Nov. 7, 1950 E. W. BREISCH 2,529,279

VACUUM TUBE SUPPORT

Filed July 14, 1948

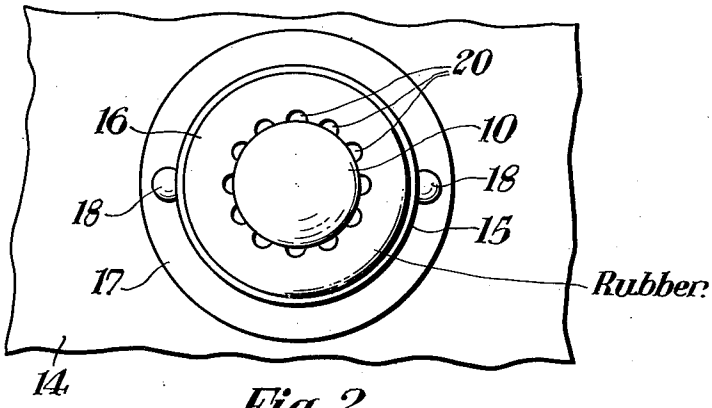


Fig. 2.

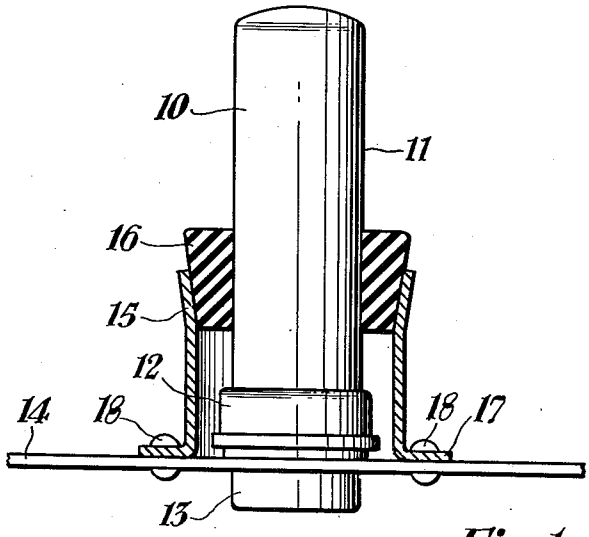


Fig. 1.

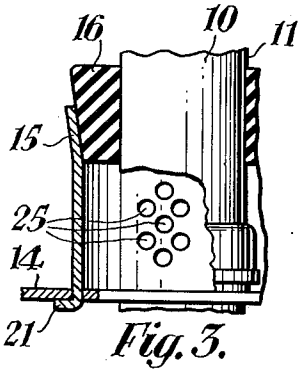


Fig. 3.

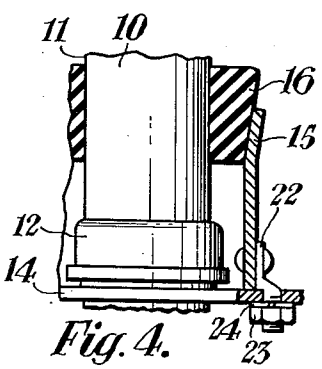


Fig. 4.

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Patented Nov. 7, 1950

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UNITED STATES PATENT OFFICE

2,529,279

VACUUM TUBE SUPPORT

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Application July 14, 1948, Serial No. 38,720

7 Claims. (Cl. 250—27.5)

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My invention relates to vacuum tube supports, and more particularly to means for protection of vacuum tubes from vibration. impact and shock.

It is well known that vibration, impact and shock applied to vacuum tubes may damage the tube elements and may impair the tube's operating characteristics. Many types of tubes are standard commercial items which are produced by large scale methods in order to reduce their cost. The design and construction of such standard tubes are in a large measure based on the supposition that the tubes will be used in equipment located in relatively quiet places, such as in radio receivers located in homes.

