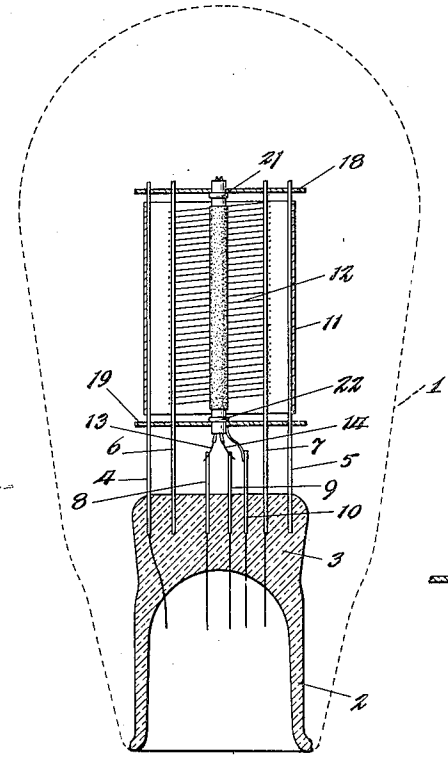
Sept. 25, 1934. V. D. GOODWIN 1,974,916

ELECTRON DISCHARGE DEVICE

Filed April 25, 1934

Fig. 1.



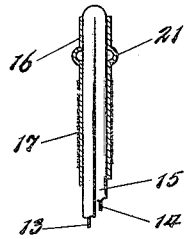


Fig. 2.

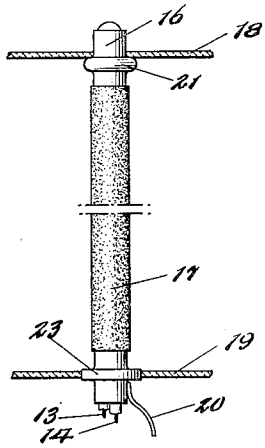


Fig. 3.

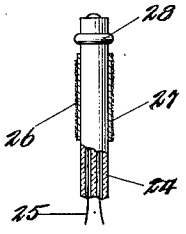


Fig. 4.

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ELECTRON DISCHARGE DEVICE

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Application April 25, 1934, Serial No. 722,323

6 Claims. (Cl. 250—27.5)

This invention relates to electron discharge devices and with particularity to devices employing so-called indirectly heated electron emitters.

An object of the invention is to provide an improved cathode structure for heater-type vacuum tubes whereby the reliability and uniformity of operation of such tubes is increased.

A feature of the invention is to provide an electron discharge tube of the thermionically emissive type wherein disturbing noises caused by vibrations of the cathode assembly, are substantially eliminated.

Another feature relates to a tubular type emitting cathode having means for preventing both longitudinal and transverse vibrations thereof.

A further feature relates to a tubular type emitting cathode having means for facilitating centering thereof in an electrode assembly.

A further feature relates to the novel organization, arrangement and relative location of parts which go to make up an improved repeater and/or amplifier and/or detector of the electron discharge type.

Other features and advantages not specifically enumerated will be apparent after consideration of the following detailed descriptions and the appended claims.

While the invention will be disclosed herein as embodied in one specific type of discharge device, it will be understood that this is done merely for explanatory purposes, and the cathode structure according to the invention may be embodied in a wide variety of discharge devices of known construction.

According in the drawing Fig. 1 is a partial sectional view of an electron discharge tube embodying features of the invention.

Fig. 2 is an enlarged detail view of part of the heater cathode shown in Fig. 1.

Fig. 3 shows a modification of the heater cathode of Figs. 1 and 2.

Fig. 4 shows a further modification of the heater cathode of Fig. 1.

Referring more particularly to Fig. 1, the numeral 1 represents in dotted outline an enclosing envelope such as ordinarily employed for lamps, tubes or the like. Envelope 1 may be evacuated or may contain a filling of one or more inert gases or vapors as desired. Sealed into the bottom of the envelope 1, is a "mount" comprising a re-entrant portion 2 terminating in a press 3 into which are sealed the various electrode lead-in and support wires 4 to 10 inclusive. Wires 4 and 5 are connected to and support a hollow tubular anode 11. Wires 6 and 7 are connected to and support the wound wire or foraminous grid electrode 12, while wires 8 and 9 connect with the heater filament wires 13 and 14. As shown in detail in Fig. 2 the filament wires 13 and 14 are provided with a coating of insulation 15 and are preferably formed of a single length of wire doubled back upon itself to form a four strand bundle, although it will be understood that the invention is not limited to any particular formation of the filament wire. The folded insulated filament is positioned within a tubular metal sleeve 16 of nickel or other similar material. For a detailed description of this general type of indirectly heated cathode structure reference may be had to application Serial No. 620,157. The sleeve 16 is provided throughout the major portion of its external surface with any well-known electron emissive material or materials.

