July 12, 1932. J. W. HORTON 1,866,533

VACUUM TUBE MOUNTING

Filed June 28, 1929

FIG. 2

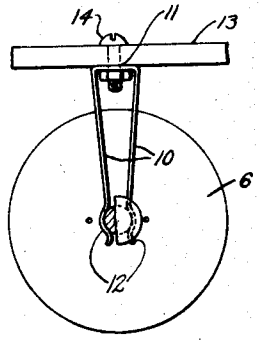
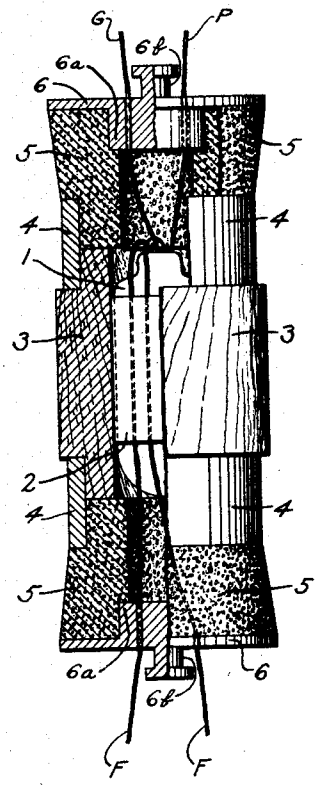


FIG. 1



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UNITED STATES PATENT OFFICE

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VACUUM TUBE MOUNTING

Application filed June 28, 1929. Serial No. 374,539.

This invention relates to mounting electron discharge devices.

An object of the invention is to reduce distortion in signalling waves transmitted by said devices, especially distortion caused by sound waves in air or by other mechanical vibrations transmitted to the device, or by both.

In one specific aspect the invention is a vacuum tube amplifier in which a vacuum tube is shielded from sound waves in the air, and also from mechanical vibrations in its supporting means. The tube is wrapped in friction tape. The taped tube is inserted in a non-metallic balsa wood tube or cylindrical casing. The balsa wood casing is weighted at its ends with rigidly attached, massive lead rings. The weighted casing is resiliently held between thick end rings of sponge rubber. The wood casing, the lead rings and the sponge rubber rings form a hollow cylinder. The ends of this cylinder are closed by two hard rubber discs, to form a sound proof container for the vacuum tube. The discs fit against the rubber rings, respectively. Each disc has a central projecting portion adapted to engage a holding clip mounted on and projecting from a support, as for example, a vertical panel of wood. Vacuum tubes so mounted are readily accessible for inspection or replacement.

Other objects and features of the invention will be apparent from the following description and claims.

Fig. 1 of the drawing is a view, partly in cross section, of the specific form of vacuum tube container described above, and a vacuum tube therein; and Fig. 2 is a top plan view of one of the two holding clips used for mounting the container on a panel.

A thermionic vacuum tube 1 of the usual type has three electrodes (not shown), an anode electrode, or plate, a filament, and a grid or discharge control electrode. Conductors G, P, and F are electrical conductors external to the vacuum tube and connected to the grid, the plate, and the filament, respectively, in the tube. Insulating tape 2 or the like is wrapped about the tube 1 and the conductors F. The taped vacuum tube is inserted in a tube, or hollow cylindrical casing 3 of balsa wood or the like. The overall diameter of the tape and the vacuum tube is sufficiently small to admit of the taped vacuum tube being easily slipped into the balsa wood tube, but is sufficiently large to cause the tape to frictionally engage the internal wall of the balsa wood tube, and consequently hold the vacuum tube in the position in which it is placed, relatively to the balsa wood tube. The ends of the balsa wood tube are of smaller diameter than the central portion of the tube. Massive rings 4 of lead or other heavy material fit tightly on these reduced end portions of the balsa wood tube. Each of two thick rings 5 of sponge rubber or the like has one of its ends of smaller diameter than the remainder of the ring, and has this reduced end portion fitting into one end of one of the lead rings 4 and abutting against one end of the balsa wood tube 3. The shoulder formed in each of the sponge rubber rings, where the reduced end portion meets the portion of larger outer diameter, fits tightly against the adjacent end of one of the lead rings 4. The conductors G and P pass through the central opening in one of the sponge rubber rings. The conductors F pass through the central opening in the other sponge rubber ring. Each of these openings in the sponge rubber rings is of larger diameter at the end of the ring remote from the balsa wood tube than at the end adjacent the balsa wood tube. Each of these openings is closed tightly at its larger end by a disc 6 of hard rubber or the like which has a plug portion 6*a* fitting snugly into the enlarged portion of the opening in the sponge rubber ring and abutting against a shoulder formed in the ring where the internal diameter of the ring changes. The conductors G and P pass through small, widely separated openings that extend through one disc 6. The conductors F pass through small, widely separated openings that extend through the other hard rubber disc. Each of the discs 6 has a hub portion 6*b* extending from the face of the disc opposite to the face that fits against the sponge rubber ring. The U-shaped spring clips 10, one of which is shown in Fig. 2, are mounted on a vertical wood

