

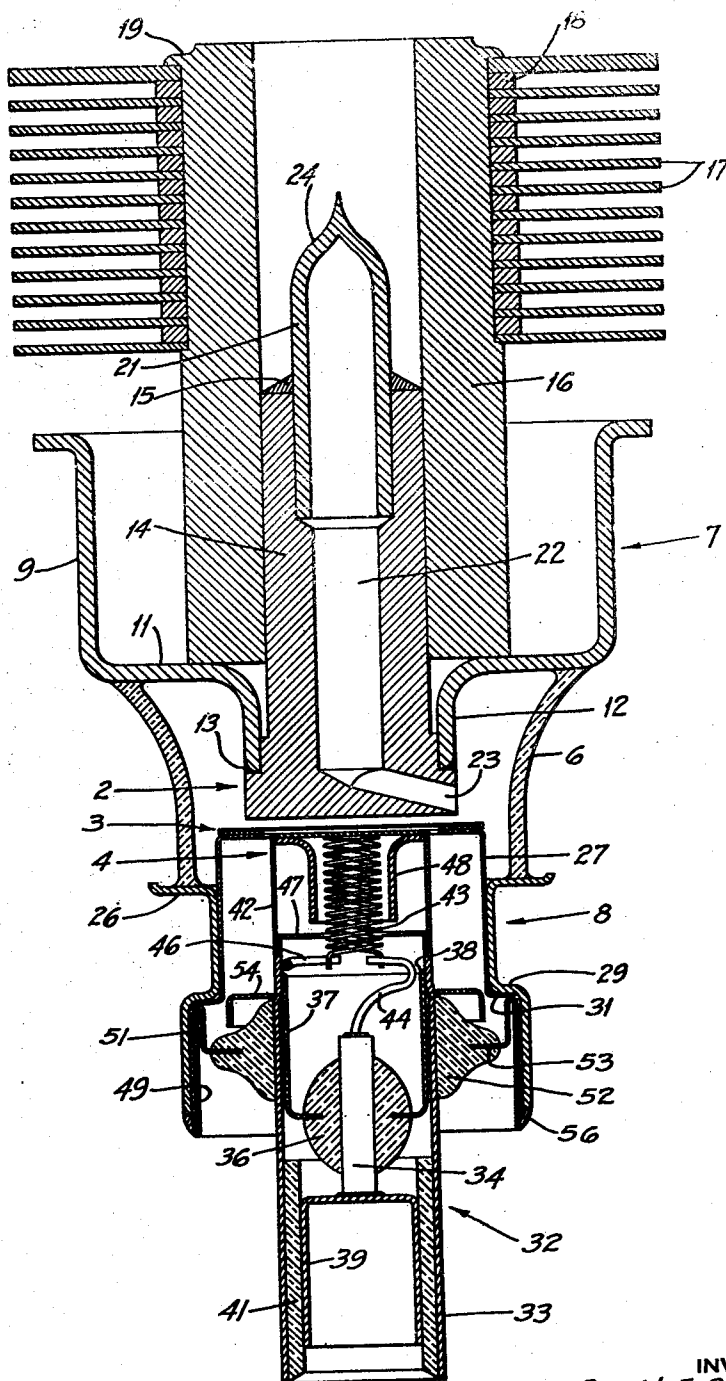
Jan. 11, 1949.

D. F. DRIESCHMAN ET AL

2,458,693

ELECTRON TUBE

Filed Jan. 25, 1946



INVENTORS
Donald F. Drieschman
Radford Leonard
BY *Harold E. Long*
ATTORNEY

UNITED STATES PATENT OFFICE

2,458,693

ELECTRON TUBE

Donald F. Drieschman, Los Altos, and Radford Leonard, San Bruno, Calif., assignors to Eitel-McCullough, Inc., San Bruno, Calif., a corporation of California

Application January 25, 1946, Serial No. 643,286

10 Claims. (Cl. 250—27.5)

1

Our invention relates to an electron tube of the type having parallel plane electrodes, and more particularly to improvements in the tube structure disclosed in the application of Donald F. Drieschman, Serial No. 592,542, now Patent No. 2,446,269, filed May 8, 1945.

It is among the objects of our invention to provide a tube structure and method of assembling the same, whereby the electrodes may be positioned with great accuracy and facility.

Another object is to provide a tube of the character described in which very close electrode spacings may be obtained, without special operator skill, and with the maintenance of uniform electrode spacings from tube to tube.

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, the single figure of the drawing is an axial sectional view of a tube embodying the improvements of our invention.

