Nov. 22, 1938. J. J. GLAUBER 2,137,571

THERMIONIC TUBE CONSTRUCTION

Filed July 8, 1935

Fig. 2.

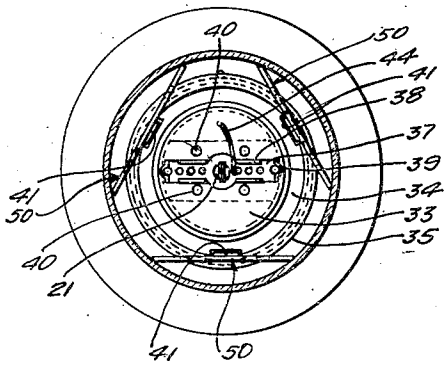


Fig. 3.

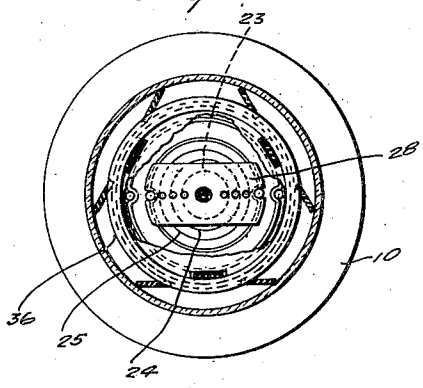


Fig. 1.

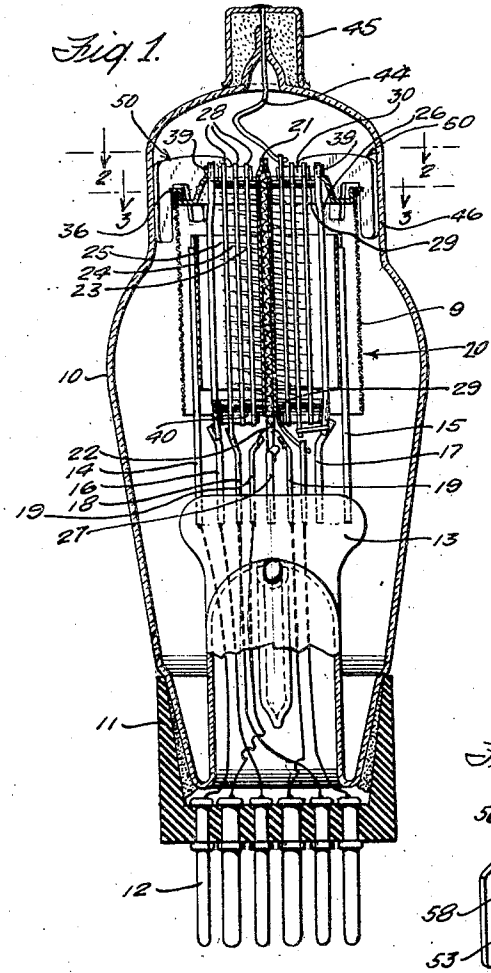


Fig. 4.

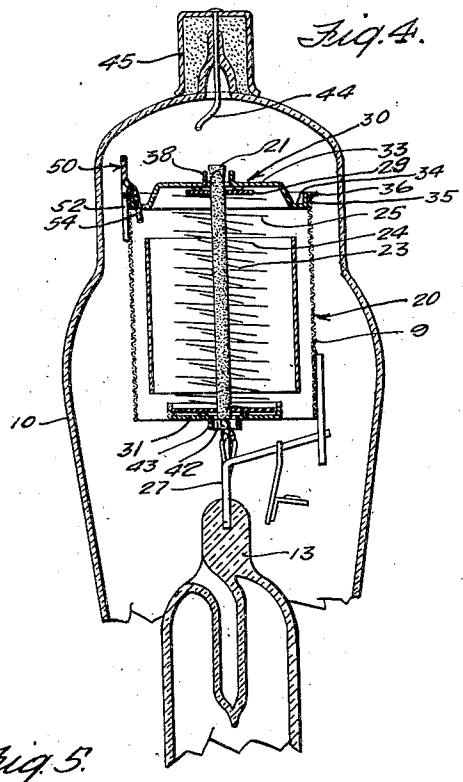
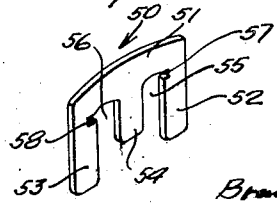


Fig. 5.



