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CATHODE DAMPENER

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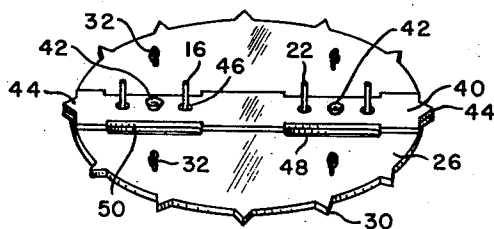


FIG-3

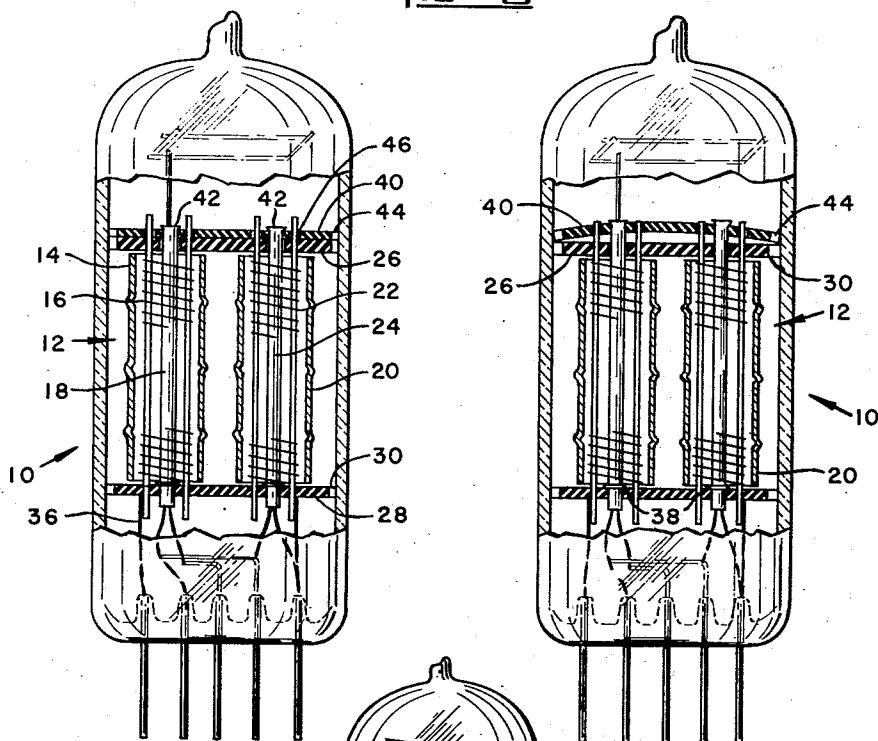


FIG-1

FIG-2

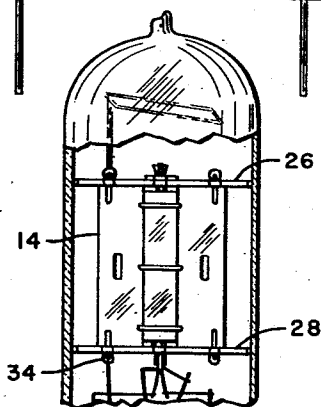


FIG-4

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1

2,802,132

CATHODE DAMPENER

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6 Claims. (Cl. 313-261)

This invention relates to support means for an indirectly heated cathode in an electron device or tube.

A usual form of support for electrode elements in an electron tube is provided by spaced insulators within an evacuated envelope, the insulators being spanned by the electrode elements. The electrode elements such as grid and anode usually have prolongations extending through the insulators and fastened thereto by some means. The cathode cannot be so fastened since it is subject to thermal expansion. Therefore it is usually mounted in one of the insulators in such a manner that it cannot move longitudinally relative thereto, and mounted for free movement in the other of the insulators. However, this freedom of movement in the other insulator may be such as to allow lateral movement of the cathode thereby varying the spacing between cathode and grid and upsetting the electrical characteristics of the device. This is particularly true after repeated heating and cooling of the cathode with consequent wear on the adjacent walls of the insulator.

It is an object of the invention to provide a means for firmly supporting the otherwise free end of a cathode to prevent lateral movement of the cathode while yet permitting longitudinal expansion thereof.

It is another object of the invention to so construct this supporting means that there shall be no freedom of motion of said cathode with respect to the support means even after repeated expanding and contracting movements of the cathode.

It is yet another object of the invention to provide a simple means for positioning the cathode and which will operate efficiently for the life of the electron device even though subjected to the high temperature conditions existing within the tube during manufacture and subsequent normal use.

As an exemplification of the invention and a better understanding thereof, attention is directed to the following specification and accompanying drawings in which

Fig. 1 is a vertical elevation of an electron tube showing the electrode mount in cross section.

Fig. 2 is a similar view but showing, in exaggerated degree, the appearance of the upper support for the cathode when the cathode is elongated due to being heated.

Fig. 3 is a top view of the electron mount, and

Fig. 4 is a side view of the tube illustrated in Figs. 1 to 3 taken at right angles to Fig. 1.