For the purpose of accurately and permanently spacing all the above described electrodes from one another, there are usually provided insulator spacer strips or discs 18, 19. These discs have sets of aligned lateral perforations to receive the rods 4, 5, 6 and 7, and a pair of aligned central perforations to receive the cathode assembly. Heretofore it has been the practice to rely on the rigidity of the filament wires 13 and 14 or the tab 20 to support the cathode assembly against vertical movement. It has been found however that because of natural flexibility of the wires 6 and 7 and tab 20, microphonic disturbances are introduced when the tube is subjected to slight shocks or jars. While this vibratory movement of the cathode assembly may be imperceptible the effects are very noticeable when the tube is in actual use, particularly in high-gain amplifiers, detectors or the like. In order to overcome this defect, the tubular metal sleeve 16 is provided adjacent opposite ends, with annular beads or lips 21, 22 which when in assembled position bear against the insulator discs 18, 19 respectively. With this arrangement the ends of the sleeve may be tightly fitted into the central perforations in discs 18, 19, to prevent lateral vibrations of the cathode assembly, while the annular beads 21, 22 prevent vertical vibrations thereof.

In the embodiment of Fig. 1, in order to assemble the cathode in position within the electrode assembly as a whole, it is necessary to first position the cathode in one of the discs, e. g. disc 19, and then to assemble the other disc 18 over the opposite end of the cathode. There is shown in Fig. 3 an alternative form of cathode which is capable of assembly after the discs 18

and 19 have been assembled in fixed position. In the embodiment of Fig. 3 parts corresponding to similar parts of Fig. 1 bear the same designation numerals. Thus the internal heater comprises an insulated wire 13, 14 which is doubly bent back upon itself to general M-shaped formation, and is fitted within the tubular metal sleeve 16. Sleeve 16 is provided adjacent its upper end with an annular bead or embossing 21 which is adapted to bear against the under face of disc 18. It will be noticed that disc 18 is provided with an opening which is considerably larger in diameter than the sleeve 16. Preferably this opening is materially larger than the over-all outside diameter of the sleeve with its coating. The purpose of this is to allow the cathode assembly to be passed upwardly through the opening in disc 19 without danger of the edge of the opening contacting with and scratching away the relatively thin coating 17. In order, however, to prevent swaying movement of the cathode assembly there is provided at the lower uncoated end of sleeve 16 an annular bead or lip 23 which fits snugly within the opening in disc 19. Preferably, although not necessarily, the bead 23 is provided with a flattened periphery as shown. With this arrangement it is possible to assemble the discs 18 and 19 in fixed relation to each other, and then to assemble the cathode unit in place merely by passing it upwardly through the opening in disc 19, it being understood that the said opening is slightly larger than the outer diameter of sleeve 16 at the upper beaded portion. Because of the enlarged character of the opening in disc 19 the chances of the emissive coating being scratched during the assembling operation, are materially reduced. When the upper bead 21 engages disc 18, the lower bead 23 is seated within the opening in disc 19 and relative vibratory movement of the cathode with respect to the remaining electrodes is avoided.

Referring to Fig. 4 there is shown another embodiment comprising a cylindrical rod of insulation 24 provided with a pair of longitudinal bores through which is threaded the uncoated hair-pin filament 25. Tightly fitted on rod 24 is a metal sleeve 26 which carries the usual electron emissive coating 27. Rod 24 protrudes beyond the ends of sleeve 26 and each protruding end is provided with an annular bead or lip 28 which is adapted to bear against the associated insulating disc already described. Because of the difficulty of providing a suitable bead on the surface of the relatively small rod 24, the structures of Figs. 1 to 3 are to be preferred since with these latter structures it is practical to provide an integral bead on the tubular metal sleeves without introducing high shrinkage losses in the cathode manufacture.

Various changes and modification may be made herein without departing from the spirit and scope of the invention.

What I claim is:

1. In combination, a tubular cathode, a control-grid surrounding said cathode, an anode surrounding said control grid, an upper and a lower insulator disc for spacing all said electrodes apart, the body of said tubular cathode being provided at opposite ends with integral embossed portions engaging the opposed faces of said discs.

2. In combination an anode, a control electrode within said anode, a cathode within said control electrode, a pair of insulator members for spacing the upper and lower ends of said electrodes apart said cathode comprising a tubular metal sleeve provided with integral annular beads at opposite ends engaging the opposed faces of said insulator members.

3. A mount for a radio tube comprising a press, a plurality of sets of electrode support rods supported from said press, an upper and a lower insulator member, said members having sets of aligned lateral perforations to receive said support rods, a cathode comprising a tubular metal sleeve having an integral annular bead at each end, said discs having aligned central perforations to receive said cathode, the edges of said central perforations engaging said beads to prevent longitudinal movement of said cathode.

4. In combination, a pair of insulator discs, a cathode including a tubular metal sleeve having integral annular beads one of said beads being of larger diameter than the other, one of said discs having a perforation to receive one end of said cathode said perforation being of smaller diameter than the smaller one of said beads, the other of said discs having a perforation which is larger in diameter than the larger one of said beads.

5. In combination a pair of parallel disposed insulator members having aligned perforations of different sizes, a tubular cathode having an integral bead at one end adapted to bear against a face of one of said discs, and an integral bead at the other end adapted to be seated within the larger perforation.

6. In combination, a tubular cathode, a pair of spacer discs, said cathode having an integral bead cooperating with a perforation in one of said discs to prevent vertical movement, and an integral bead cooperating with a perforation in the other disc to prevent lateral movement.

VERNON D. GOODWIN.