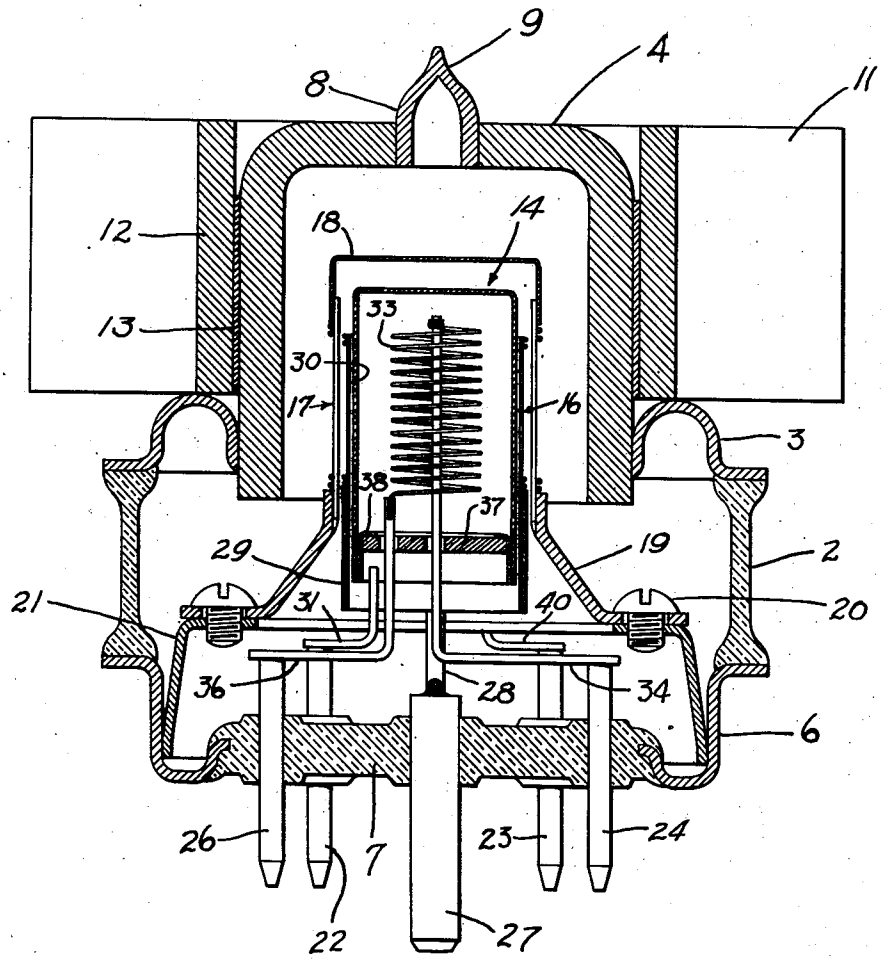
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BASE STRUCTURE FOR ELECTRON TUBES

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BASE STRUCTURE FOR ELECTRON TUBES

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My invention relates to electron tubes, and more particularly to the electrode arrangement and envelope structure of such tubes.

It is among the objects of my invention to provide improvements in multi-grid tubes such as tetrodes.

Another object is to provide an improved header structure for the tube envelope.

Another object is to provide an improved terminal arrangement for the electrodes of a tetrode.

Still another object is to provide a tube design which particularly adapts it to tubes of small physical size.

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 of the drawing is a vertical sectional view of a tube embodying the improvements of my invention.

In terms of broad inclusion, my tube comprises an envelope having a disk-like vitreous header at one end and an anode adjacent the other end. Electrodes are provided in the envelope and contact prongs for certain of the electrodes are sealed to the header. A plurality of these prongs are preferably arranged in arcuate formation, and another prong is located inside this formation. In my preferred tube, comprising a tetrode structure, the cathode is connected to one of the prongs of the arcuate formation and the control grid is connected to the inside prong. Another feature of my tube is that the screen grid is connected to a terminal ring surrounding the header. The preferred tube embodies an indirectly heated type of cathode having a heater connected to other contact prongs of the arcuate formation, and has an external type of anode supported from the grid terminal ring by a vitreous section of the envelope. It is understood, however, that an ordinary filamentary cathode may be used instead of the indirectly heated type, and that a conventional internal anode may be employed instead of the external anode type.

In greater detail, and referring to the drawing, my invention is illustrated by an external anode tetrode structure comprising an envelope having a vitreous section 2 sealed between a flange 3 on tubular anode 4 and a metallic ter-

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minal ring 6 located below the anode. A disk-like vitreous header 7 is sealed to ring 6. By the term "vitreous" I mean a material having insulating and vac-tight properties such as glass, ceramic or the like. Ring 6 and anode flange 3 may be of a suitable glass-sealing metal, such as Kovar, and cup-shaped anode 4 may be of copper. The tube is preferably exhausted through a metal tubulation 8 on the anode, which tubulation is pinched off at tip 9. Heat is removed from the anode by a finned cooler 11 having a core 12 bonded to the anode by solder 13.

