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ELECTRON TUBE

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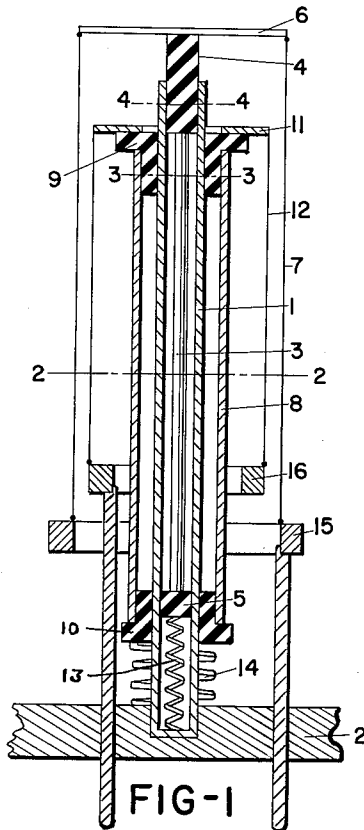


FIG-1

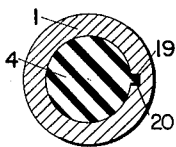


FIG-4

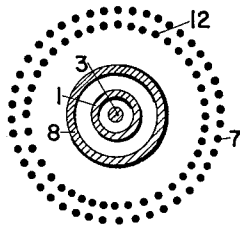


FIG-2

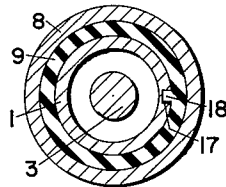


FIG-3

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1

3,045,142

ELECTRON TUBE

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The present invention relates to electron tube construction and more particularly to an arrangement for exerting a tensile stress upon a plurality of electrode members within the tube such as the cathode and control grid. Longitudinal stressing of the electrode members is advantageous in that it serves to minimize bending or breakage of the electrodes or some of their parts due to the heating effect which arises as a result of operation of the tube. Moreover, by applying tensile stress to one or more of the electrodes, it enables the tube designer to establish a correspondingly smaller radial distance between the cathode and control grid, which is highly desirable for various known technical reasons.

The objective of the invention, namely application of tensile stress to the electrode members of the tube is attained, generally speaking, by mounting one end of each of the electrode members in fixed position inside the wall of the tube, the electrode members being disposed in radially spaced relation and extending in a direction longitudinally of the tube axis, and mounting the opposite end of each electrode member on a support member which is arranged for movement longitudinally of the tube axis in a direction away from fixedly mounted end of the electrode member under the action of a loading spring.

More particularly, the improved construction comprises a first tubular member which is fixed in position and extends longitudinally of the tube axis, i.e. the electrode system axis, an elongated member such as a rod mounted for displacement within and longitudinally of the first tubular member, a first electrode support member connected to the upper end of said rod, a first electrode member extending longitudinally of said tube axis, the lower end of said first electrode member being fixed in position and the upper end thereof being connected to said first electrode support member, and a first spring under compression and having the lower end thereof in abutment with the lower end of said first tubular member and the upper end thereof pushing upwardly against the lower end of said rod to thus apply tensile stress to the first electrode member; a second tubular member surrounding said first tubular member and mounted thereon for longitudinal displacement, a second electrode support member connected to the upper end of said second tubular member, a second electrode member extending longitudinally of said tube axis, the lower end of said second electrode member being fixed in position and the upper end thereof being connected to said second electrode support member, and a second spring under compression and having the lower end thereof bearing against a fixed abutment and the upper end thereof pushing upwardly against the lower end of said second tubular member to thus apply tensile stress to the second electrode member.

The invention will become more apparent from the following detailed description of one practical embodiment thereof, and from the accompanying drawings.

FIG. 1 of these drawings shows the improved electrode mounting structure in vertical central section, the other structural parts of the electron tube not essential to an understanding of the invention being excluded in the interest of simplifying the disclosure.

FIG. 2 is a transverse section on line 2-2 of FIG. 1.

2

FIG. 3 is also a transverse section on line 3-3 of FIG. 1 but drawn to a larger scale; and

FIG. 4 is also a transverse section on line 4-4 of FIG. 1 and also drawn to a larger scale.

With reference now to the drawings it will be seen that the improved construction for applying tensile stress to the electrode members comprises a first cylindrical tubular member 1 which can be made of metal arranged concentric about the axis of the electrode system within the tube. The lower end of tubular member 1 is closed and is fixed to the base plate 2 of the tube by being inserted in a suitable recess in such plate. The upper end of tubular member 1 is open. Arranged concentrically within the tubular member 1 is an elongated member 3 which can be in the form of a round metallic rod as shown. The rod 3 is provided at its upper and lower ends with cylindrical members 4 and 5, respectively and which are made of electrically insulating material, and the outer diameters of the cylindrical members 4 and 5 are made just slightly less than the internal diameter of tubular member 1 as will establish a close sliding fit therebetween. Mounted atop the upper end of the rod 3, i.e. at the top of the cylindrical member 4 is a circular or star-shaped disc 6, the plane of the disc being normal to the tube axis, and secured to the periphery of disc 6 is the upper end of the control grid 7, the individual conductors of which extend parallel to the tube axis and lie on a circular cylinder.

