

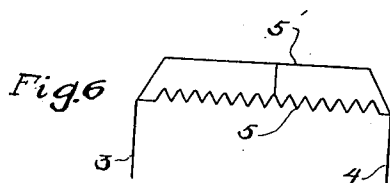
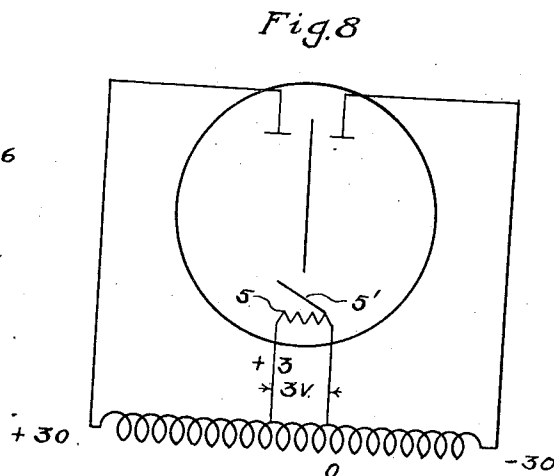
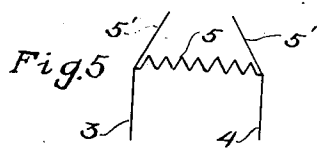
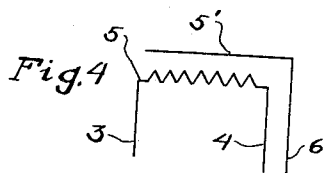
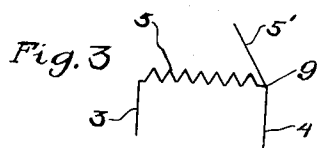
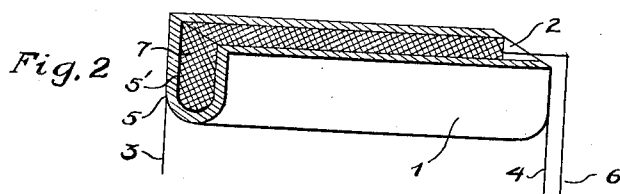
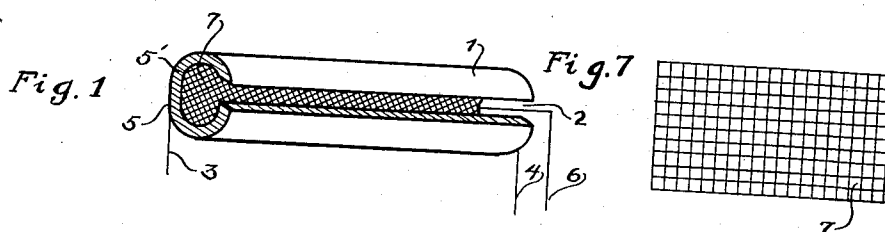
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2,084,172

ELECTRON TUBE

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ELECTRON TUBE

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America, a corporation of Delaware

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10 Claims. (Cl. 250—27.5)

My invention relates to electron tubes and more particularly to novel apparatus for and methods of cathode construction therefor.

It has been proposed that indirectly heated cathodes be made of a hollow construction to provide large electron emission surface. In these cathode structures, the heating filament is surrounded by a metallic sheath and insulated therefrom. The metallic sheath is coated on the outside and the entire unit then enveloped by a reflecting screen, the space between the screen and the cathode being filled with coated material to increase the emitting surface without increasing the heat radiating surface.

With the development of gaseous tubes for power purposes, such as large rectifying tubes, efficiency of operation has come to play a more and more important part in the tube, and it is accordingly of importance, where large current values are involved, to operate the tube at the highest possible degree of efficiency.

According to my invention, the heating element is made of reflecting material and envelopes within itself the whole structure including the emitting material which is placed on the inside of the cathode. The whole is arranged in the form of a hollow trough or tube, although it will be understood that any other shape may be used.

Inasmuch as the electron emitter is on the inner surface of the open trough, a very large emitting surface is provided. The filament or heating portion is integral with and a part of the entire unitary structure and accordingly very efficient heating is obtained since all of the heat generated by the filament is directly conducted to the emitter which is thus maintained at the same temperature as the heating filament.

The efficiency is further increased by providing polished mirror surface on the outside of the trough reducing heat radiation over this surface, which constitutes a serious cause of inefficiency of the cathode construction heretofore used.

An object of my invention is to provide a novel cathode construction which will operate at a high degree of efficiency.

A further object of my invention is to provide a novel indirectly heated cathode construction, with a maintenance of temperature equal to that of directly heated cathodes.

