting leads 9 welded to extension leads 11 projecting through pinch 12 of a reenterant stem 13 at the lower portions of the envelope. Since the tube is designed for high frequency work the leads 11 preferably project directly out through the base of the tube to avoid the congestion in the usual pronged base structures. Leads 11 are preferably somewhat larger than the inner leads 9 for purposes of rigidity. These leads are made of metallic rods, such as tungsten.

A cup-shaped metallic shield 14 is preferably provided on the stem to protect it against heat and electron bombardment. Leads 9 project through a slot in the top of the shield, and the shield is grounded to one of the leads by a welded lip 16. After the shield has been assembled a strip 17 is secured in place over the slot to cover the opening leaving only a small clearance about the other lead. Apertures 18 in the sides of the shield provide openings through which air may be quickly withdrawn during the exhaust process.

Important features of the invention reside in the structure of the envelope and improved means for supporting and establishing connections with the anode and grid. As shown in Figures 1 and 2, the envelope is cylindrical in shape, having a top dome 19 and joined to stem 13 by a base flare 21. In a tube having an anode diameter of about ¾ inch the diameter of the envelope is about 2 inches. This gives a relatively close spacing between the envelope side walls and the electrodes for purposes of making short connections. In order to relieve the envelope from the heat zone about the anode, additional clearance is provided by a circumferential bulge 22 lying between the planes defined by the ends of the anode. This bulge provides an annular recess with the greatest wall spacing at the mid section of the anode where the heat is greatest.

A pair of aligned leads 23 are provided for the anode, which leads are disposed transversely of the electrode axis adjacent the upper end of the

anode. These anode leads extend through seals on horns **24** arranged on opposite sides of the cylindrical envelope wall above bulge **22**. The anode is supported on the inner ends of leads **23** by arcuate brackets **26** each welded at one end to an anode flange and at the other end to one of the leads. Each bracket is made from two pieces of metal welded to opposite sides of the anode fin and shaped so that when lying together they form a flanged hollow sleeve for embracing lead **23**. This gives strength to the bracket, and the flanges function to radiate heat.

Aligned leads **27** are also provided for grid **4**, which leads are also disposed transversely of the electrode axis. These grid leads extend through seals on horns **28** arranged on opposite sides of the cylindrical envelope wall below bulge **22**. Leads **23** and **27** lie in the same plane with the axis of the electrodes. The grid is supported on the inner ends of leads **27** by brackets **29** each secured at one end to ring **8** and at the other end to one of the leads. Brackets **26** and **29** of the anode and grid are made of a ductile material such as tantalum, while the leads **23** and **27** are rigid rods of say tungsten.

The structure above described provides a pair of leads for both the anode and grid. Connections may thus be made to the electrodes through either one or both of the leads in each pair; and utilizing the dual leads the electrodes may be interposed in an external circuit so as to balance capacity.

An important feature of our construction is that alignment of the leads provides a maximum spacing between the leads in each pair. Another important feature is that the leads extend through the cylindrical walls of the envelope lying closest to the electrode axis, so that the electrical path to the electrodes is kept short. Furthermore, the presence of bulge **22** increases the length of glass path between the anode and grid leads. These are desirable features in a tube for high frequency work.

In addition to the above advantages the tube is easy to fabricate and the electrodes readily assembled in proper alignment. Ease of assembly and alignment of the parts is enhanced because the electrodes and cylindrical envelope are all concentric, and because the transversely extending leads are aligned in pairs all lying in the same plane with the axis of the electrodes and envelope. Furthermore, the cylindrical envelope with its annular bulge **22** provides a compact tube having improved mechanical strength.

We claim:

1. An electronic tube comprising a substantially cylindrical envelope, an anode and grid in the envelope, said envelope having a circumferential bulge providing an interior recess disposed about the anode, a lead connected with the anode and extending through the envelope above the bulge, and a lead connected with the grid and extending through the envelope below the bulge, said leads being disposed transversely of the envelope axis.

2. An electronic tube comprising a substantially cylindrical envelope, an anode and grid in the envelope, said envelope having a circumferential bulge providing an interior recess disposed about the anode, a lead connected with the anode and extending through the envelope above the bulge, a lead connected with the grid and extending through the envelope below the bulge, a cathode in the envelope, and leads for the cathode extending through the lower portions of the envelope.

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