Nov. 8, 1932. J. S. VAN HORNE 1,886,991

FILAMENT SUPPORT

Filed March 29, 1926

Fig. 1

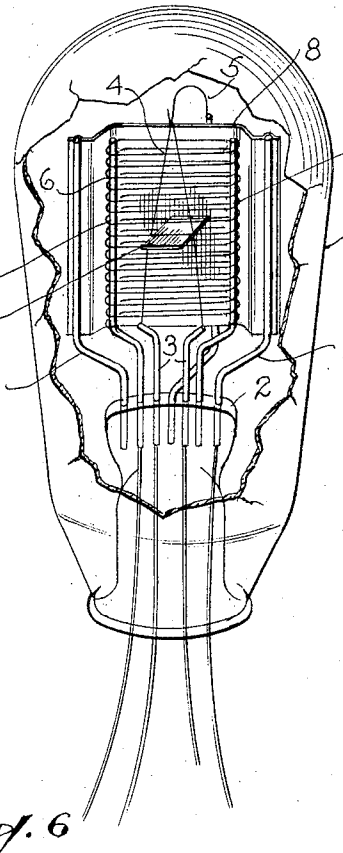


Fig. 2

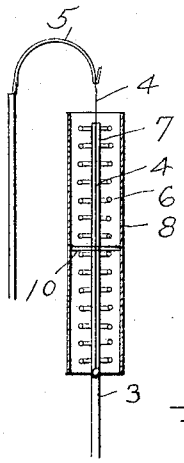


Fig. 3

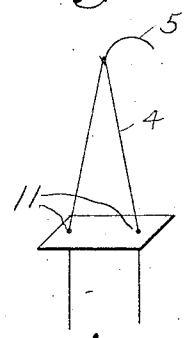


Fig. 4

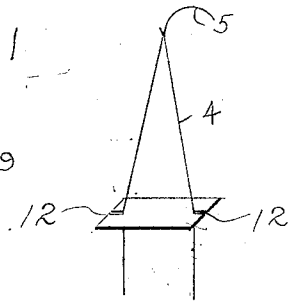


Fig. 6

Fig. 5

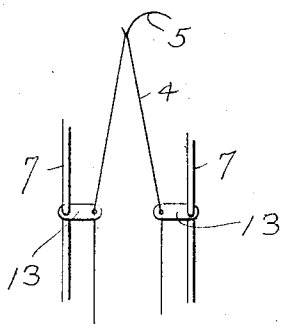


Fig. 8

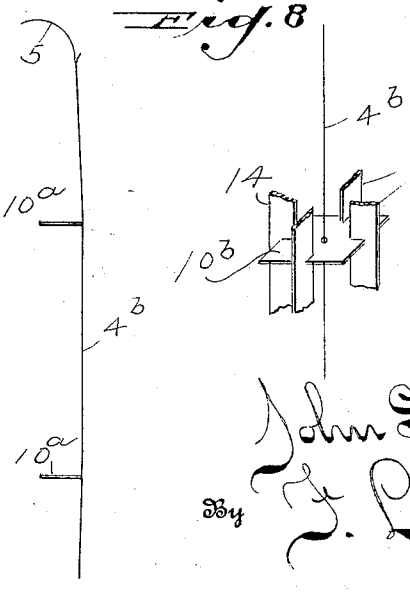
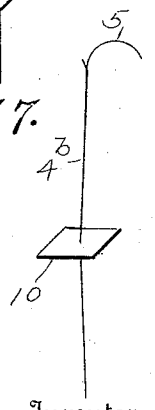


Fig. 7.



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Patented Nov. 8, 1932

1,886,991

UNITED STATES PATENT OFFICE

JOHN S. VAN HORNE, OF FRANKLIN, OHIO, ASSIGNOR TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

FILAMENT SUPPORT

Application filed March 29, 1926. Serial No. 98,166.

My invention relates to electron discharge devices embodying filamentary electrodes and more particularly to thermionic valves or radio tubes, the purpose being to eliminate microphonic noises by minimizing the vibration of the electrode filament.

While the microphonic noises reproduced in the head phones or loud speaker units of a radio receiving set may to some extent be induced by other elements of a thermionic valve or radio tube, it has been found by experiment and research that such noises are caused primarily by vibrations of the heated filament or electron emitting element, which because of its fragile nature is usually more or less flexibly or loosely mounted and is highly susceptible to vibratory motion. The hum or ringing sound produced by such vibration is greatly magnified and augmented by the radio receiving apparatus and is finally reproduced as a harsh discordant and disagreeable noise.

