June 4, 1929. D. G. LITTLE 1,716,142

THERMIONIC DEVICE

Filed June 15, 1921

Fig. 1.

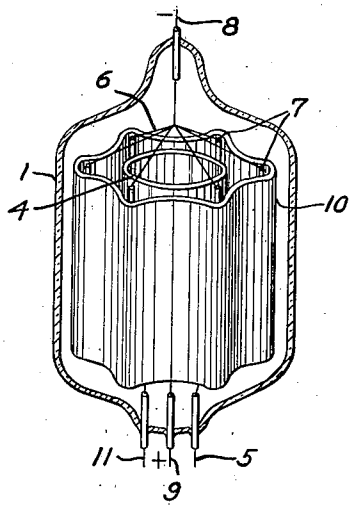


Fig. 2.

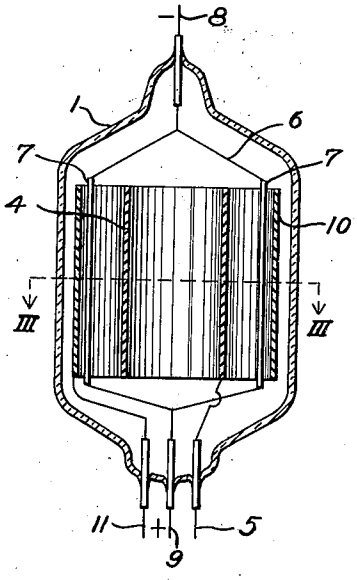
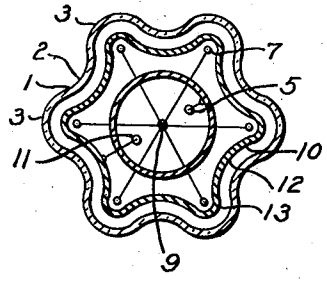


Fig. 3.



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UNITED STATES PATENT OFFICE.

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THERMIONIC DEVICE.

Application filed June 15, 1921. Serial No. 477,651.

My invention relates to thermionic amplifiers and particularly to that type of thermionic amplifiers employing a grid surrounding a filamentary electrode.

An object of my invention is to design a thermionic amplifier having a greatly increased capacity for heat radiation.

Another object of my invention is to provide a thermionic amplifier in which the control electrode shall exert maximum control over electron emission.

Heretofore, the heating of electron tubes has considerably lowered the rating of the tubes, since, above a certain temperature, tubes will not operate at maximum efficiency and, therefore, their capacity has been limited, in a large degree, by their ability to radiate heat. Moreover, in tubes constructed in accordance with the usual practice, the grid or control electrode has not exerted the maximum control over the electron emission, for the control electrode has usually been so placed with respect to the source of electrons that only a small portion of its surface has been close thereto.

In my form of tube, I employ a longitudinally fluted container within which is located a cylindrical electrode fixed centrally therein. Around the central electrode is placed a filament element comprising a series of longitudinally disposed strands. Entirely circumscribing the filament element and the cylindrical electrode is a fluted control electrode, the flutes of which are substantially parallel to the flutes in the container and are so placed as to bring a relatively large portion of the surface of the control electrode into proximity to each of the filament strands.

In the drawings:

Figure 1 is a perspective view of my thermionic amplifier.

Fig. 2 is a longitudinal sectional view through the main axis of my amplifier.

Fig. 3 is a cross-sectional view taken on the line III—III of Fig. 2.

I have shown an evacuated glass container 1 whose surface is longitudinally fluted or corrugated, having depressions 2 and raised portions 3, as can be plainly seen in Fig. 3. Located centrally within the container 1 is a metallic cylindrical electrode 4 constituting the anode of the tube and connected to a lead 5. Encircling the anode 4 is a cathode element 6, comprising a series of equally spaced-apart and parallel strands 7 of resistance wire. Each of the strands 7 lies in a plane with, and substantially parallel to, the longitudinal axis of the tube. The filament strands are heated by means of an electrical current passing through them and through leads 8 and 9.

