

Aug. 2, 1927.

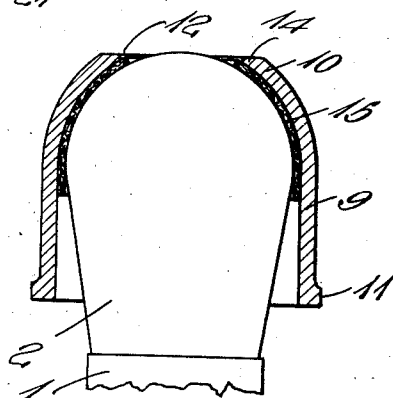
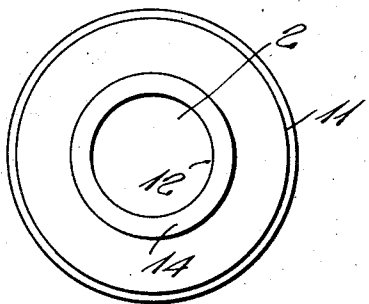
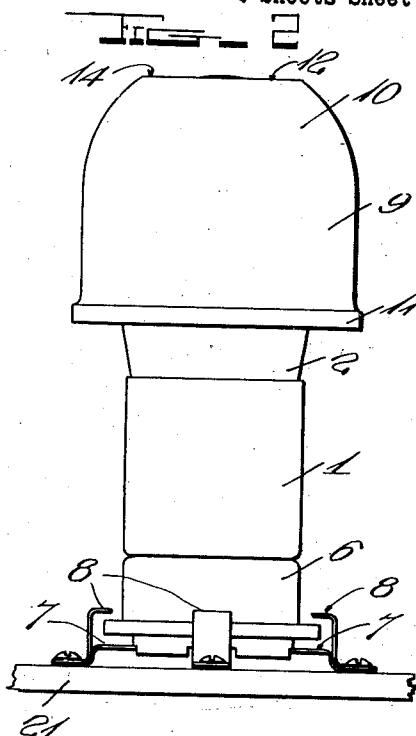
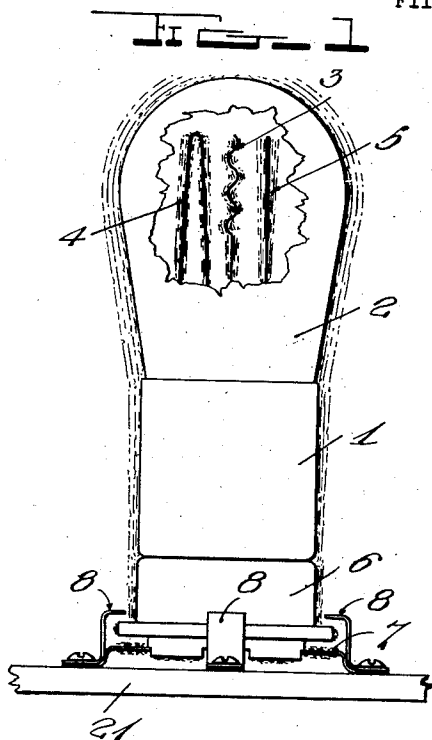
F. A. KOLSTER

