June 26, 1928. 1,674,742

K. ROTTGARDT

FLAT ELECTRODE FOR ELECTRICAL DISCHARGE VESSELS

Filed Aug. 26, 1921

Fig. 1.

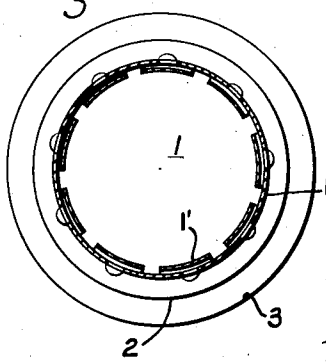
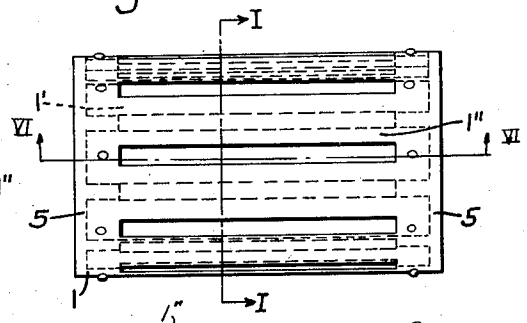


Fig. 2.



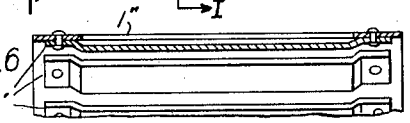


Fig. 6.

Fig. 4.

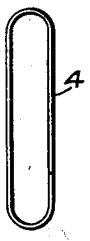


Fig. 3.

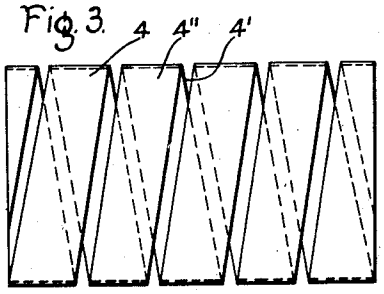
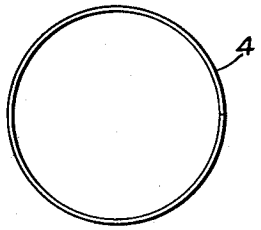


Fig. 5.



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Patented June 26, 1928. 1,674,742

UNITED STATES PATENT OFFICE.

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FLAT ELECTRODE FOR ELECTRICAL DISCHARGE VESSELS.

Application filed August 26, 1921, Serial No. 495,593, and in Germany August 16, 1919.

The invention refers to a special design of flat electrodes for electrical discharge vessels, especially of flat anodes. In order to facilitate and improve in discharge vessels, such as amplifiers, rectifiers or other devices, the de-gasifying of such flat electrodes at the time of the manufacture of the tube, it has been suggested to divide the electrode surface and to connect in a suitable manner the individual members or parts thus obtained. In this manner there is obtained the possibility of bringing about an efficient incandescence of the metal body of the electrode with an electrical current of comparatively low voltage. However, by this division of the electrode surface there arises grooves, seams or clearances, which interfere with the proper action of the electrode and especially with the proper action of the anode, because there is no longer available a barrier which extends across the path of the electrons, free from places where the electrons may pass. Such a barrier has the same effect as a continuous surface for the electrons to impinge against. I, therefore, refer to it herein as a continuous surface.

According to this invention the divided flat electrodes required to promote the vaporization or gasification are designed in such a manner that in spite of the division of the surface of the electrodes there is available for the impinging electrons a continuous surface. This result can be obtained by arranging the individual parts of the electrodes in such a manner that such individual parts or members overlap at their ends so that there is obtained in a plane vertical to the path of the electrons a single continuous active metal surface. The overlapping parts are not in actual contact, but are slightly separated in the direction of travel of the electrons. In order to pass the barrier, the electrons must change the direction of their motion abruptly, which only a negligible number of them can do. The effect of such overlapping parts is consequently the same as that of a continuous surface. The flat electrodes may for instance be made up of several strips which overlap each other and which offer to the electrons a seamless metal surface. The same apparatus may also be obtained by having the flat electrodes made of a single strip of metal. In this case the metal strip is so wound and folded that the clearance or seam between any two members of a layer is covered by a member of the layer immediately behind. Of course other manners of execution may be resorted to for the purpose of securing in flat electrodes a metal surface in accordance with the principle underlying this invention, namely, a surface which while being divided and split up, offers a continuous surface to the impinging electrons.

