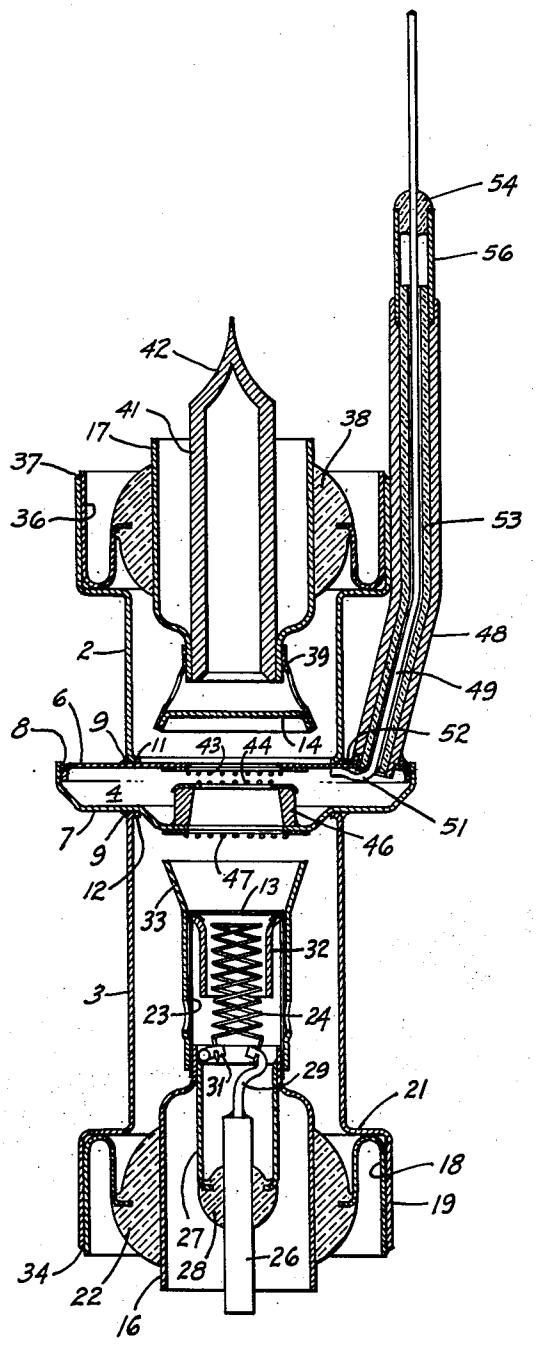
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REFLEX OSCILLATOR TUBE

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REFLEX OSCILLATOR TUBE

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My invention relates to an improved electron tube of the reflex klystron type.

It is among the objects of my invention to provide a tube of the character described, so designed and constructed as to obtain compactness and maximum ruggedness.

Another object is to provide such a tube having terminals for the cathode and repeller electrodes arranged coaxially with the cylindrical envelope.

A further object includes the provision of a tube of simple construction in which the resonant cavity is made of disk-like flanges connected together and to the adjacent envelope sections with brazed joints.

A still further object is to provide an improved terminal and supporting structures for the cathode and repeller electrodes, wherein the supporting stems are readily assembled in the ends of the envelope and sealed in place by simple brazed joints.

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

Referring to the drawing:

The single figure is an axial sectional view of a tube embodying the improvements of my invention.

In terms of broad inclusion my improved reflex oscillator tube comprises a generally cylindrical metallic envelope, a circular resonant cavity interposed between the ends of the envelope, a cathode in the envelope adjacent one side of the cavity, a repeller electrode in the envelope adjacent the other side of the cavity, and coaxial terminals for the cathode and repeller electrode at opposite ends of the envelope. In the preferred structure the envelope comprises a pair of aligned tubular envelope sections and the interposed cavity is made up of a pair of disk-like flanges metallically bonded together and to the adjacent envelope sections. The cathode and repeller electrodes and the coaxial terminals for the same are assembled on stem structures which are fitted in the ends of the envelope and sealed in place by metallically bonded joints.

In greater detail and referring to the drawing, my improved tube comprises a generally cylindrical metallic envelope having a pair of aligned tubular envelope sections 2 and 3. Be-

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tween these sections is interposed a circular resonant cavity 4 formed by a pair of disk-like metallic flanges 6 and 7 having aligned apertures disposed across the tube axis. These flanges are metallically bonded by a braze 8 along the peripheral edges, and the flanges are likewise metallically bonded by brazes 9 at the inturned lips 11 and 12 of the envelope sections. The latter joints lie intermediate the width of the flanges so that the circular cavity projects radially from the body of the tube envelope.