Still a further object of my invention is to provide a novel cathode construction suitable for power tubes and adapted for inexpensive and convenient methods of manufacture.

Other objects of my invention will be clearer

from the detailed description of the invention which is to follow.

Referring to the drawing:

Figure 1 is a perspective view of my novel cathode construction.

Figure 2 is a perspective view of a modified form of the cathode shown in Figure 1.

Figures 3, 4, 5 and 6 are diagrammatic showings of connections from the heating filament to the cathode.

Figure 7 is a diagrammatic showing of my emitter.

Figure 8 discloses a radio tube embodying my novel cathode construction.

As shown, the cathode 1 is of the hollow construction preferably in the form of a trough having an opening 2 through which, as will appear hereinafter, the generated electrons from the emitter are permitted to escape to the anode of the tube. Conductors 3 and 4 for carrying the heating current, are connected to the heating element 5 which may be of any well known electrical heating purposes and which is an integral part of and covers the entire cathode construction 1. This heater may be easily stamped to shape from sheet material and there- after conveniently assembled.

On the inner surface of the heating element there is placed an emitting coating 6 of any well known composition and connected to the terminal 6 extending to the external electrical circuits as shown in detail in Figure 8. This emitter may be first formed by coating a core comprising a series of strips of material 7 in parallel and at right angles to each other as shown in Figure 7. After the material is coated, it is inserted in the inner surface of the hollow trough.

The outer surface of the core heating material is polished to form a mirror-like appearance, thus reducing heat radiation over this very large surface.

As shown in detail in Figures 3, 4 and 5, the cathode need not necessarily be connected to the filament throughout its length. As shown in Figure 3, only one end of the emitter is connected to the heating filament, as at point 9. In Figure 4, the emitter is completely insulated from the heating filament, in Figure 5 two emitters are provided, one end of each of which is connected to opposite ends of the heating filament and in Figure 6, the emitter is connected at its midpoint to the midpoint of the heater.

In Figure 8, the electrical circuits showing my novel filament construction connected in a radio

tube is shown, as applied to a full wave rectifier. As herein shown, the heater is connected to a source of alternating currents and the anodes are connected to opposite terminals of the source.

5 When the emitter is heated, an electron discharge from the cathode will ionize the gas and a discharge occurs between the cathode and each of the anodes alternately as the alternating voltage passes through its positive and negative cycles.

10 As will be understood, with these constructions, an indirectly heated equipotential cathode construction is obtained.

I claim:

1. A hollow cathode having a wire mesh coated with emitting material therein, said hollow cathode also consisting of heating material through which heating current flows for raising the temperature of said emitting coating to emitting temperature.

20 2. A hollow cathode comprising a trough-shaped metallic body having a wire mesh coated with emitting material applied to its inner surface, and electric leads connected to the ends of said trough for conducting heating current therethrough to maintain said emitting layer at electron emitting temperature.

3. A cathode comprising a hollow metallic cylindrical body having a lengthwise slot and a wire mesh coated with emitting material applied to its inner surface, and electrical leads to the ends of said cylinder for conducting heating current therethrough for maintaining said layer at electron emitting temperature.

35 4. A hollow cathode comprising a trough-shaped metallic body having a wire mesh coated with emitting material applied to its inner surface, and means for heating said emitting layer to an electron emitting temperature.

40 5. A cathode comprising a hollow metallic cylindrical body having a lengthwise slot and a

wire mesh coated with emitting material applied to its inner surface, and means for heating said emitting layer to an electron emitting temperature.

6. In a cathode structure, a hollow metallic body, an electron emitter comprising a metallic mesh coated with electronically active material and mounted on the inner surface of said body, and means for heating said emitter to electron emitting temperature.

7. A cathode structure for an electron discharge tube comprising an elongated tubular body having a lengthwise slot formed by the disposition of the opposite edges of said body in closely spaced relation such that the width of said slot is a fraction of the diameter of the tubular body, a coating of electron emissive substance applied to the inside surface of said body, and means for heating said body to raise said coating to electron emitting temperature.

8. A space discharge device comprising a vessel, a cylindrical thermionic cathode therein having a lengthwise slot through which the electron emission occurs, and at least one anode in cooperative relation to said cathode.

9. A discharge device comprising a vessel, a cylindrical thermionic cathode having a lengthwise slot through which the electron emission occurs, said cathode being provided with an internal electron emissive surface, and at least one anode in cooperative relation to said cathode.

10. A space discharge device comprising a vessel, a cylindrical thermionic cathode therein, said cathode having a lengthwise slot through which the electron emission occurs, a coating of electronically active material on the internal surface of said cathode, the external surface of said cathode serving as a heater therefor, and an anode in cooperative relation to said cathode.

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