In the present invention, the elimination or at least, the minimizing of such objectionable noises is contemplated by supporting the electrode filament at one or more intermediate points, thereby dampening the vibration of the filament or dividing the filament into two or more sections of reduced length, which will not respond to vibration, or if vibration should occur, it will be at such rate as to be inaudible. As a convenient and economical embodiment of the invention for commercial production, it is preferred to provide a support or bridge of thin mica, which engages with the filament at a mid-length point. In the usual and popular assembly of thermionic valves or radio tubes, wherein is employed an electrode filament of the hair-pin type surrounded by a grid element on opposite sides of which extend the plate or anode elements, it is preferred to interpose such dampening bridge of mica or the like, intermediate the reverse strands of the hair-pin filament, and extending in transverse relation through the grid element and abutting upon the plate or anode element on opposite sides thereof. The mica bridge or support is of such size as to slightly spread the strands of the filament causing sufficient tension against the edges of the interposed mica bridge to dampen the vibration. While other materials may be employed, and other means of supporting the filament or holding it against vibration may be utilized, the mica bridge is preferred, since it not only affords a high dielectric resistance, but is also low in heat conductivity, and therefor will have a minimum cooling effect, upon the filament causing minimum dissipation and thereby but slightly, if at all, affecting the emission of electrons.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation or their equivalents as hereinafter described and set forth in the claims.

Referring to the accompanying drawing, Fig. 1 is a perspective view of an assembled thermionic valve or radio tube, with one side of the anode or plate element removed. Fig. 2 is an enlarged vertical sectional view at right angles to the plane of view of Fig. 1. Figs. 3, 4 and 5 illustrate different methods of supporting or dampening electrode filaments of the hair-pin type. Figs. 6, 7 and 8 illustrate further modifications, more particularly as applied to single strand filaments.

Like parts are indicated by similar characters of reference throughout the several views.

In the preferred form of embodiment illustrated in the drawing, 1 is the bulb or envelope of a thermionic valve of which 2 is the press or stem, supporting the several elements. Connected with conductors 3 into the press 2, is an electron emitting electrode or filament 4, of inverted V shape or hair-pin type, the bight of which is supported by an anchor arm 5 also supported by the press 2. Surrounding the electron emitting element 4 is a helical winding 6 of fine wire supported upon upright fingers or standards 7 and forming the grid element. Enclosing the grid and filament is an anode or plate element 8, usually formed in two interconnecting plates, extending on opposite sides of the grid element, and supported upon arms 9, one of

which is continuous through the press 2, for electrical connection of the plate into an electrical circuit, as is also one of the supporting fingers or standards 7 of the grid element. The anchor arm 5 of the electron emitting filament 4 is quite fine and flexible in order to yieldingly support the filament against breakage by shock and also to accommodate expansion and contraction of the filament. This flexible mounting necessary for the preservation of the fragile filament is more or less directly responsible for the noise inducing vibration.

To minimize the vibration of the filament without subjecting the filament to undue tension, a spreader 10 of preferably electrically and also thermally insulating material is interposed between the strands of filament 4. This bridge or spreader 10 is preferably a small rectangular piece of thin mica. The spreader 10 extends transversely through the grid element, intermediate successive turns or convolutions of the grid wire 6, and is of such length as to abut upon the inner faces of the plate or anode element 8 at the opposite ends. The width of the spreader or bridge 10 is sufficient that the filament strand will rest against the edges of the bridge or support, with only such pressure to arrest their vibration. The portions of the strand at opposite sides of the bridge or support are usually thrown slightly out of alignment or are very slightly angular one to the other. This bridge or support 10 is quite thin and very light and easily supported in its adjusted position, in which it is held against lateral movement in one direction, by its terminal abutment upon the inner faces of the plate element 8, and against movement transversely by its engagement with the filament strand 4. It is supported vertically by the helically wound wire 6 of the grid element. Being thus disposed it braces the filament 4 against undue vibration and if any vibrations occur, it is in the shortened length of filament above and below the bridge or support, the rate of vibration of which is such as to be inaudible if it does occur, the length of such sections being so short as to be normally unresponsive to vibratory tendencies. The bridge or support is located at approximately the mid-length point of the filament strand, although it need not be exactly so located. If so located as to divide the filament strand into unequal sections, they will not only produce a high vibratory rate, if vibration should be induced, but being unequal, they will possess different vibratory rates, and tend to neutralize each other. In the case of extremely long filaments or strands, two or more rests or supports 10^a may be provided as shown in Fig. 6. In any event, the filament is restricted to a succession of comparatively short sections or lengths, which are not readily susceptible to vibration, but in which if vibration should be induced, it would occur in such frequency as to be inaudible.