The strands 7 are so arranged within the tube that each strand lies adjacent to, and parallel with, a raised portion 3 of the glass container 1. Located exteriorly of the filament strands and between them and the walls of the container 1 is a control electrode or grid 10, connected to a lead 11. The control electrode 10 is formed with depressions 12 parallel, and adjacent to, the depressions 2 of the container 1, and raised portions 13 parallel, and adjacent to, the raised portions 3 of the container 1. The raised portions 13 of the control electrode 10 form alcove-like flutes within which the strands 7 of the filament element 6 are adapted to lie.

By forming the control electrode to partially surround each of the electron-emitting strands 7 of the cathode element 6, a relatively large portion of the surface of the control element will lie adjacent, and close, to the electron-emitting filament strands, whereby increased control over electron emission is obtained. Moreover, by reason of the fluted surface of the container 1, which conforms to the flutes in the control electrode 11, the heat-radiating properties of the tube are greatly increased over present practice.

Since I have not shown all of the possible modifications of my invention which could be conceived by one skilled in the art, I desire that my invention shall be limited solely by the prior art and by the scope of the appended claims.

I claim as my invention:

1. In an electron-discharge device, an envelop having corrugations providing a plurality of distinct compartments, a plurality of electrodes located in said envelop adjacent to the depressions formed by said corrugations and thus within the several compartments and control-electrode means disposed adjacent to the walls of said envelop.

2. In an electron-discharge tube, an envelop having a plurality of outwardly projecting portions, a plurality of electrode elements disposed respectively in the depres-

sions constituted by said portions, and electrode means disposed adjacent to the walls of said outwardly projecting portions to cooperate with said first-mentioned electrode elements.

3. In an electron-discharge tube, an envelop having a plurality of outwardly projecting wall portions, a plurality of cathode elements disposed adjacent to the depressions formed by said wall portions, an anode cooperating with said cathode elements, and additional electrode means disposed adjacent to the walls of said outwardly projecting portions to control the electron-discharge between said cathode elements and said anode.

4. A thermionic device comprising a filament having a longitudinal portion, an evacuated envelop the surface of which is longitudinally fluted, said longitudinal portion of the filament being adjacent one of the flutings, an electrode disposed on the side of the filament portion opposite said fluting, and another electrode on the side of said longitudinal portion of the filament opposite the first-mentioned electrode.

5. A thermionic device comprising a filament element, a fluted container, said filament element being located in a depression formed by a flute in said container, a fluted control electrode disposed adjacent the container, and another electrode located on a side of the filament element opposite the first-mentioned electrode.

6. A thermionic device comprising a container, a centrally located cylindrical electrode, a filament element located exteriorly of the central cylindrical electrode and a longitudinally fluted control electrode located between the filament element and container walls, said filament element being located in the depressions of said fluted electrode in spaced relation thereto.

7. A thermionic device comprising a container, an electrode centrally located therein, a filament element having a series of filament strands located exteriorly of the central electrode and an outer electrode located between the filament element and container walls, the surface of the outer electrode having flutes embracing, but not touching, said filament strands.

8. A thermionic device including a control electrode and a container each having longitudinal flutes providing a plurality of axial wall depressions in the interior thereof.

9. A thermionic device comprising a container having longitudinal flutes, an electrode centrally located therein, a filament element having a series of longitudinal strands disposed in the depressions formed by said flutes, and a control electrode the surface of which is fluted to conform to the flutes of the container to bring a relatively large portion thereof into proximity to the filament strands.

10. A thermionic device comprising a container having longitudinal flutes, a cylindrical electrode centrally located therein, a filament element having a series of longitudinal strands disposed adjacent to said flutes, and a fluted control electrode embracing the strands.

In testimony whereof, I have hereunto subscribed my name this 8th day of June, 1921.

DONALD G. LITTLE.