Fig. 1 is an end view of a set of electrodes including an anode formed according to the invention;

Fig. 2 is a side view of the anode;

Fig. 3 is a side view of a modified form of anode;

Fig. 4 is an end view of the anode shown in Fig. 3, and

Fig. 5 is an end view of another form of anode, the side view of which is like Fig. 3;

Fig. 6 is a sectional view of a portion of the anode shown in Fig. 2 taken on lines VI—VI.

According to Figures 1 and 2, the cylindrical anode 1 of an amplifying tube which may be surrounded concentrically by a grid 2 and by cathode 3, consists of strip 1′ arranged in an inner circuit and of strip 1″ arranged in an outer circuit. Strips 1″ are so displaced with regard to strips 1′ that they cover the seams or clearances between strips 1′. In this manner there is offered to the radially incoming electrons a continuout seamless metal surface by anode 1. Strips 1′ and 1″ may be connected at their ends in any suitable manner, for instance by means of a common ring.

In the flat electrode of Figures 3 and 4 a metal strip 4 is wound up in such a manner that there is obtained a metal surface made up of front and rear members alternately, the rear members 4′ overlapping and covering the seams or clearances between front members 4″. Such a metal body may, as shown in Figure 2, be utilized as a flat electrode or may be wound up into a cylindrical electrode as shown in Figure 5. Also in this case there is obtained a continuous metal surface for the incoming electrons.

Claims:

1. An electrode for electrical discharge vessels comprising a plurality of conducting

bodies adjacent one another, each body consisting of alternate bars and slots narrower than said bars, said bodies being arranged to break joints whereby the surface of said electrode presents an effectively continuous barrier for an electron stream.

2. An electrode for electrical discharge vessels comprising a plurality of separated members electrically connected and arranged to so overlap that the surface of said electrode presents an effectively continuous barrier for an electron stream.

3. An electrode for electrical discharge vessels comprising a plurality of conductive bodies adjacent one another and electrically insulated throughout a substantial portion thereof, a second plurality of conductive bodies adjacent one another and insulated throughout a substantial portion thereof, said second plurality being adjacent to said first plurality and insulated therefrom throughout a substantial portion thereof and positioned to so overlap said first-mentioned plurality of conductive bodies, that the surface of said electrode presents an effectively continuous barrier for an electron stream, and means for electrically connecting all of said conducting bodies together.

4. An electrode for electrical discharge vessels comprising a cylinder formed of conducting bodies spaced one from the other, a second cylinder formed of metal bodies spaced one from the other, said cylinders being concentric and the conducting bodies of one being positioned opposite the spaces formed by separation of the conducting bodies of the other, whereby the surface of said electrode presents an effectively continuous barrier for an electron stream, and means for electrically connecting all of said conducting bodies together.

5. An electrode for electrical discharge vessels comprising a conductive member having slots therein, a second conductive member adjacent said first-mentioned conducting member having openings therein, the openings in each member being positioned opposite the solid portions in the other member.

6. In an electron discharge device including a cathode and a grid, an anode comprising a plurality of conducting bodies adjacent one another, each body comprising parallel strips separated by slots, said conducting bodies being arranged to break joints, whereby the surface of said electrode presents an effectively continuous barrier to the electrons emitted by said cathode.

7. In an electron discharge device including a cathode and a grid, an anode comprising a plurality of parallel strips electrically connected and arranged to so overlap that the surface of said electrode presents an effectively continuous barrier to the electrons emitted by said cathode.

8. In an electron discharge device including a cathode and a grid, an anode comprising two concentric cylinders each having conducting areas spaced apart, said cylinders being positioned so that the conducting bodies of one are opposite the spaces formed by the separation of the conducting bodies of the other, whereby an effectively continuous surface is presented to the electrons emitted by the cathode, and means for electrically connecting all of said anode conducting bodies together.

9. In an electron-discharge device, an electrode comprising two concentric cylindrical bodies having in their walls slots parallel to their axes, said bodies being so positioned that the solid areas of one body aline radially with the slots in the other body.

In testimony whereof I affix my signature.

DR. KARL ROTTGARDT.