Various methods of supporting the filament to arrest or minimize vibration may be employed. In Fig. 3, the support or rest has been shown provided with spaced holes 11, through which the filament strands 4 extend. In Fig. 4, the rest or bridge is shown provided with marginal notches 12, in which the filament strands engage. In Fig. 5 there is shown a modified construction, where in lieu of a spreader or bridge member interposed between the strands of the electrodes, each filament strand is separately supported by a tie 13 of insulating material medially connecting the filament strand with the spaced standards or supporting fingers 6 of the grid element. Figs. 6 and 7 show the damping support applied to a single strand filament, which may either bear against the marginal edge of such support or rest as shown in Fig. 6, or may pass through a central orifice therein, as shown in Fig. 7. In Fig. 8, the damping support is shown applied to a radio tube and the like, employing a radially disposed anode and monulating plates, arranged about the central filament 4^b. In this case, the damping support or rest 10^b, is preferably provided with marginal notches, which engage the radially disposed element plates 14 and is further provided with a central orifice through which the filament strand extends.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprises the preferred form of several modes of putting the invention into effect, and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In a thermionic valve, the combination with a filament, a grid element surrounding the filament, and a plate element extending on opposite sides of the grid element, of an auxiliary support for the filament with which the filament engages at a midlength point. said support extending transversely through

the grid element and abutting upon the plate element at opposite sides of the grid element.

2. A thermionic valve, wherein a hairpin type of electrode filament is surrounded by a grid element, and a plate element which extends on opposite sides of the grid element, characterized by a brace of dielectric material interposed between the strands of the hairpin electrode and extending transversely through the grid element into abutment with the plate element on opposite sides thereof.

3. Means for minimizing microphonic noises of thermionic valves and the like, including the combination with an electrode filament, an anode and a grid element symmetrically disposed about the plane of said filament of a dampening element engaging the electrode filament of such valve at a mid-length point and deflecting the filament in said plane and out of aligned direction to eliminate vibration.

4. In a thermionic valve, the combination with a hairpin type of electrode filament having its strands included in a plane, of a spreaded member interposed between and distending the strands but in said same plane whereby microphonic noises due to filament vibration is materially reduced.

5. Means for supporting a substantially V-type filament of a thermionic valve, comprising a spreader member interposed between the spaced strands of the filament intermediate its bight and ends, the spreader being of greater extent than the normal spacing of the filament strands at the points of engagement, whereby the strands are deflected in their normal plane and out of normal alignment by their engagement with the spreader.

6. The combination with a substantially V-shaped filament for a thermionic valve, of a spreader interposed between the arms of the V-shaped filament at an intermediate point and deflecting the arms of the filament out of straight lines in contrary directions but in their normal plane.

7. The combination with a substantially V-shaped filament for a thermionic valve, of a perforated brace member for the filament, through the perforations of which the arms of the V-shaped filament extend, the strand-receiving perforations being differently spaced from the normal spacing of the arms at their points of engagement with the brace member, whereby the arms are deflected out of straight lines.

8. In a thermionic tube, the combination with an inverted normally V-shaped filament having its legs lying in a common plane, of an insulating member interposed between the filament legs in straddled fashion and causing them to be outwardly extended but in the same plane, said insulating member lying in a plane substantially perpendicular to the filament plane.

In testimony whereof, I have hereunto set my hand this 19 day of March A. D. 1926.

JOHN S. VAN HORNE.

CERTIFICATE OF CORRECTION.

Patent No. 1,886,991. November 8, 1932.

JOHN S. VAN HORNE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 26, claim 4, for "spreaded" read "spreader", and line 27, after "strands" insert the words "out of aligned direction"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of May, A. D. 1933.

M. J. Moore.

(Seal) Acting Commissioner of Patents.