In terms of broad inclusion, our improved tube comprises an envelope and electrode supports insertable in the envelope, the envelope and supports being shaped and proportioned to provide limit stops to establish predetermined spacing between the electrodes. In our preferred structure the electrode supports comprise sleeves insertable in a tubular end section of the envelope, the sleeves being sized to nest together and into the tubular section so as to establish the desired electrode spacings when so nested. For a triode structure we prefer to carry the grid and cathode on the supporting sleeves and the anode on the opposite end of the envelope.

In greater detail, and referring to the drawing, our improvements are illustrated by a triode structure comprising an anode 2, grid 3 and cathode 4 arranged with active surfaces disposed in parallel planes. These electrodes are mounted in a suitable envelope comprising a body section 6 of vitreous material, such as glass, sealed at one end to an anode supporting member 7 and at the other end to a tubular envelope section 8. Anode support 7 also functions as the anode terminal and comprises a metal cup having a cylindrical wall 9 extending from a flange 11 to which the glass is sealed. Anode 2 is secured to neck 12 of the support by braze 13.

The anode is preferably of metal having good

2

heat conductivity, such as copper, with a flat anode surface presented interiorly of the envelope and having a stem portion 14 extending outwardly of the envelope. A suitable cooler is provided on the anode, preferably comprising a metal core 16 fitted on stem 14 and carrying a series of transverse disk-like heat radiating fins 17 separated by spacing rings 18, the fins and spacers being clamped together by a crimped lip 19 on core 16.

The tube is exhausted through a metal tubulation 21 secured to anode stem 14 by braze 15 and communicating with a passage 22 ported into the envelope through opening 23. After exhaust, the tube is sealed by pinching off the tubulation at tip 24.

Envelope section 8 at the opposite end of the envelope is a cylindrically shaped metallic member having an outturned flange 26 to which glass body section 6 is sealed. Section 8 is arranged coaxially with the anode and also functions as the terminal for grid 3. During assembly, the outer end of tubular section 8 is open, whereby the grid and cathode structures may be inserted through this end of the envelope.

Grid 3 is supported on a sleeve 27 of metal having good heat conductivity, such as copper, insertable in envelope section 8. The section 8 and sleeve 28 are shaped and proportioned to provide limit stops to establish a predetermined spacing between the grid and anode. This is preferably accomplished by an offset portion 29 on section 8 providing an annular seat engageable by a lip formed by an offset portion 31 on sleeve 27.

Cathode 4 is mounted on a stem 32 also coaxial with the anode and arranged to project into the envelope through tubular section 8. The cathode stem comprises a pair of concentric stem members including an outer tubular part 33 and an inner rod-like part 34. These stem members are joined together by a glass bead 36 sealed between rod 34 and the lower end of a sleeve 37, which sleeve is fitted into stem member 33 and secured thereto by braze 38. For convenience in making connection with the inner stem member, a cup-shaped terminal 39 is preferably fixed to the outer end of rod 34 and spaced from the outer stem member by insulator 41.

The cathode comprises a cylindrical can 42 having a flat top carrying the active cathode coating which may be of the usual oxide type commonly used for indirectly heated cathodes. Can 42 is coaxial with and secured to the inner end of stem member 33. The cathode heater comprises a spiral 43 having one end connected

3

to stem member 34 by bracket 44 and the other end connected to stem member 33 by bracket 46. Suitable baffles 47 and 48 arranged in can 42 serve to confine the heat and direct it toward the active surface of the cathode.

The cathode structure is supported from envelope section 8 by a U-shaped metallic sleeve having an outer flange 49 and an inner flange 51, this cathode supporting sleeve being fitted into section 8 in nested relation to grid supporting sleeve 27. A vitreous ring 52 is sealed between stem member 33 and an intumed lip 53 on sleeve flange 51. A shield 54 on the stem above glass ring 52 serves to protect the latter against heat and material sputtered from the cathode.

Cathode supporting sleeve 49-51 is also shaped and proportioned to provide a limit stop to establish a predetermined spacing between the cathode and grid, this being accomplished by utilizing the folded inner end of the sleeve as a lip for engaging the seat provided by offset portion 31 of the grid supporting sleeve. The various parts are so proportioned that the distance between the upper grid surface and the lip at offset 31 is less than that between the anode surface and the seat at offset 29 by the anode-grid spacing. Likewise, the distance between the cathode surface and the lip at the end of the cathode sleeve is less than that between the lower grid surface and the seat at offset 31 by the grid-cathode spacing. By this arrangement the electrodes are accurately and positively positioned with the desired electrode spacings. Tubes with an anode-grid spacing of .025 inch and a grid-cathode spacing of .0045 inch have been satisfactorily made and used.

The final closure is made by a fused metallic bond 56 joining the outer adjacent edges of section 8, sleeve 27 and sleeve flange 49. This bond may be formed by welding or brazing to simultaneously join the three edges together.

