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GETTER FOR ELECTRON DISCHARGE DEVICES

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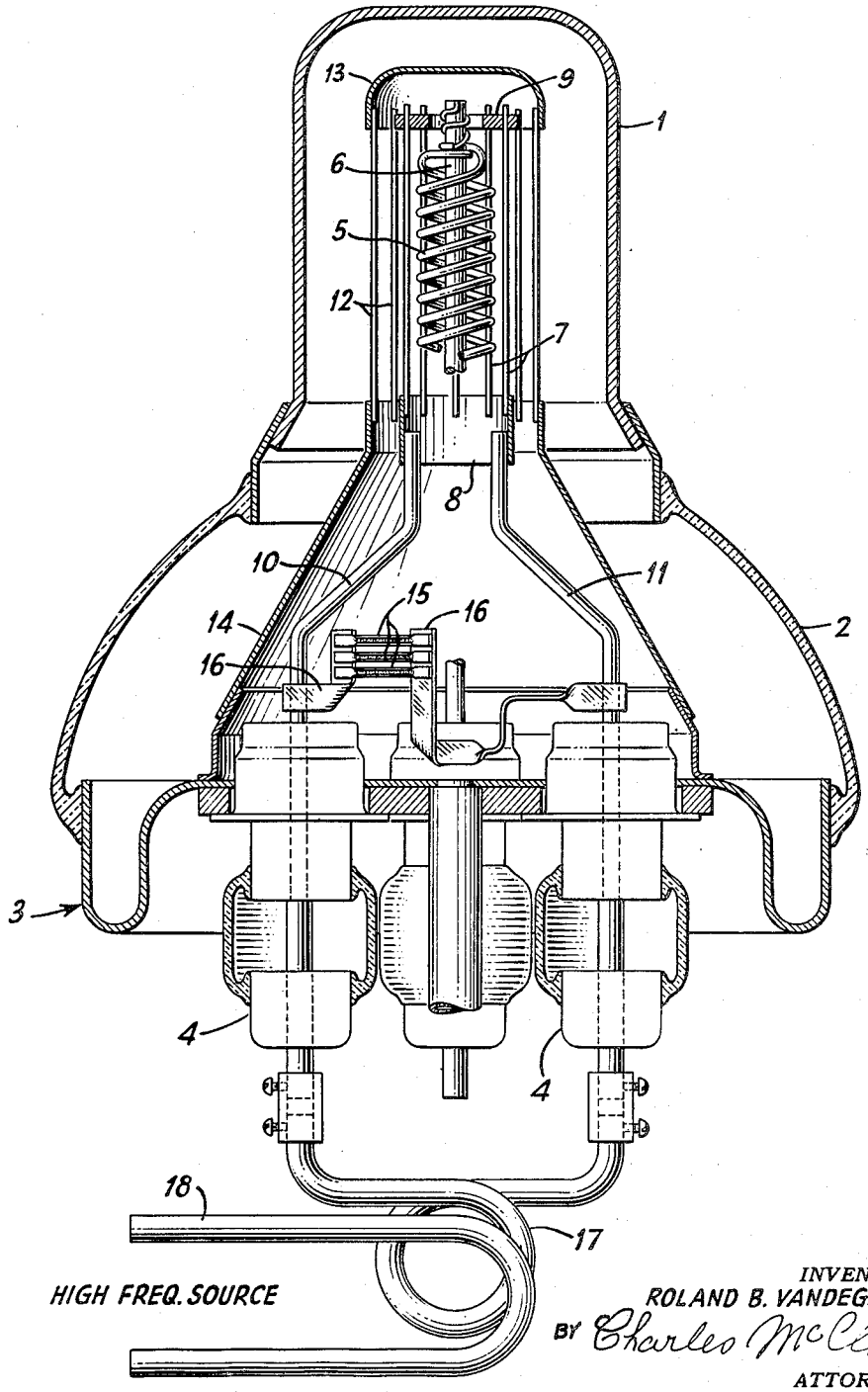

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GETTER FOR ELECTRON DISCHARGE DEVICES

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4 Claims. (Cl. 250—27.5)

My invention relates to electron discharge devices, particularly to getters and means for vaporizing active metals in such devices.

Getter materials are commonly vaporized in the envelope of a radio tube by inducing high frequency circulating currents in the core or carrier for the getter material by a coil outside the envelope. When the metal parts of the tube shield the getter, electrical resistance heating means may be used by connecting a strip or wire carrying the getter material between two lead-in conductors sealed in the envelope wall and by externally connecting the leads to a voltage source. Since the getter wire or strip cannot be permanently connected between electrically separate and insulated electrodes, at least one and sometimes both of the getter lead-ins must comprise conductors in addition to the electrode lead-in conductors. Additional lead-ins however increase manufacturing costs and in some tubes seriously complicate the design of the tubes.