Referring to the drawings in greater detail, at 10 there is disclosed an envelope within which is a mount 12, in this instance comprising a duo-triode, one triode being comprised of an anode 14, grid 16 and indirectly heated cathode 18, and the second triode comprising anode 20, grid 22 and cathode 24, all suitably connected to pin terminals extending through the base of the envelope. The electrode elements are all held in proper spaced relationship to each other by top insulating wafer 26 and bottom insulating wafer 28. These wafers are here shown as of conventional material, namely mica, the wafers being provided with triangular teeth 30 frictionally engaging

2

the inner walls of the envelope. The anodes are fixed in position between the micas 26 and 28 by twisting end tabs 32 and 34, respectively, on the top and bottom edges of the anodes, as is conventional in the art, connection to the tube terminal pins from the anodes being effected by directly welding selected ones of these pins to end tabs of the anode and which extend through the lower mica. The grid is held in place by frictional contact of the grid side rods with both of the micas or by welding to grid stops (not shown) fastened to the micas, as is customary in the art. Also the terminal pins, as pin 36, may be made of a height to abut the lower face of the lower mica and when welded to the grid side rod, the construction will effect a rigid mounting of the grid and the lower mica within the envelope. The cathode sleeves are held in place within the envelope in a novel manner. Each cathode sleeve is usually provided with a bead 38 near one end of the sleeve. The sleeves are inserted in apertures in the lower mica 28, until the bead rests on the upper surface. The apertures afford snug fits for the cathode sleeves. The sleeves are inserted loosely through apertures in the upper mica 26 to allow for easy expansion of the cathode sleeves on heating thereof, without buckling of the sleeve and without exerting strain on the micas. However, if the loose fit of the upper ends of the cathode were the only means of support for the cathodes, the tube could easily prove to be microphonic and would have other undesirable physical and electrical characteristics, as may be easily perceived. To steady the cathode sleeves and yet allow for expansion thereof, the upper ends of the sleeves are supported by a resilient support or bridge 40 made of mica. This material has a positive coefficient of expansion and unlike metal springs will not lose its resilient characteristics when subjected to heat. The cathode sleeves snugly engage perforations in said bridge and are further fastened thereto by crimping and flaring the upper ends of the sleeves over the upper face of the mica bridge as shown at 42. The bridge 40 is a narrow strip of mica with pointed teeth 44 similar to the teeth 30, these teeth frictionally engaging the inner walls of the tube and providing pivots for the bridge on expansion and flexure thereof, but yet permit some sliding motion of the bridge along the axis of the grid side rods. The side rods of the grids 16 and 22 pass loosely through apertures 46 in the mica whereby no forces are imposed on the grids through bridge flexure use, but the side rods do prevent undue rotational movement of the bridge in a plane normal to the grid side rods. The anode is not secured to the bridge, since it is secured to the top mica outside of the narrow bridge. In Fig. 3 conventional slots 48 in the upper mica are shown, these being provided to reduce leakage across the face of the mica. To maintain these slots open, the bridge 40 may be provided with recessed portions 50, registering with the slots 48.

In Figs. 1, 3 and 4, the bridge 40 is shown in its position when the cathode sleeve is not heated. In Fig. 2, the bridge is shown in a flexed position to illustrate how the cathode sleeve can expand, when heated, without injury to the electron device. The degree of flexure is greatly exaggerated for the sake of clarity.

Having thus described the invention, what is claimed as new is:

1. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween, one of said elements being an indirectly heated cathode, said cathode fitting snugly in one of said members and loosely in the other, and an additional resilient spacing member adjacent said other member also engaging walls of the envelope, said additional member being fixedly secured to the cathode and free for movement at its

3

junction with the cathode toward and away from said other member.

2. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween, one of said elements being an indirectly heated cathode, said cathode fitting snugly in one of the members and loosely in the other, and an additional resilient spacing member, normally lying close to said other member, fixedly secured to the otherwise loosely supported end of the cathode, said additional spacing member having portions engaging opposite interior walls of the envelope and being free from attachment with said other spacing member.

3. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween, one of said elements being an indirectly heated cathode, said cathode fitting snugly in one of the members and loosely in the other, and a mica bridge normally lying close to said other member, fixedly secured to the otherwise loosely supported end of the cathode, said mica bridge having portions engaging opposite interior walls of the envelope and being free from attachment with said other spacing member.

4. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween including an anode, a grid and a cathode, means for securing the anode and grid to said spacing members to prevent movement therebetween, means for securing the cathode to one of said members to prevent relative movement therebetween, said cathode passing freely through said other member, a resilient third spacing member adjacent said other member also engaging interior walls of

4

the envelope and fastened to the otherwise free end of the cathode, said grid having side rods extending through said other member and loosely through perforations in the third spacing member.

5. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween including an anode, a grid and a cathode, means for securing the anode and grid to said spacing members to prevent movement therebetween, means for securing the cathode to one of said members to prevent relative movement therebetween, said cathode passing freely through said other member, a third sheet mica spacing member adjacent said other member also engaging interior walls of the envelope and fastened to the otherwise free end of the cathode, said grid having side rods extending through said other member and loosely through perforations in the third sheet mica spacing member.

6. In an electron device, an envelope, a pair of spaced insulating members therein engaging interior walls of the envelope and supporting electrode elements therebetween, one of said elements being an indirectly heated cathode, said cathode fitting snugly in one of said members and loosely in the other, and an additional resilient spacing member adjacent said other member also engaging walls of the envelope, said additional member being fixedly secured to the cathode and free for movement at its junction with the cathode toward and away from said other member.

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