The internal electrodes of my preferred tube comprise a cathode 14, control grid 16 and screen grid 17. These are tubular electrodes projecting into the anode and coaxial therewith. The two grids have upper free ends and lower fixed ends and are preferably made of wire bars, the screen grid preferably being capped by top piece 18. Screen grid 17 is supported from its lower end by a bracket 19 fastened by screws 20 to a flange 21 secured to envelope ring 6. By this arrangement the ring 6 serves as a terminal for the screen grid.

The remaining electrodes are connected to and supported by rigid contact prongs sealed to header 7. As shown, a plurality of prongs 22, 23, 24 and 26 arranged in arcuate formation such as in a circle concentric with the header. Another prong 27, preferably of larger diameter than the others, is located inside the arcuate formation, the preferred location being at the center of the header. All these prongs are rigid rods so that they are adapted to be plugged directly into a socket. Being of heavier stock, the center prong gives added support for the tube in the socket.

Control grid 16 is preferably connected to center prong 27 by a supporting bracket 28, which bracket may conveniently be of U-shape brazed at the center to the top of prong 27 and at the ends to opposite sides of grid band 29. By connecting the control grid to center terminal prong 27, which prong is concentric with terminal ring 6, it will be seen that the external terminals of the two grids are coaxially arranged. Such an arrangement is particularly desirable in circuits for higher frequency operation employing coaxial lines.

The indirectly heated cathode 14 comprises a cylindircal core 30 of metal, preferably cup-shaped, carrying a suitable coating of emissive material on its outer surface. A coating of barium and strontium oxides, commonly used in

cathodes of this type, may be employed. The cathode is connected to prong 22 by a supporting bracket 31. In order to give added support and provide additional conductor means, other similar brackets may be connected between the cathode and other prongs (not shown) in the circular formation. Cathode heater 33 is a coil of resistance wire connected to other prongs 24 and 26 by suitable brackets 34 and 36. If desired, the lower end of the cathode may be closed by an insulator 37 fastened in place by a sleeve 38.

In addition to being connected to terminal ring 6, the screen grid 17 is also preferably connected to a contact prong 23 of the header by a strap 40 bridging the prong and grid supporting flange 21.

As hereinbefore mentioned, the cathode may be of the conventional filamentary type, in which case the two ends of the filament would be connected to a pair of the contact prongs in a manner similar to the cathode heater coil illustrated. Likewise, a conventional type of internal anode may be used instead of an external anode. I prefer the external type of anode, however, because of the increased heat dissipation properties.

My tube structure has a number of advantages, particularly in multi-grid tubes such as the tetrode illustrated. The improved header and terminal arrangement enables the tube to be built in small physical sizes. For example, a power tetrode of the character shown and with an anode dissipation capability of around 100 watts, has been made with an overall height of about 2 inches and a diameter of about 1½ inches. Another advantage due to the improved terminal arrangement, is that my tube is capable of operation in the higher frequency ranges.

Still another feature is that the screen grid support members 19 and 21 form a metallic shield extending transversely from the screen grid to the wall of the envelope, which shield is interposed between the anode and the control grid structure. This arrangement provides good shielding between the output and input electrodes.

I claim:

1. An electron tube comprising an envelope including a metallic ring and a disk-like vitreous header sealed along its periphery to said ring, a contact prong disposed centrally of the ring and sealed to the header, said prong having an inner end projecting into the envelope and an outer contact end projecting externally of the envelope, and electrodes in the envelope including a control grid connected to and supported by the inner end of the prong and a screen grid connected to said ring.

2. An electron tube comprising an envelope including a metallic ring and a disk-like vitreous header sealed along its periphery to said ring, a contact prong sealed to the header, said prong having an inner end projecting into the envelope and an outer contact end projecting externally of the envelope, coaxial electrodes in the envelope including a control grid and screen grid, said grids being mounted above the header and each having an upper free end and a lower fixed end, means attached to the fixed end of the control grid supporting it on the inner end of said prong, and means attached to the fixed end of the screen grid supporting it on said ring.

3. An electron tube comprising an envelope including a disk-like vitreous header at one end, a plurality of contact prongs mounted in arcuate formation and sealed to the header, another contact prong located inside said formation and sealed to the header, said prongs having inner ends projecting into the envelope and having outer contact ends projecting externally of the envelope, and electrodes in the envelope including a cathode connected to and supported by the inner end of a prong of the arcuate formation and a grid connected to and supported by the inner end of the inside prong.

4. An electron tube comprising an envelope including a metallic ring and a disk-like vitreous header sealed along its periphery to said ring, a plurality of contact prongs mounted in arcuate formation and sealed to the header, another contact prong located inside said formation and sealed to the header, said prongs having inner ends projecting into the envelope and having outer contact ends projecting externally of the envelope, a control grid connected to the inner end of the inside prong, a screen grid connected to said ring, and an indirectly heated cathode and heater therefor connected to the inner ends of prongs of the arcuate formation.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,113,671	Zottu et al.	Apr. 12, 1938
2,238,596	Mouromtseff et al.	Apr. 15, 1941
2,278,278	Miller	Mar. 31, 1942
2,288,380	Wing	June 30, 1942
2,404,363	Chevign	July 23, 1946