A principal object of my invention is electron discharge devices with improved means for electrically vaporizing getter material in the device.

A more specific object of my invention is means for resistance heating a getter from an external electrical source without increasing the number of lead-in conductors in the envelope.

The characteristic features of my invention are defined in the appended claims and one embodiment thereof is described in the following specification and shown in the accompanying drawing in which Figure 1 is a sectional view of a radio tube showing my improved getter.

The particular radio tube chosen for illustrating my invention and shown in the drawing comprises a transmitting tube for shortwave operation. The envelope of the tube is principally of metal and comprises a cup-shaped anode 1 sealed along its rim by glass bulb 2 to a metal header 3. High voltage bushings 4 hermetically seal the lead-in conductors in the metal header. The spiraled cathode 5 is steadied by a central support rod 6, the lower end of which is omitted for clarity, and is surrounded by a tubular control grid 7 comprising a number of parallel rods or wires held at their lower ends by metal rings 8 and guided at their upper ends by spacer 9. The grid is supported upon two rigid lead-in conductors 10 and 11 joined at their inner ends to the lower metal ring 8. The two lead-in conductors 10 and 11 for the grid have been found necessary to reduce grid lead-in inductance in the tube when operated at ultra high frequencies.

The screen grid 12 in this particular tube is similar in construction to the control grid comprising circularly arranged parallel rods joined at their upper ends to a shielding cap 13 and fastened at their lower ends to the small end of the metal cone 14, which is carried on the header. The metal cone and the metal header effectively enclose and shield the input electrodes and lead-in conductors from the electrostatic influence of the anode.

Getter material is carried on a resistance heating element 15 shown in this tube as a grooved ribbon which is electrically connected at its ends to the two control grid lead-in conductors. In large tubes the heating element should comprise, as shown, two or more ribbons connected in parallel for carrying larger quantities of getter material. The ribbons are supported upon metal straps 16 spot welded to the getter ribbons and to the grid lead-ins at a point on the lead-ins near the lead-in bushing. I have found that the getter ribbons can be heated and the active metals of the getter vaporized by direct resistance heating, although there is an apparent short circuit through the grid structure including the lower grid collar. To the outer ends of the grid lead-in conductors are clamped the ends of a loop 17 of wire. Coupled to the loop is the output of a high frequency source of power 18. It has been found that by raising the frequency of the high frequency source to some value of moderate wavelength, sufficient current can be made to flow through the getter ribbon to raise it to flashing temperature without overheating the grid collar. In one tube in which the getter was spaced below the lower grid collar about thirty millimeters, the getter could be easily flashed even though the resistance of the lower grid collar was much less than the resistance of the getter ribbon. I believe that the division of the high frequency current through the higher resistance path of the getter ribbon is because of the lower total reactance of the ribbon path. The areas of the plane enclosed by the circuit including the getter and the lead-in conductors is less than the area of the circuit including the grid collar. Since the inductance of a loop at high frequencies is approximately proportional to the area of a plane surrounded by the loop, it is possible to increase the frequency of the electrical source to a value where the principal portion of the current will flow through the getter ribbon even though its ohmic resistance may be higher than the parallel grid collar path. The frequency of the source used accordingly is a matter of choice determined by the relative areas of the two parallel loops

and by the resistance of the two parallel paths. In a tube of the type shown a current timed to a frequency of about three hundred kilocycles per second was sufficient to flash the getter although the getter was spaced below the grid collar only about thirty millimeters.

My improved electron discharge device comprises a resistance heated getter that may be flashed from an external source of power without increasing the number of lead-in conductors.

I claim:

1. An electron discharge device comprising an envelope, an electrode in said envelope, at least two lead-in conductors in said envelope, the inner ends of said conductors being short circuited together and to said electrode, an electrical resistance heating element spaced from said inner ends of the conductors and connected across said conductors, and a vaporizable getter material on said element.

2. An electron discharge device comprising an envelope, an electrode in said envelope, two lead-in conductors sealed in the wall of said envelope, the inner ends of said conductors being short circuited and directly connected to said electrode, a getter in said envelope comprising metal heating elements connected at its ends to said conductors the points of connection being intermediate the inner ends of the conductors and the lead-in seals of the conductors, and vaporizable getter material on the said member.

3. The method of exhausting an electron discharge device with two leads effectively short circuited near their inner ends comprising connecting a getter of the resistance heater type across said leads intermediate the envelope of the device and the short circuited point, and applying a tuned high frequency potential to the outer ends of the leads.

4. The method of exhausting an electron discharge device with two lead-in conductors electrically connected together in the device through a path of low ohmic resistance comprising connecting a resistance heating element carrying getter material across said conductors intermediate the lead-in seals and the low resistance path, and applying a high frequency potential to the outer ends of the conductors, said potential having such a frequency that the resistance of the circuit including said path is greater than the circuit including the heating element.

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