A second cylindrical tubular member 8 which can also be made of metal surrounds the first tubular member 1 and is spaced radially therefrom. This second tubular member 8 is concentric with tubular member 1 and extends longitudinally of the same but is somewhat shorter than tubular member 1. Positioned within and secured to the upper and lower ends of the second tubular member 8 are flanged sleeves 9 and 10, respectively and which are also made of electrically insulating material. The internal diameters of the sleeves 9 and 10 are made just slightly larger than the external diameter of the second tubular member 8 as will also establish a close sliding fit therebetween. Mounted atop the upper end of tubular member 8, i.e. at the top of the upper insulating sleeve 9, is an annular disc 11 which surrounds the first tubular member 1, the plane of this disc also being normal to the tube axis, and secured to the periphery of disc 11 is the upper end of the cathode 12, the individual conductors of which extend parallel to the tube axis and lie on a circular cylinder which is located radially within the circular cylinder that contains the wires or conductors of the control grid 7.

Located within the bottom of the tubular member 1 is a first helical spring 13 under compression. The lower end of spring 13 bears against the lower closed end wall of tubular member 1, and the upper end of spring 13 bears against the lower end of insulating member 5 thus exerting a constant upward force against member 5 and hence rod 3 and also the disc 6 which thereby exerts an upward pull on the conductors which form the control grid 7, the lower end of the latter being secured to a ring 15 which surrounds the tubular member 8 in radially spaced concentric relation and is fixed in position within the electron tube. Thus the control grid conductors 7 are placed under the desired tensile stress.

A second helical spring 14 under compression surrounds the lower end of tubular member 1. The lower end of spring 14 bears against the base plate 2, and the upper end of spring 14 bears against the lower end flange of the bottom insulating sleeve 10 thus exerting a constant upward force against this sleeve and hence also tubular member 8 and also disc 11 which thereby exerts an upward pull on the conductors which form the cathode 12, the lower end of the latter being secured to a ring 16

which also surrounds tubular member 8 in radially spaced concentric relation and is fixed in position within the electron tube. Thus the conductors which form the cathode 12 are also placed under the desired tensile stress.

In order to prevent any undesired torsional effect between the cathode and control grid as a result of forces which arise due to operation of the tube, means can be provided for preventing any relative rotation between the discs 6 and 11. One practical way in which this result can be obtained is to provide the outer surface of the tubular member 1 with a longitudinally extending groove 17 which receives a longitudinally extending rib 18 provided on the inner surface of the sleeve 9 as shown in FIG. 3, and to similarly provide the inner surface of tubular member 1 with a longitudinally extending groove 19 which receives a longitudinally extending rib 20 provided on the outer surface of the cylindrical member 4 as shown in FIG. 4.

This expedient prevents any relative rotation between the first and second tubular members 1 and 8, and also prevents any relative rotation between the first tubular member 1 and the cylindrical member 4. Thus there can be no relative rotational displacement between the discs 6 and 11.

In conclusion, it is to be understood that while I have described and illustrated one practical embodiment of my invention, various modifications in the construction and arrangement of component parts may be made without, however, departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A device for supporting electrode members of an electron tube comprising a first tubular member fixed in position within said tube and extending upwardly along the tube axis, a rod member mounted within said first tubular member for longitudinal displacement, a first electrode support member supported by said rod member, a first electrode member extending longitudinally of said tube axis, the lower end of said first electrode member being fixed in position and the upper end thereof being connected to said first electrode support member, and a first spring under compression within said first tubular member, the lower end of said first spring being fixed as to position and the upper end thereof pushing upwardly against the lower end of said rod member to thus apply tensile stress to said first electrode member; a second tu-

bular member surrounding said first tubular member and mounted thereon for longitudinal displacement, a second electrode support member connected to the upper end of said second tubular member, a second electrode member extending longitudinally of said tube axis, the lower end of said second electrode member being fixed in position and the upper end thereof being connected to said second electrode support member, and a second spring under compression and surrounding said first tubular member, the lower end of said second spring being fixed as to position and the upper end thereof pushing upwardly against the lower end of said second tubular member to thus apply tensile stress to said second electrode member.

2. An electrode supporting device as defined in claim 1 wherein the lower end of said first tubular member is closed and the lower end of said first compression spring bears against said closed end.

3. An electrode supporting device as defined in claim 2 wherein the lower closed end of said first tubular member is mounted on a base plate and the lower end of said second spring bears against said base plate.

4. An electrode supporting device as defined in claim 1 and which further includes means preventing relative rotation between said rod and first tubular member, and means preventing relative rotation between first and second tubular members thus to prevent any relative rotational displacement between said first and second electrode support members which are connected to the upper end of said rod and second tubular members respectively.

5. An electrode supporting device as defined in claim 1 wherein said rod member includes cylindrical members of electrically insulating material at the opposite ends thereof establishing a sliding fit with the inner surface of said first tubular member and wherein said second tubular member includes flanged sleeve members disposed within opposite ends thereof establishing a sliding fit with the outer surface of said first tubular member.

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