Our improved tube structure, above described, permits the electrodes to be assembled within the envelope with great accuracy and facility, it requiring no special skill to nest the sleeves together and insert them into the envelope. Maintenance of precise spacings is positively assured by the limit stops on the nested parts. Another advantage of the structure is that the final closure joint at 56 is made by a single fusing operation which simultaneously fixes the parts together and closes the envelope.

While we have shown a triode structure to illustrate the invention, it is understood that our improvements may be incorporated in tubes having additional electrodes. For example, a tetrode may be constructed with an additional supporting sleeve carrying a screen grid, thus making three sleeves nested together within envelope section 8.

We claim:

1. An electron tube having parallel plane electrodes, an envelope supporting an electrode at one end and having a tubular section at the other end, a pair of sleeves inserted in said tubular section and carrying others of said electrodes, one of said sleeves lying within the other sleeve, said tubular section and said sleeves having limit stops to establish predetermined spacing between the electrodes.

2. An electron tube having parallel plane electrodes, an envelope supporting an electrode at one end and having a tubular section at the other end, a pair of sleeves inserted in said tubular section and carrying others of said electrodes,

4

one of said sleeves lying within the other sleeve, said tubular section and said sleeves having limit stops to establish predetermined spacing between the electrodes, and a fused bond joining adjacent edges of the tubular section and said sleeves.

3. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, a first sleeve inserted in said tubular section and carrying the grid, a second sleeve inserted in the first sleeve and carrying the cathode, said tubular section and said sleeves having limit stops to establish predetermined spacing between the electrodes.

4. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, a first sleeve inserted in said tubular section and carrying the grid, a second sleeve inserted in the first sleeve and carrying the cathode, said tubular section and said sleeves having limit stops to establish predetermined spacing between the electrodes, and a fused bond joining adjacent edges of the tubular section and said sleeves.

5. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, a seat on the envelope spaced from the anode, a grid support inserted in said tubular section and having a lip engaged with the seat on the envelope, the distance between the grid and its support lip being less than that between the anode and envelope seat by the anode-grid spacing, a seat on the grid support spaced from said grid, a cathode support inserted in the grid support and having a lip engaged with the seat on the grid support, the distance between the cathode and its support lip being less than that between the grid and its support seat by the grid-cathode spacing.

6. An electron tube having parallel plane electrodes, an envelope supporting an electrode at one end and having a tubular section at the other end, said section having an intermediate offset portion, an electrode supporting sleeve inserted in the tubular section and having an intermediate offset portion engaged with the offset portion of said section, and another electrode supporting sleeve inserted in the first sleeve and having an end engaged with the offset portion of said first sleeve.

7. An electron tube having parallel plane electrodes, an envelope supporting an electrode at one end and having a tubular section at the other end, said section having an intermediate offset portion, an electrode supporting sleeve inserted in the tubular section and having an intermediate offset portion engaged with the offset portion of said section, another electrode supporting sleeve inserted in the first sleeve and having an end engaged with the offset portion of said first sleeve, and a fused bond joining adjacent edges of the tubular section and said sleeves.

8. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, said section having an intermediate offset portion, a grid supporting sleeve inserted

5

in the tubular section and having an intermediate offset portion engaged with the offset portion of said section, and a cathode supporting sleeve of U-shape inserted in the first sleeve and having a folded end engaged with the offset portion of said first sleeve.

9. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, said section having an intermediate offset portion, a grid supporting sleeve inserted in the tubular section and having an intermediate offset portion engaged with the offset portion of said section, a cathode supporting sleeve of U-shape inserted in the first sleeve and having a folded end engaged with the offset portion of said first sleeve, a cathode stem, and a vitreous ring sealed between the stem and the inner flange of said cathode supporting sleeve.

10. An electron tube having parallel plane electrodes including an anode and grid and cathode, an envelope supporting the anode at one end and having a tubular section at the other end, said section having an intermediate offset portion, a grid supporting sleeve inserted in the

6

tubular section and having an intermediate offset portion engaged with the offset portion of said section, a cathode supporting sleeve of U-shape inserted in the first sleeve and having a folded end engaged with the offset portion of said first sleeve, a cathode stem, a vitreous ring sealed between the stem and the inner flange of said cathode supporting sleeve, and a fused bond joining adjacent edges of the tubular section and grid supporting sleeve and inner flange of the cathode supporting sleeve.

DONALD F. DRIESCHMAN.
RADFORD LEONARD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,093,303	Beggs	Sept. 14, 1937
2,262,901	Murphy	Nov. 18, 1941
2,406,121	Young	Aug. 20, 1946
2,406,850	Pierce	Sept. 3, 1946
2,411,046	Liimatainen	Nov. 12, 1946