

May 7, 1946.

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2,399,752

EXTERNAL ANODE

Filed Jan. 17, 1944

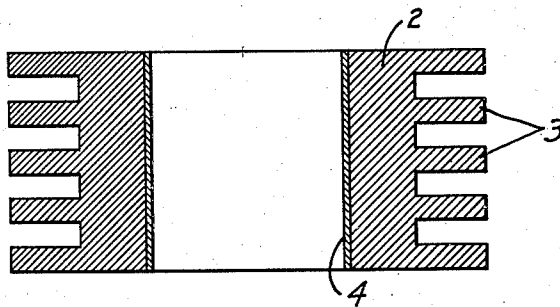


Fig. 1

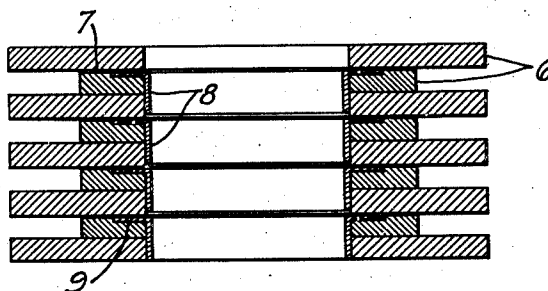


Fig. 2

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2,399,752

EXTERNAL ANODE

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Application January 17, 1944, Serial No. 518,636

3 Claims. (Cl. 250—27.5)

My invention relates to an electrode for vacuum tubes, and more particularly to an anode for such tubes.

It is desirable, in certain kinds of vacuum tubes to make the plate electrode or anode part of the envelope so that the outer surface of the anode is exposed externally of the tube. This type of electrode is known as an external anode. It is usually made of a metal such as copper having good heat conducting properties. The advantage of an external anode is that it dissipates heat more readily, which is of course desirable in high power tubes. The disadvantage of the external anode structure is that it is difficult to obtain and maintain a high degree of vacuum in the tube. This is due to the fact that metals which are suitable for external anodes do not have good gettering (residual gas clean-up) properties, and also because such anodes operate at a temperature lower than is required for a good gettering action.

The broad object of my invention is to provide an external anode having means associated therewith for enhancing the gettering properties of the anode.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of my invention. It is to be understood that I do not limit myself to this disclosure of species of my invention as I may adopt variant embodiments thereof within the scope of the claims.

Referring to the drawing:

Figure 1 is a vertical sectional view of an anode embodying the improvements of my invention; and

Figure 2 is a similar view of a modified structure.

In terms of broad inclusion, my improved electrode comprises a hollow body of a metal such as copper, and a liner in the body of a metal, such as zirconium or tantalum, having better gettering properties than that of the body. The body may be of solid or laminated construction. If laminated, the liner preferably comprises a plurality of ring sections each having a flange caught between the laminations of the body.

In greater detail, and referring to Figure 1 of the drawing, one type of external anode structure embodying my invention comprises a hollow body 2 of metal, such as copper. A simple ring structure is shown adapted to be interposed between other portions of an envelope. If desired the anode may be cup-shaped, forming an integral closure at one end. Other parts of the

tube, such as cathode and grid, are not shown since my improvements relate to the anode structure only and may be incorporated in any tube having an external anode. The anode body illustrated has heat radiating fins 3, although this is optional.

Means are provided in body 2 for enhancing the gettering properties of the anode. For this purpose a liner or sleeve 4 of relatively thin sheet metal is provided; the liner being of a metal having better gettering properties than that of body 2. Zirconium is preferably used for the liner, although other metals having good gettering properties, such as tantalum, may be employed. The liner may be held in place by any suitable means, as by a press fit with the anode body or by out-turned flanges on the ends of the sleeve.

Liner 4 is on the inside of body 2 and therefore faces the heat zone originating from the other electrodes. Electrons moving toward the anode also impinge on the liner. This causes the liner to operate at a relatively high temperature compared to the main body of the anode. Since the liner is of a material having inherently good gas absorbing properties, and since it operates at an elevated temperature suited for gas absorption, the resulting anode structure has materially improved gettering properties compared to an ordinary external anode of copper or the like.

Figure 2 shows a modified construction comprising a laminated body of copper rings 6 secured together with interposed sheets 7 of a copper-silver alloy used as a solder or bonding flux. In this case the liner is made up of ring sections 8 of say zirconium or tantalum, each having an outturned flange 9 caught between the body laminations. This type of structure is conveniently made by initially forming the liner sections as flat rings and securing the peripheral portions between the body laminations when the latter are united. By subsequently passing a cylindrical die through the hollow body the inwardly projecting portions of the liner rings may be forced against the inner side walls of the body, producing the structure shown in Figure 2.

The sectional liner structure has an added advantage by reason of flanges 9 projecting into the body, causing these portions of the liner to run cooler than portions 8. As a result there is temperature gradient in the liner sections, which is desirable for the gettering action.

While my improvements are particularly adapted for use in an external anode, it is understood that they may be incorporated in an electrode which lies wholly within an envelope.

I claim:

1. An electrode comprising a hollow body of laminated metal, and a metallic liner in the body having a flange caught between laminations of said body.

2. An electrode comprising a hollow body of laminated metal, and a metallic liner in the body comprising a plurality of ring sections each having a flange caught between laminations of said body.

3. An external anode for an electron tube comprising a hollow body of metal having an inner face presented inside the tube and an outer face presented externally of the tube, and a liner on said inner face of a metal having better gettering properties than that of the body, said liner having portions extending outwardly into said body.

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