1,637,864

ELECTRON TUBE APPARATUS

Filed May 25, 1926

2 Sheets-Sheet 1



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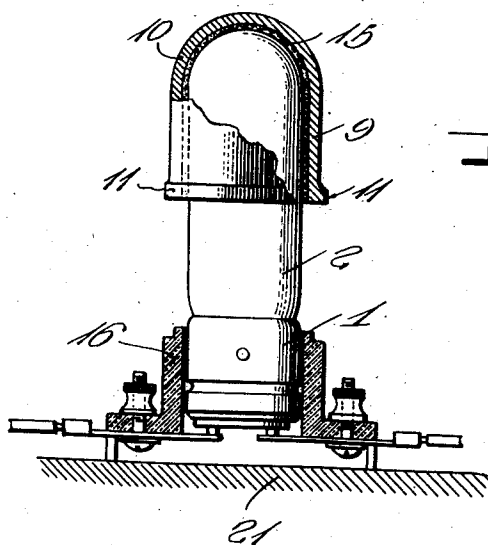
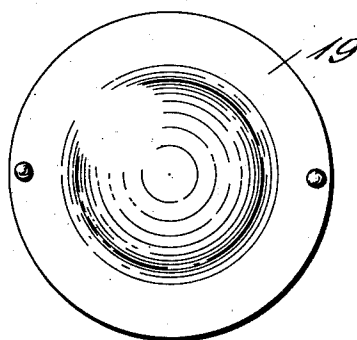
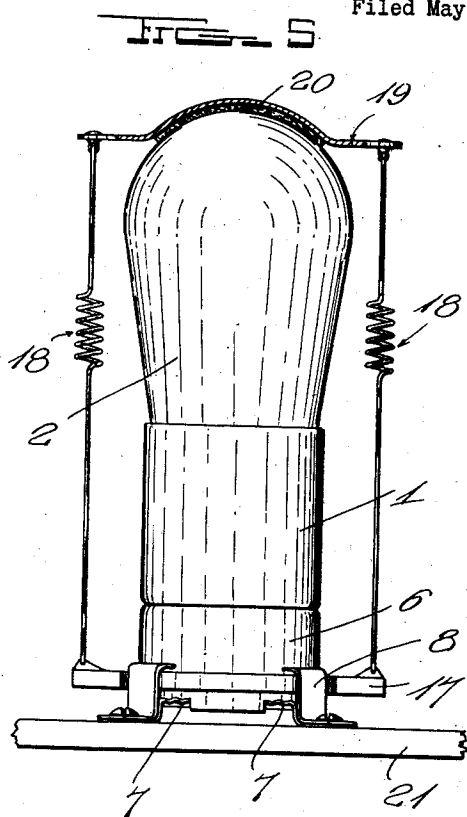
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ELECTRON TUBE APPARATUS

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2 Sheets-Sheet 2



INVENTOR.
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Patented Aug. 2, 1927.

1,637,864

UNITED STATES PATENT OFFICE.

FREDERICK A. KOLSTER, OF PALO ALTO, CALIFORNIA, ASSIGNOR TO FEDERAL TELEGRAPH COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF CALIFORNIA.

ELECTRON-TUBE APPARATUS.

Application filed May 25, 1926. Serial No. 111,533.

My invention relates broadly to electron tube amplification systems and more particularly to an apparatus for preventing the generation of microphonic noises in the circuits of sensitive electron tube amplification systems.

One of the objects of my invention is to provide an apparatus for association with the usual constructions of electron tubes connected in electron tube amplification systems for eliminating the vibration of the electron tubes for preventing disturbances in the circuits associated with the electron tubes and the generation of microphonic noises therein.

Another object of my invention is to provide a device which may be applied to the usual electron tube structure for introducing the required amount of inertia in the tube structure for preventing the vibration of the glass envelope of the tube, eliminating vibration of the interior elements of the tube and preventing distortion of the signaling currents and the setting up of microphonic noises in the circuits associated with the electron tube.

Still another object of my invention is to provide a construction of weight shaped to conform with the contour of the electron tube for substantially enveloping the bulb of the electron tube and imposing such weight thereon that movement of the glass and interior electrodes is prevented whereby the microphonic noises inherent in sensitive electron tube amplifiers may be substantially eliminated.

My invention will be more fully understood from the specification hereinafter following and by reference to the accompanying drawings wherein:

Figure 1 is a theoretical diagram showing an electron tube mounted within a resilient socket and representing the vibration to which the electron tube and the internal electrodes thereof are normally subjected; Fig. 2 is a side elevation of an electron tube upon which the weight of my invention has been placed for introducing the necessary inertia for preventing vibration of the electron tube elements; Fig. 3 is a plan view of the weight constructed in accordance with my invention.

Fig. 4 is a fragmentary view showing an electron tube with the weight of my invention disposed thereon and illustrated in

cross-section; Fig. 5 is a modified construction of the device of my invention; Fig. 6 is a plan view of the modified construction illustrated in Fig. 5; and Fig. 7 illustrates an electron tube of a different type equipped with a weight in accordance with the principle of my invention whereby vibration of the glass and the interior electrodes of the tube is prevented.

