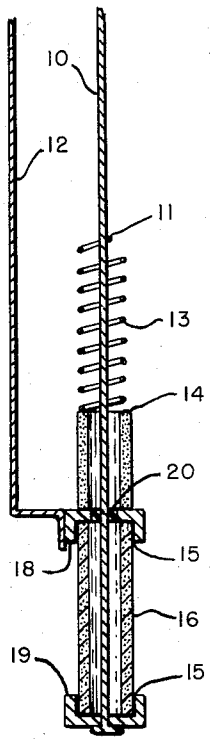
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CATHODE

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CATHODE

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1 Claim. (Cl. 313—341)

The principal object of the present invention is to provide an improved cathode for electron discharge tubes.

This invention relates to cathodes for electron discharge devices and more particularly to cathodes for electron discharge devices of the magnetron type.

An object of the invention is to provide an improved cathode which has the ability to withstand extremely high operating temperatures without structural failure.

The primary object of the present invention is to generally improve electron emissive tubes and particularly to eliminate fracture of the cathode due to temperature changes.

The present invention provides an improved cathode support characterized by long life and mechanical rigidity.

To accomplish the foregoing and other objects which will hereinafter appear, our invention resides in a support for a ceramic-metallic sleeve type cathode which provides improved mechanical strength and improved electrode contact.

The specification is accompanied by a drawing in which the single figure represents a cross-sectional view of the cathode support assembly.

In cathodes for power applications it is desirable to have the highest possible emission current. To accomplish this, extremely high operating temperatures are required, however, at these temperatures shorting of turns of the tungsten filament occurs. A mixture of 80% thorium oxide and 20% molybdenum powder produces a conducting mixture which has several advantages over mixtures of thoria with powdered tungsten. Further, this new mixture withstands extremely high temperatures without excessive evaporation. However, my invention overcomes the major difficulties encountered with the cathode sleeve of this type by providing suitable electrical contact with the ends of the cathode sleeve and by supporting the sleeve to improve its mechanical strength. The attachment of tantalum to the ceramic-metallic sleeve results in cracking because radial expansion and contraction of the soldered tantalum apparently produces tension on the ceramic-metallic sleeve. Ceramic-metallic, as well as ceramic bodies, are extremely weak in tension. By resting the ceramic-metallic cathode on powdered molybdenum, radial expansion and contraction are resisted less than with the tantalum foil. Molybdenum powder is effective until it sinters into a solid mass, then failure always occurs by cracking the cermet. Our improved supporting means is capable of withstanding temperatures

in the order of 1900° C. without injury to the sleeve and which produces D. C. emission substantially equal to that of pure thoria.

Referring to the drawing, the cathode sleeve **16** is supported in position by cup shaped end members **18** and **19**. Molybdenum powder **15**, included in the cups, coats the end surfaces of cathode sleeve **16** and the cup walls to provide a low impedance electrical contact to the ends of the sleeve. Contact is established to the lower plug **19** by means of support rod **10** which passes through the length of the sleeve **16**. The rod is insulated at **20** from the top member **18** and also from the sleeve **16**. The cathode is held under compressive force by a tungsten spring **13** which is insulated from member **18** by an insulating sleeve **14**. A second lead **12** is joined to end plate **18**. This type of construction permits both leads from the heater to be brought out of the same side of the sleeve and thus minimizes the distortion of the electrical field around the emitting surface of the cathode. The cathode is easily assembled since after the components are properly positioned on rod **10**, a spot weld of the spring **13** to the rod **10** at point **11** firmly affixes the components in place. The close fit and the compressive force between the cathode sleeve **16** and the support members **15** retain the powder in position.

In a specific case we employ a .040 inch tantalum rod **10**, a 0.14 inch tungsten spring. The end members **18** and **19** are machined from tantalum and the insulating sleeve **14** is thorium oxide. With this support, a cermet sleeve of 20% molybdenum power and 80% thorium oxide is capable of withstanding temperatures in the order of 1800° C. for long periods of time without failure.

While there has been shown the preferred embodiment of this invention, it will be apparent to those skilled in the art that many changes and modifications can be made without departing from the scope of the invention.

What is claimed is:

A cathode structure comprising a molybdenum-thorium oxide cylindrical cathode sleeve, an upper cup shaped support member engaging the upper edge of said sleeve; a lower cup shaped support member engaging the lower edge of said sleeve; molybdenum powder coating the surfaces between the sleeve and the support members; compression means urging said upper support and sleeve toward said lower support; an insulating sleeve interposed between said compression means and upper support; a rod centrally positioned passing through said insulating sleeve, upper cathode support and cathode sleeve; said rod affixed to said lower support; said compression means consisting of a spring attached at the upper end to said rod with the lower end adjacent said insulating sleeve, and an electrical connection to said upper support.

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