By this arrangement the flanges 6 and 7 act as diaphragms so that the dimensions of the cavity may be altered by compressing or extending the cavity walls for purposes of changing the resonant frequency of the cavity. Any suitable tuning means (not shown) connected to the envelope sections 2 and 3 and actuated by screws or the like may thus be provided for applying an axial force to the cavity for purposes of adjusting the operating frequency of the tube.

A cathode 13 is mounted in the envelope adjacent one side of the cavity and a repeller electrode 14 is positioned in the envelope adjacent the opposite side of the cavity. In my tube improved electrode supporting stem structures are provided for the cathode and repeller, wherein the terminals 16 and 17 for these electrodes are coaxial with the tube axis. Considering first the cathode stem, it will be seen that the terminal 16 is tubular and projects into the end of envelope section 3. This terminal is surrounded by a metallic U-shaped sealing ring 18 fitted in the enlarged end 19 of the envelope section so that the base of the ring seats against the offset lip 21. A vitreous ring 22 such as glass is sealed between terminal 16 and the inner flange of the sealing ring 18.

Cathode 13 is preferably of the oxide coated type and is preferably shaped as a flat button, although the surface of the cathode may be concave instead of flat depending upon the electron beaming characteristics desired. The cathode is supported on the stem structure by a sleeve 23 projecting from the reduced inner end of terminal 16, this sleeve being preferably of thin metal to thermally isolate the cathode.

An insulated heater coil 24 is mounted within the cathode assembly, connected at one end to the terminal 16 and at the other end to an inner terminal prong 26 concentric with the tubular terminal. The inner terminal is supported by a sleeve 27 brazed to and projecting downwardly within the tubular terminal. A vitreous bead 28 seals the inner terminal to

the lower end of sleeve 27. Supporting connections for the heater coil are provided by suitable lugs 29 and 31 on the inner terminal adjacent the rim of the tubular terminal. A heat shield 32 projecting downwardly from the cathode and surrounding the heater coil improves the heating efficiency of the cathode.

The electron gun assembly is completed by a focusing sleeve 33 extending upwardly from the terminal 16 about the cathode sleeve 23 and having a conical focusing portion projecting beyond the cathode 13. As in the case of the cathode button 13, the shape and dimensions of the focusing sleeve depends upon the electron beaming characteristics desired, as will be readily understood by those skilled in the art.

The entire cathode and electron gun assembly is thus supported on the cathode stem which is assembled as a unit and inserted into the end of envelope section 3. Since the parts are all coaxial with the envelope it will be seen that the inserted sealing ring 18 functions to center the cathode and gun assembly axially of the envelope. Likewise the seating of the inserted sealing ring against lip 21 serves to establish proper spacing of the cathode with respect to other parts of the tube. A final vacuum-tight seal is made by a metallic bond at braze 34 along the registering edges of ring 18 and the envelope section.

The supporting stem for the repeller electrode 14 is assembled in the opposite end of the envelope in a similar manner, namely, by means of a sealing ring 36 brazed in place at the peripheral braze 37 and connected to the tubular terminal 17 by vitreous bead 38. The disk-like repeller electrode 14 is supported on the inner end of terminal 17 by a perforated conical bracket 39, which electrode is properly centered and spaced by the coaxial stem structure when the stem is inserted. Another feature at this end of the envelope is that the metal exhaust tubulation 41 is carried by the stem. The tubulation is secured to the inner end of terminal 17 and projects outwardly through the terminal. After evacuation of the envelope the tubulation is pinched off at tip 42.

A cavity grid 43 is mounted across the upper cavity aperture and a second cavity grid 44 is disposed across the lower cavity aperture, the latter grid being preferably mounted on a reentrant portion 46 of the cavity. An accelerator grid 47 is also preferably interposed between the cathode and cavity, which grid is preferably mounted directly on the cavity wall below the lower aperture. These several grids may be fabricated in any conventional manner as by parallel wires stretched across suitable mounting rings.