In certain uses, such as, telephone systems for railway trains and like mobile units, the tubes of the equipment become subjected to vibration, impact and shock much more severe than that for which their construction is designed. It has been found that vibration and impact to which the vacuum tubes of train telephone systems are subjected tend to gradually loosen the crimped section of metal tubes of standard commercial design allowing movement between the metal shell and the base, and this continued movement flexes and strains the connection leads from the tube elements to the base pins, and eventually one or more of these leads may become broken, thus prematurely ending the service life of the tube.

This means that systems using tubes under severe operating conditions must resort to a specially designed tube which greatly increases the first cost or else must resort to frequent tube inspection and replacement which increases the cost of maintenance of the system.

Again. in many of these tube uses, proper ventilation of the tube is essential for its desired operation due to the relatively high temperature at which the tube operates.

In view of the aforementioned conditions in vacuum tube uses, a feature of my invention is the provision of an improved vacuum tube support to lessen the effects of vibration, shock and impact upon the structure of the tube and upon its operating characteristics.

A further feature of my invention is the provision of a vacuum tube support that is easy to apply to the tube and which support permits a tube to be easily replaced.

Another feature of my invention is the provision of a vacuum tube support which incorporates novel means for ventilation of the tube.

Again, a feature of my invention is the provision of a vacuum tube support which is of simple and rugged design to permit its construction at low cost, which does not have parts difficult for the maintainer to handle and which will automatically grip the tube tighter as the vibration becomes excessive.

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Other features, objects and advantages of my invention will appear as the specification progresses.

I shall describe one form of vacuum tube support embodying my invention, together with certain modifications that I may use and which also embody the invention, and shall then point out the novel features thereof in claims.

In the accompanying drawings, Figs. 1 and 2 are an elevation view partly in section and a plan view, respectively. showing a support embodying my invention when applied to a metal envelope type of vacuum tube. Fig. 3 and 4 are fragmental views showing modifications of the tube support of Figs. 1 and 2 and which modifications also embody the invention.

In each of the several views, like reference characters designate similar parts.

Referring to the drawings, the reference character 10 designates a vacuum tube having a metal envelope 11 and a base 12 to which the pins of the tube electrodes are brought out for connection with the tube socket in the usual manner. The tube 10 may be any one of many types of tubes of this general construction. A tube socket 13 is mounted in any suitable manner in a panel or base plate 14 for receiving the pins of the tube 10 for connection with the outside circuits, the tube being inserted into the socket and firmly held in place therein in the usual arrangement.

The panel or base plate 14 may be of any suitable material, and it is a part of the chassis or other frame work not shown on which the tube and its related equipment are mounted, the chassis in turn being secured in a suitable housing.

It is apparent that vibration and shock applied to the housing will be transmitted to the panel 14 and in turn transmitted through the tube socket to the tube itself and for communication systems using tubes carried on railway trains, the vibration and shock transmitted to the tubes 10 may be relatively severe notwithstanding the chassis on which the tubes are carried may itself be supported in the housing by shock absorbing means. To protect the tube 10 against the effects of vibration and shock, I provide a tube support for each individual tube of the equipment. This tube support comprises two

major parts, a supporting annular shell 15 and a flexible ring 16.

The annular shell 15 is a tubular member having an inside diameter somewhat greater than the maximum outside diameter of the tube envelope 11 and its base 12. The shell 15 is preferably a metal shell and as shown in Fig. 1, it is formed with a flange 17 so that the shell may be secured to the panel 14 by the flange 17 being riveted as by rivets 18 to the panel. This shell 15 is assembled on the panel 14 to be coaxial with the tube socket 13 and with the tube 10 when inserted in the socket. The shell 15 is of a length sufficient to surround the tube 10 a given distance above the tube base. The upper or free end of the shell 15 is flared outwardly, as will be apparent by an inspection of Fig. 1, for its upper portion to provide a conical seat. Preferably the length of the shell 15 is made such that a conical seat of a given length is provided and with the base of the seat somewhat above the top of the base of the tube when the tube is inserted in the socket. The flexible ring 16 is formed with an inside diameter substantially equal to the outside diameter of the metal envelope 11 of the tube. The outer surface of the ring 16 is made wedge shaped to fit into the conical seat of the shell 15. Thus the ring 16 when slipped over the tube 10 provides a snug fit around the tube and a complete seat in the shell 15. The width of the ring 16 is made sufficient so that a small portion of the ring extends above the upper rim of the shell 15. The ring 16 is of a material which will withstand high temperatures without appreciable deterioration and without losing its flexibility. Preferably the ring 16 is made of "Silicone" compound. In this position around the tube, the ring 16 substantially prevents vibration and shock from being transmitted from the panel 14 to the tube. When excessive vibration occurs, the ring 16 will have a tendency to slip down on the body of the tube to wedge it tighter within the shell 15.

