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H. W. PARKER
ELECTRON DISCHARGE TUBE

1,945,979

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FIG. 1

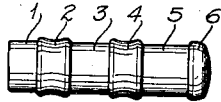


FIG. 2



FIG. 3

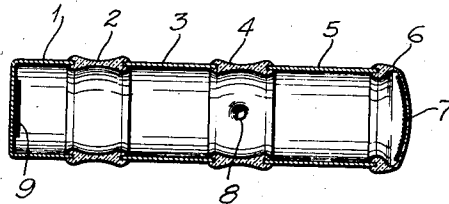


FIG. 4

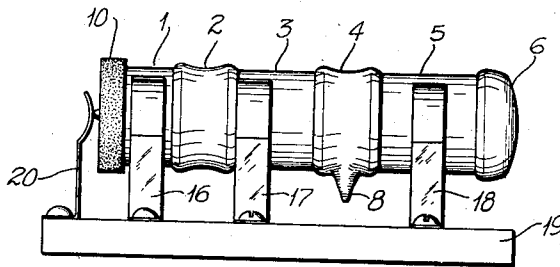


FIG. 5

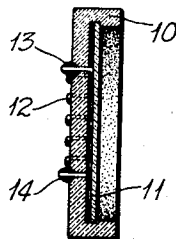
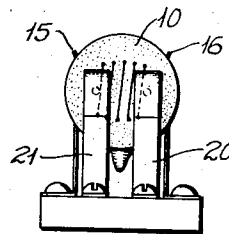


FIG. 6



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ELECTRON DISCHARGE TUBE

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3 Claims. (Cl. 250—27.5)

My invention relates to electron discharge tubes and pertains particularly to that type of such tubes which are termed thermionic tubes.

One of the objects contemplated by my invention consists in providing a thermionic tube of extreme simplicity.

Another object contemplated by my invention consists in providing a thermionic tube requiring no lead-in wires for making contact with the electrodes thereof.

An additional object contemplated by my invention comprises producing a thermionic electron discharge device of such nature that the same may be constructed in small dimensions.

A further object contemplated by my invention consists in providing an electron discharge device employing no internal electrodes for the purpose of producing a luminous spot of fluorescent light.

A still further object contemplated by my invention comprises producing a thermionic tube in which the walls of the tube are partially constructed of the electrodes thereof.

I accomplish all of the above noted desirable results and others which will hereinafter be pointed out and discussed by a novel design of electron discharge device in which the evacuated envelope within which the electron discharge takes place is composed of alternate metallic sections and vitreous sections, the metallic sections of which constitute the electrodes of the tube.

In the drawing accompanying and forming a part of this specification and in which like reference numerals designate corresponding parts throughout:

Fig. 1 illustrates a substantially full size elevation of my novel tube.

Fig. 2 is an end view of the same.

Fig. 3 is an enlarged section of my improved tube.

Fig. 4 illustrates my improved tube in position in a contacting socket therefor.

Fig. 5 is a sectional view of one form of cathode heater.

Fig. 6 is an end view of my tube in position in its contacting socket, showing the method of making contact with the cathode heater element.

Referring now particularly to the Figs. 1, 2, and 3, which illustrate a preferred form of one type of construction of my improved tube, the tube comprises substantially tubular metallic sections 1, 3, and 5, which are united by vitreous sections as 2 and 4. The metallic sections are welded to the glass or vitreous tube sections

in any well known manner and there is provided in the type of tube illustrated a vitreous transparent cap 6 coated on the inside with any suitable material 7 which becomes fluorescent upon bombardment by electrons, such as zinc sulphide. The metallic section 1 is in the form of a cap and bears on the inside thereof a coating 9 of electron emissive substance such as barium oxide, or other substance capable of emitting electrons at relatively low temperatures.

There is further provided on the vitreous section 4 an exhaust tubulation 8 through which the tube may be exhausted and thereafter sealed.