Energy is preferably coupled out of cavity 4 by a coaxial line 48 having an inner conductor 49 terminating at the coupling loop 51. This output line is located externally of the envelope and enters the cavity through flange 6, the line being supported by having its outer conductor bonded to flange 6 at braze 52. The inner conductor 49 is spaced from the outer conductor by a vitreous tube 53, and a vacuum tight seal is provided adjacent the outer end of the conductors by a glass bead 54 sealed between the inner conductor and a sealing sleeve 56 which forms an extension of the outer conductor.

I claim:

1. A reflex oscillator tube comprising a pair of aligned tubular metallic envelope sections, a cavity resonator comprising a pair of disk-like metallic flanges having aligned apertures interposed between the envelope sections, said flanges being metallically bonded together along their peripheral edges and each flange being metallically bonded to one of said envelope sections, a cathode in the envelope adjacent one side of the cavity resonator, a repeller electrode in the envelope adjacent the other side of the cavity resonator, sealing rings inserted in opposite ends of the envelope with outer edges of the rings registering with the outer edges of said tubular envelope sections, said edges being metallically bonded together, a cathode stem at one end of the envelope comprising a tubular terminal extending axially of the envelope for supporting the cathode, a vitreous ring interposed between said terminal and the adjacent sealing ring, a repeller electrode stem at the other end of the envelope comprising a tubular terminal extending axially of the envelope for supporting the repeller electrode, and a vitreous ring interposed between the last mentioned terminal and the adjacent sealing ring.

2. A reflex oscillator tube comprising a pair of aligned tubular metallic envelope sections, a cavity resonator comprising a pair of disk-like metallic flanges having aligned apertures interposed between the envelope sections, said flanges being metallically bonded together along their peripheral edges and each flange being metallically bonded to one of said envelope sections, a cathode in the envelope adjacent one side of the cavity resonator, a repeller electrode in the envelope adjacent the other side of the cavity resonator, sealing rings inserted in opposite ends of the envelope with outer edges of the rings registering with the outer edges of said tubular envelope sections, said edges being metallically bonded together, a cathode stem at one end of the envelope comprising a tubular terminal and a concentric inner terminal extending axially of the envelope, a sleeve projecting from the tubular terminal and connected to the cathode, a heater for the cathode connected to said terminals, a vitreous ring interposed between the terminals, a vitreous ring interposed between the tubular terminal and the adjacent sealing ring, a repeller electrode stem at the other end of the envelope comprising a tubular terminal extending axially of the envelope for supporting the repeller electrode, and a vitreous ring interposed between the last mentioned terminal and the adjacent sealing ring.

3. A reflex oscillator tube comprising a pair of aligned tubular metallic envelope sections, a cavity resonator comprising a pair of disk-like metallic flanges having aligned apertures interposed between the envelope sections, said flanges being metallically bonded together along their peripheral edges and each flange being metallically bonded to one of said envelope sections, a cathode in the envelope adjacent one side of the cavity resonator, a repeller electrode in the envelope adjacent the other side of the cavity resonator, sealing rings inserted in opposite ends of the envelope with outer edges of the rings registering with the outer edges of said tubular envelope sections, said edges being metallically bonded together, a cathode stem at one end of the envelope comprising a tubular terminal extending axially of the envelope for supporting the cathode, a vitreous ring interposed between said terminal and the adjacent sealing ring, a repeller electrode stem at the other end of the envelope comprising a tubular terminal extending axially

of the envelope for supporting the repeller electrode, a vitreous ring interposed between the last mentioned terminal and the adjacent sealing ring, and an exhaust tubulation projecting outwardly of the envelope through said last mentioned terminal.

4. A reflex oscillator tube comprising a pair of aligned tubular metallic envelope sections, a cavity resonator comprising a pair of disk-like metallic flanges having aligned apertures interposed between the envelope sections, said flanges being metallically bonded together along their peripheral edges and each flange being metallically bonded to one of said envelope sections, a cathode in the envelope adjacent one side of the cavity resonator, a repeller electrode in the envelope adjacent the other side of the cavity resonator, sealing rings inserted in opposite ends of the envelope with outer edges of the rings registering with outer edges of said envelope sections, said edges being metallically bonded together, means supporting the cathode on one of said sealing

rings, and means supporting the repeller electrode on the other sealing ring, said supporting means for the repeller electrode including a fixed exhaust tubulation extending axially of the envelope.

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