INVENTOR
JOHN J. GLAUBER

BY
Brascher, Whitemore & Davies
ATTORNEYS

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THERMIONIC TUBE CONSTRUCTION

John J. Glauber, Newark, N. J., assignor to Arcturus Development Company, Newark, N. J., a corporation of Delaware

Application July 8, 1935, Serial No. 30,342

3 Claims. (Cl. 250—27.5)

This invention relates to electron discharge devices, and more particularly to new and improved means for securing the electrode assembly of such devices in a firm and properly positioned relationship with reference to the enclosing envelope of the wall of the device.

In present day manufacture of electron discharge devices of the type generally known as radio tubes consisting of an electrode assembly positioned within an envelope, it is of increasing importance that means be provided to prevent vibration due to external shock either against the envelope itself or against the supports of the envelope. Use of radio tubes, for example, on automobiles and other vehicles, and subjection of the apparatus to continued vibration from external sources require development of apparatus to overcome the accompanying ill effects of vibration upon the electrical action and efficiency of the tube.

In my co-pending application Serial No. 693,281, filed October 12, 1933, entitled "Tube element shock absorber", now Patent No. 2,089,647, I have described a satisfactory and efficient means for absorbing such vibration consisting of an E-shaped strip of mica formed from a rectangular plate having edge extensions on one side forming tongues, the tongues being adapted to engage the electrode assembly and the ends of the mica strip to engage, under tension, the inner wall of the tube. The central tongue of this device engages a member of the electrode assembly in such a manner as to resist separation or detachment therefrom.

It is an object of the invention of this application to provide improved means for attaching the strip of the shock absorber device or spacer to the electrode assembly of an electron discharge tube or device. An additional object of the invention is to provide an attaching means between the shock absorber mica strip and the electrode assembly which does not require material modification of the electrode assembly cooperating member. Still another object of the invention is to provide an attachment means between the resilient yielding shock absorbing element and the electrode assembly of a radio tube which is essentially firm and secure and will not become detached after insertion within the dome-shaped head of the radio tube. A further object is to provide a type of locking means between the mica strip and electrode assembly which is distributed along the length of the strip and not concentrated at one particular point, and in this manner lessening the strain at one point of the strip. An object, also, is to provide a type of locking means which will not require unnecessary removal of material from the body of the strip, thereby causing a weakening of its structure.

The invention is described specifically in the claims hereto appended, but in order to set forth the form of the invention which may be preferred and the process of making the same, reference is made to the following detailed description of an embodiment of the invention and to the accompanying drawing, in which:

Fig. 1 is an elevation in section of a radio tube to which my invention is applied;

Fig. 2 is a sectional view taken along the lines 2—2 of Fig. 1;

Fig. 3 is another section taken along the lines 3—3 of Fig. 1;

Fig. 4 is an elevation in section at 90° to the line of viewpoint of Fig. 1 with parts removed; and

Fig. 5 is a perspective view of the shock absorber device employed in the present invention.

In the drawing I have shown a type of radio tube having an envelope 10, which may be of glass or other substance not permeable to gases, which is mounted on a base 11 of insulation material, cup-shape in form, from the under side of which project the various contact terminals 12, to which the various electrodes within the tube are connected. Within the envelope reentrant stem 13 is fused at its top about the base of the anode rods 14 and 15, the support rods 16 and 17, the grid support rods 18, and the cathode heater lead-in posts 19.