Heretofore in the art sensitive electron tube amplification systems have been subject to severe interference from microphonic noises. The electron tubes are so sensitive that the minute vibration of the glass and the increment movements of the internal electrodes serve to set up disturbances in the associated circuits which result in the distortion of the amplified current and the generation of microphonic noises. This disturbance is generally supposed to resemble a continuous singing or humming in the reproducer which is connected with the amplification system. Any slight vibrations in the vicinity of the amplification system where the amplification system may be used as a portion of a radio broadcast receiving apparatus, serve to so interfere with the functioning of the circuits of the amplification system as to render the received broadcasting unenjoyable.

I have discovered that by introducing a large mass upon each of the electron tubes of the amplification system the vibration of the glass and the movement of the electrodes is prevented by reason of the increased inertia of the electron tube apparatus. The result which follows the placing of weights upon each of the electron tubes is striking. The continuous microphonic roar present in the reproducer subsides within a brief interval after the placing of the weights upon each of the electron tubes. Thereafter mechanical vibration in the immediate vicinity of the amplification circuits does not result in the establishment of further microphonic noises and broadcasting may be received without interference. I construct the weights of such shape that they readily conform to the contour of the bulb of the electron tube and snugly fit about the electron tube, raising the center of gravity of the tube to a point substantially central of the electrodes within the bulb, thereby stabilizing the electrodes and eliminating any tendency of movement.

Referring more particularly to the drawings reference character 1 represents the base structure of an electron tube having bulb 2 with grid filament and plate electrodes 3, 4 and 5 therein. The electron tube is shown mounted in Figs. 1, 2 and 5 in a resiliently supported socket structure 6 flexibly suspended from contact 7 with associated limiting stops 8. The weights by which the center of gravity of the tube structure is moved to substantially a central point with respect to the internal electrodes 3, 4 and 5 as represented at 9 have a cylindrical portion and a circular head portion 10 conforming with the shape of the bulb of the electron tube 2. The skirt of the weight 9 terminates in an angular bead 11 uniformly surrounding the bulb 2. The upper portion of weight 9 is apertured at 12 and the weight flattened as represented at 14. A felt lining 15 is provided for preventing mechanical injury to the glass of the bulb 2 of the electron tube.

In Figs. 1, 2 and 4 I have shown the weight as applied to a standard electron tube having an enlarged bulb construction, whereas in Fig. 7 I have shown the weight as applied to an electron tube having a cylindrical envelope where the tube is mounted in a socket support 16 which may not be of the resilient type. My invention is equally applicable to electron tubes whether resiliently mounted or rigidly mounted for in each instance a large amount of inertia is induced for stabilizing the electron tube.

In Figs. 5 and 6 I have shown a modified construction wherein the base 17 of the socket structure 6 is extended on opposite sides to permit spring members 18 to be attached to opposite sides thereof and secured

to the cap member 19 which bears upon the bulb 2 of the electron tube with felt covering 20 therebetween for preventing vibration of the glass under conditions of shocks and jars imparted to the tube structure through the supporting base 21.

It will be observed that the weight construction is capable of inexpensive manufacture by a process of casting. The result produced in the amplification system where the tubes are equipped with a weight in accordance with the principles of my invention is a great improvement over the operation of amplification systems heretofore employed in the art.

While I have described my invention in certain preferred embodiments, I desire it to be understood that modifications may be made and that no limitations upon my invention are intended other than are imposed by the scope of the appended claim.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

An electron tube apparatus comprising in combination with an electron tube having a bulb portion and a base portion, a socket for receiving said base portion, a plate member having an annular flange with a dome shaped central portion connected thereto, a pad disposed upon the under surface of said dome shaped central portion and a pair of resilient members disposed between diametrically opposite points on said annular flange and points on said socket for maintaining said plate in engagement with the bulb portion of said electron tube.

In testimony whereof I affix my signature.

FREDERICK A. KOLSTER.