The embodiment of my tube illustrated is intended for use with television reception systems in which small individual light areas may be modified in luminous intensity corresponding to the picture detail. I therefore, in this embodiment of my device, prefer to construct the tube of relatively small diameter and for that purpose employ for the metallic sections of the tube such metals as molybdenum, nickel or copper and for the vitreous sections of the tube either lead glass or low expansion borate glass.

Obviously, the electron emissive substance 9 may be rendered active by the application of heat in any convenient manner. A preferred way of accomplishing the desired result is shown in Figs. 4, 5, and 6. The heater comprises a cap 10 of refractory insulating material through which is threaded a high resistance heating wire 12, the extremities of which are welded to standards to form contact terminals 13 and 14 and the heater cap is provided with a disc 11 of heat resistant insulating material such as mica. The cap 10, when placed over the end of the metallic section 1, is held in place by means of terminal spring clips 20 and 21, which bear against the terminals of the heater 13 and 14 and make contact therewith. The tube may be supported in a series of spring clip terminals 15, 16, 17 and 18, secured to a base 19 of insulating material.

The metal section 3 serves as the control grid of the tube while the metal section 5 serves as the anode. When the tube is used for the purpose of producing a spot of variable illumination due to the action of the electrons upon the fluorescent material 7, the section 3 functions as a control or focusing cylinder to control the intensity of the bombardment of the fluorescent material and hence its luminosity in accordance with the varying potentials applied to the control cylinder 3.

Contact with the cathode section 1 may be made through either spring clip 15 or 16, while

contact with the grid section 3 may be made with spring clip 17 or its companion not shown in the figure. Similarly, suitable operating voltages may be connected to the anode section by means of spring clip 18 or its companion not shown in the figure.

It will be obvious from the foregoing that my improved tube can be made in extremely small dimensions and that the embodiment of my tube described herein may be made in sufficiently small dimensions to be used as an individual variable light area for television reception systems or that, further, the tube may be used as a visual indicator of electrical intensities varying at comparatively high frequency. The simplicity of my thermionic tube is obvious from the fact that as all of the electrodes of the tube form part of the wall of the tube, there is no necessity for lead-in wires.

My experiments have indicated that the heat required for the cathode is extremely small and that efficient electron emission can be achieved from the material 9 by a degree of heat which does not cause the metal section 1 to become visibly red.

Obviously, if the tube is intended for use as a detector, relay or amplifier, the vitreous cap 6 may be dispensed with and the end of the anode section 5 closed to form a metallic cap.

While I have illustrated and described one preferred embodiment of one type of my improved tube, it is to be understood that I may vary the details thereof without departing from the spirit or narrowing the scope of my invention.

Having thus completely described my invention what I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A thermionic tube comprising, a substantially evacuated container, having walls comprising alternate metallic and vitreous tubular sec-

tions and end portions, one of said end portions comprising a metallic cup bearing an electron emissive substance on the interior thereof and adapted to function as a cathode through the direct application of heat to the exterior thereof, the other end portion comprising a cap coated on the interior thereof with a material adapted to be rendered fluorescent through bombardment by electrons and the metallic sections of said tube comprising respectively the grid and anode of said tube.

2. An electron discharge device comprising a partially evacuated container, having walls comprising alternate vitreous and metallic tubular sections and end portions, one of said end portions comprising a metallic cup bearing an electron emissive substance on the interior thereof and adapted to function as a cathode through the direct application of heat to the exterior thereof, the other end portion comprising a vitreous cap coated on the interior thereof with a substance adapted to be rendered fluorescent through bombardment by electrons and the remaining metallic sections constituting the only remaining electrodes of said tube.

3. An electron discharge device comprising, a partially evacuated container, having walls comprising alternate vitreous and metallic tubular sections and end portions, one of said end portions comprising a metallic cup coated on the inner end surface only with an electron emissive substance and adapted to function as a cathode through the direct application of heat to the exterior thereof, the other end portion comprising a transparent vitreous cap coated on the interior surface with material adapted to become fluorescent on bombardment by electrons and the remaining metallic sections constituting respectively the only grid and anode for said tube.

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