As will be seen from inspection of Fig. 1 of the drawing, the electrode assembly, generally designated by the numeral 20, consists of a series of concentric electrodes mounted upon and connected to the various standards 14 to 19 inclusive. At the center in the axis of the assembly is the cathode 21 formed of nickel externally coated with electron emitting materials such as the alkaline earth metal oxides and within which is the heating filament 22 formed of a coil of coated insulation wire electrically connected to the lead-in posts 19. Surrounding the cathode 21 is the control grid 23 which is a wire coil of narrow cylindrical formation surrounding the cathode throughout its length. Additional grids are designated by the numerals 24 and 25 and consist of coils of wire surrounding each other, the coil 25 being external to the coil 24, and the coil 24 being external to the coil 23. Enclosing the cathode and grids above mentioned is the

plate or anode cylinder **26** which consists of solid metal sheeting. As shown, the method of attaching the support rods **14** and **15** to the anode is by means of the formation of an axial groove along the external surface of the anode in which the standard rods lie and are welded.

Surrounding the anode is the screen mesh cylinder **9**, which consists of a closely perforated metal webbing or mesh, which in turn is supported by means of a wire connection **27** to the top of the stem.

The various grids above mentioned, namely **23**, **24** and **25**, are supported in position with reference to the cathode and anode by means of a plurality of support rods **28**, each grid having two of these rods spaced equally from the axis of the tube, and about which the grid is wound. The axis of the various support rods **28**, as well as the cathode and the anode support rods **16** and **17**, are sufficiently elongated to extend above and below the electrode assembly and pass through the rectangular insulation strips **29** at the top and at the lower end of the electrode assembly, apertures being provided in the insulation material for this purpose. These strips **29**, which may be of mica, are each positioned respectively within a dish-shaped metal cap **30** and **31** against which the mica strips **29** are held by the action of the various coiled wire grids.

As clearly shown in section in Fig. 1, the top cap **30** is a dish-shaped member having a central recess or depression forming a circular flat base **33**, and an annular radial flat rim **34**, the rim terminating in an annular ring **35** of cylindrical formation with an outwardly flared flange **36**. The base **33** of the top end cap **30** is formed with a diametric slot **37**, the side edges **38** of which are bent back to form shielding members, and the end edges **39** of which are bent upwardly to form contact members with the supporting rods **16** and **17**. Depressions **40** are also formed in the base **33** which extend toward the mica insulation plates **29** and serve to space the same from the metal surface of the cap. In the radial portion **34** of the cap **30** rectangular apertures **41** approximately parallel to the tangent of the cap are cut at spaced intervals about the periphery in order to receive the cooperating member of the insulating spacer units as will be hereinafter described.

The lower ends of the various support rods **28** are adapted to be inserted in the lower insulation strip **29**, as hereinabove mentioned. This strip rests in the lower cap **31** which consists of a circular flat metal plate having an upwardly extending annular flange about its edge. The plate is slotted diametrically as at **42** in the area where the mica plate **29** rests with the ends of the support rods extending through the insulation plate and slot to points beneath the plate, where connection is made to the various lead-in wires or electrical connections mounted on the stem **13**. The edges of the metal along the lower slot **42** are turned downwardly to form protecting shields **43** for the ends of the support rods, and the material at the end of the slot **42** is also turned up against the support rods that connect to the standards **16** and **17** and welded thereto so as to maintain the cap **31** in position in the assembly.

In both end strips **29** central apertures are formed to receive the ends of the cathode **21** which protrude beyond the limits of the end caps. The grid **23** has external connection by means of the connecting wire **44** and the contact **45** at the top of the tube. Attention is directed to the fact that the envelope **10** is of the so-called "dome" type, that is, the top of the tube or the end opposite the base is dome-shaped with a cylindrical portion **46**, this construction having a practical use in connection with the shock absorbing device, as will hereinafter be described.

The shock absorber device or spacer is shown in perspective in Fig. 5 of the drawing and consists of a unit **50** having a whole strip **51** provided with three tongues or projections on a side edge two of these tongues **52** and **53** being at the ends of the strip **51**, and the third **54** being intermediate the ends. These tongues are separated by open areas **55** and **56**, and the tongues **52** and **53** on their inner sides opposite the open areas **55** and **56** are each provided with notches **57** and **58** respectively which serve as the means for locking the shock absorbing unit in engagement with the electrode structure. The material of the shock absorber is mica, preferably, since it is insulating and heat resisting and has a relatively low heat conductivity. It is also electrically non-conducting and hence may be employed in connection with metal contacts either in the electrode unit or in the envelope without the necessity of adding insulating supports. It is, of course, obvious that other materials may be substituted for the mica, which may be even conducting provided the ends of the contacting areas of the shock absorber be properly electrically and heat insulated. A requirement of this shock absorbing unit is that it should be resilient so that the ends may flex in relation to the midpoint of the unit.