panel 13 or other support, as for example, by a screw 14 passing through the bight 11 of the clip. Each of the portions 6b of each disc 6 can be sprung between the end portions 12 of one of the clips, so that the weighted balsa wood tube that holds the vacuum tube is supported in a vertical position from the vertical wood panel 13 or other support by the holding clips 10, through the intermediation of the discs 6 and the sponge rubber rings 5.

The tape 2 maintains the conductors F separated a desirable distance from each other and from the conductors G and P, especially during the assembly of the vacuum tube in its mounting by unskilled persons. The tape also forms a cushioning and vibration damping support for the vacuum tube in the balsa wood tube. The balsa wood tube forms a fibrous, cellular, non-conductive casing for the vacuum tube and is highly effective in shielding the walls of the vacuum tube from sound waves in the surrounding air. It has been found that sound waves in the air surrounding vacuum tubes used in television systems to amplify waves that are transmitted to produce images of objects at a distance from the objects, tend to cause material distortion of the images; and that by shielding the vacuum tubes as just mentioned, such distortion is eliminated or greatly reduced. The balsa wood casing, being electrically non-conductive, does not cause undesirable electrostatic capacities to exist between the electrodes of the vacuum tube or between any of these electrodes and ground. The lead rings 4 are too far from the tube electrodes, and from the conductors leading to those electrodes, to produce such undesirable effects. The softness of the balsa wood facilitates making the frictional engagement of the lead rings with the balsa wood tube so tight that these three elements act substantially as an integral mass, as regards mechanical vibrations transmitted to the balsa wood tube. Thus, the lead rings effectively increase the mass and the vibration period of the balsa wood tube and consequently reduce the deleterious effects that mechanical vibrations of the device that supports the holding clips 10, or sound waves in the air, tend to produce in the operation of the vacuum tube. The hard rubber discs being electrically non-conductive, maintain proper electrical separation of the conductors, G and P, and do not undesirably increase the capacity between those conductors or between those conductors and ground. The closed chamber formed by the balsa wood tube, the sponge rubber rings, the lead rings and the hard rubber discs, is sound proof, so that sound waves in air cannot reach the vacuum tube 1; yet the vacuum tube is readily accessible for inspection or replacement since an attendant can spring the portions 6b of the discs out of the holding clips 10, remove one or both of the sponge rubber rings from engagement with the lead rings and the balsa wood tube, and then withdraw the vacuum tube from the balsa wood tube. The reverse of these operations can be performed in inverse order to assemble the vacuum tube in its sound proof container and mount the container on the supporting panel.

The invention is not limited to the material specifically mentioned above for those materials have a wide range or equivalents. Likewise, the invention is not limited to the structural form specifically set forth above, but can be embodied in various structures.

What is claimed is:

1. In combination, a casing of cellular material, for an electric space discharge device, means for increasing the mass of said casing, and means resiliently supporting said casing and said first means and closing said casing to render it sound proof, whereby said casing is adapted to shield said device from sound waves in a surrounding fluid medium.

2. In combination, a casing for an electric space discharge device, means for increasing the mass of said casing, said casing comprising a tubular portion of fibrous, cellular material and end portions principally of resilient material closing the ends of said tubular portion and supporting said tubular portion and said first means, and said first means comprising heavy metal rings uniting said tubular portion and said end portions.

3. In combination, an electric space discharge device yielding fibrous material about said device, a casing for said device and said material, means for increasing the mass of said casing, said casing comprising a tubular portion of balsa wood and end portions closing the ends of said tubular portion and resiliently supporting said tubular portion and said first means, said end portions comprising resilient members partly closing the ends of said tubular portion and rigid clamping plates of electrically insulating material adapted to be attached to a rigid support with said resilient members of said tubular portion clamped between said clamping plates.

In witness whereof I hereunto subscribe my name this 26th day of June, 1929.

JOSEPH W. HORTON.