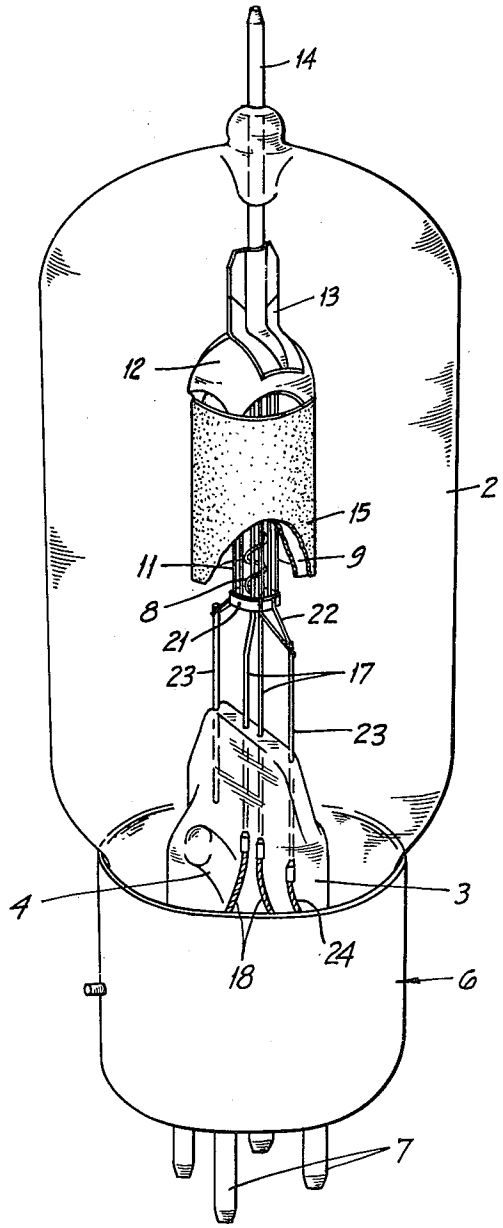
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ANODE FOR ELECTRON TUBES

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ANODE FOR ELECTRON TUBES

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My invention relates to an improved coated-type anode for electron tubes.

It is among the objects of my invention to provide an anode having improved heat dissipation and gettering (gas absorption) properties.

Another object is to provide an anode having a surface layer which is stable at high temperatures.

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, the figure of the drawing is an elevational view of an electron tube having an anode or plate embodying the improvements of my invention.

In greater detail and referring to the drawing, the tube illustrating my improvements comprises an evacuated envelope 2 having a stem 3 carrying an exhaust tubulation 4. A base 6 with prongs 7 is provided at the lower end of the envelope. The envelope encloses a cathode 8, grid 11, and tubular anode 9, the latter preferably having a cap 12 supported by bracket 13 on a lead 14 sealed to the upper portion of the envelope.

Grid 11 is preferably of the wire cage type having a base ring 21 supported by brackets 22 on rods 23, one of which serves as a grid lead connected to a base prong 7 by conductor 24. Cathode 8 is preferably of the filamentary type comprising a helix of thoriated tungsten wire welded top and bottom to a pair of leads 17 sealed to stem 3 and connected to a pair of base prongs by conductors 18.

The above described tube structure is merely for illustration and may be varied widely, as will be appreciated by those skilled in the art.

My improvements, as embodied in anode 9, comprise a surface layer 15 containing an intimate admixture of zirconium boride and free zirconium bonded together and to the anode body. Body 9 is of a suitable refractory metal having a high melting point and low vapor pressure, molybdenum being preferred because it can be fabricated in sheet form and is relatively inexpensive compared to other metals in this class.

Surface layer 15 is preferably formed by preparing a liquid or paste mixture containing zirconium and boron, which mixture is suitable for application to the anode

body 9. I prefer to add the zirconium and boron in powder form, such as finely divided zirconium powder and amorphous boron powder mixed with a suitable vehicle such as amyl acetate to a consistency for brushing or spraying. Good success has been had by using 27.4 parts by weight of zirconium powder to 3.4 parts of amorphous boron powder. These proportions may be varied, but it is important to have a major proportion of zirconium so as to leave some free or uncombined zirconium in the final coating for reasons hereinafter described.

After the coating mix has been applied to the molybdenum anode body 9 the coated anode is heated to a temperature sufficient to convert the boron to zirconium boride and sinter the particles together and to the anode body. This heating or firing is carried on in an oxygen free atmosphere such as in vacuum or in an inert atmosphere such as helium. I prefer to fire in vacuum because this aids in outgassing the electrode, which is desirable prior to incorporating the electrode in the envelope. The desired result is obtained by firing the coated anode in a vacuum furnace to about 1800° C. for about 5 minutes. After firing, the anode structure is ready for mounting and sealing in the envelope, the tube from this point on being processed and evacuated in the usual manner.

Treated as above described the final anode coating contains about 80% zirconium boride and 20% free or uncombined zirconium. The uncombined metallic zirconium is distributed throughout the coating, either in the core parts of the zirconium boride particles or between such particles, all being sintered together into a continuous coating layer which is firmly knit to the anode body.

My improved coated anode has a surface which is somewhat granular in texture and quite dark in color, which black body effect gives the anode excellent heat dissipation properties. The presence of the boride compound contributes materially in that respect. The presence of the free zirconium in the coating provides the desired gettering (gas absorption) properties for cleaning up residual gases in the tube. Another feature is that the coating containing zirconium boride is stable at high temperatures, which stability is important during processing the tube on the pump and during subsequent operation.

I claim:

1. An anode for an electron tube comprising a metallic body, and a surface layer comprising an intimate admixture of zirconium boride and uncombined zirconium bonded together and to the anode body.

2. An anode for an electron tube comprising a molybdenum body, and a surface layer comprising an intimate admixture of zirconium boride and uncombined zirconium bonded together and to the anode body.

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