The shock absorber unit **50** is utilized in connection with the electrode assembly by inserting the tongue **54** of the unit into the slot **41** in the top cap **30** of the assembly unit. The outer tongues **52** and **53** with the insertion of the tongue **54** in the slot **41**, are positioned externally to the outer ring **35** of the cap **30** and bear against this flange on their inner edges. When the spacer **50** is forced completely into position with the strip **51** in contact with the metal of the cap the notches **57** and **58** on the inner sides of the tongues **52** and **53** ride over and engage the outerly extending projecting flange **36** of the ring **35** and consequently the member **50** is thereby held in engagement thereby. When the required number of shock absorber units **50** have been positioned in the slots **41**, three being indicated, although more or less may be usable, the electrode unit as a whole is inserted within the envelope and when the shock absorbing unit comes in contact with the dome-shaped top of the envelope, the ends of the spacers are pressed inwardly and yield to permit insertion of the assembly so that the upper end thereof is within the space of the dome-shaped cavity. In such position the various spacers are flexed or bowed resiliently against the dome wall **46** with the two ends thereof in contact with said wall and with the notches **57** and **58** permanently fixed in engagement with the projecting flange **36** of the ring **35** of the top cap. Due to the retention of the central tongue **54** in the slot **41** it is apparent that by this connection the central portion of the mica member is reinforced when subjected to the flexing operation. It is also apparent that due to the flexibility of the material used the member **50** is able to accommodate itself to the variations in curvature or distortions in the surface of the envelope. In such assemblies as where the top of the mica member **50** contacts with the curved top of a dome it is evident that the mica may flex along its vertical axis to accommodate itself to this change in curvature also.

As shown the spacer **50** is attached fixedly to the top cap **30** by notches formed in the end tongues. Obviously, however, the member **50** may be held in position by a single notch connection formed in any one of the tongues or two notches in the central tongue cooperatively engaging the edge of the slots **41**, the essential feature being an interengagement between a notch on one member and a projecting edge on the other brought about by a flexing of the spacer.

Various other modifications of the invention may be made other than those here shown, the invention being limited only by the terminology of the claims hereto appended.

What I claim is:

1. An electron discharge device comprising an envelope having a tubular portion, an electrode assembly positioned within said envelope, a support member attached to said electrode assembly having a radially extending flange lying within said tubular portion of the envelope, and a spacer element comprising a strip of resilient material provided with tongues extending from one edge thereof said tongues engaging the flange, and one of said tongues having a notch on the edge thereof adapted to engage cooperatively the flange of the support member whereby the spacer is held in position between the support and the tubular portion of the envelope.

2. An electron discharge device comprising an envelope having a tubular portion, an electrode assembly positioned within said envelope, a support member comprising a flattened metal plate provided with a radial edge flange, and spaced, tangentially formed slots adjacent the flange, said plate being attached to the electrode assembly within the tubular portion of the envelope, and a spacer element comprising a strip of resilient material provided with tongues extending from one edge thereof, one of said tongues being positioned in one of the tangential slots, and another of said tongues having a notched edge adapted to engage cooperatively the flange on the support member.

3. An electron discharge device comprising an envelope having a tubular portion, an electrode assembly positioned within said envelope, a support member attached to said electrode assembly having a radially extending and circular rim having slots formed therein, a cylindrical ring on the edge of said rim, and a radially extending flange on the edge of said ring, said rim, ring and flange lying within the tubular portion of the envelope, and a spacer element comprising a strip of resilient material provided with three tongues extending from one edge thereof, two of said tongues having notches adapted to engage said flange and the other of said tongues engaging said slot, said ring being interposed between said slot and the tongues engaging the flange.

JOHN J. GLAUBER.