For ventilation of the tube, the ring 16 is preferably made with grooves 20 on the inside surface of the ring, as best shown in Fig. 2. Also, as an aid to the ventilation of the tube, the shell 15 is preferably perforated around its lower straight portion as illustrated at 25 in Fig. 3. This arrangement has been found to provide sufficient ventilation around the lower portion of the tube and for the tube itself so that the tube can operate without excessive temperature.

In place of the shell 15 being formed with a flange 17 and secured to the panel 14 as by rivets, the shell 15 may be formed with ears 21 and the panel 14 formed with corresponding holes through which the ears 21 may be inserted, and the ears bent over to secure the shell to the panel, this modification in the mounting of the shell being illustrated in Fig. 3.

As shown in Fig. 4, threaded spade lugs 22 may be riveted or welded to the lower portion of the shell 15 and the panel 14 drilled to receive the threaded portion of the lugs 22 and the shell 15 secured to the panel 14 by lock washers 24 and nuts 23 run down on the threaded portion of the lugs.

With the shell 15 assembled on the panel 14 around the tube socket, the tube 10 is inserted in the socket in the usual manner and the flexible ring 16 of the tube support is then slipped over the tube and pressed into the seat on the shell. To remove the tube it is only necessary to grasp the upper portion of the tube envelope and pull the tube from the socket in the normal way. Should there be a tendency for the flexible ring 16 to bind the tube in the shell 15, this can be overcome by pressing upward against the portion of the ring extending above the rim of the shell. It follows that with the tube in place in the socket, the flexible ring of the support can be readily applied to the tube and the support will cause little or no hindrance in the removal of the tube from the socket.

The tube support here illustrated has the advantages of supporting the body of the tube in such a secure manner that it will prevent vibration and shock from reaching the tube and tubes of standard construction can be used in systems where the tubes are subjected to severe vibration and shock without the loosening of the tube envelope from its base to cause premature failure of the tube. Also, the tube is held firmly in place and normal operation of the tube maintained. This tube support is rugged and of simple construction to be of low cost, and it is free from having parts that require removal or adjustment by a maintainer.

Although I have herein shown and described but one form of vacuum tube support embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A vacuum tube support for protection of a tube when it is inserted in a socket mounted on a housing panel, comprising, an annular shell having dimensions for it to surround the tube to be protected with a given clearance, said shell having one end secured to said panel coaxial with the tube socket and its free end flared to form a conical seat, said shell of a length for its free end to extend above the base of said tube, and a ring of flexible "Silicone" like plastic material having an inside diameter to slip over the tube body and its outer surface wedge shaped to fit said conical seat of said shell.

2. A vacuum tube support for protection of a tube against vibration and shock when the tube is inserted in a socket mounted on a housing panel, comprising, a metal annular shell having an inside diameter greater than the outside diameter of the base of the tube, said shell having one end secured to the panel coaxial with the tube socket and of a length for the free end of the shell to extend a given distance along the tube above the tube base, the free end of the shell flared to form a conical seat, the base of the conical seat being above the tube base, a ring of flexible material of "Silicone" like compound and having an inside diameter substantially equal to the diameter of the tube body and its outer surface made wedge shaped to fit said conical seat of said shell, and said ring of a width to extend a little above said shell when the ring is slipped over the tube and seated in said shell.

3. A vacuum tube support for protection of a tube against vibration and impact when the tube is inserted in a socket mounted on a housing panel, comprising, a metal tubular member dimensioned to surround the vacuum tube with some clearance, said member having one end flanged and riveted to said panel coaxial with the vacuum tube when the tube is inserted in its socket, said tubular member having its free end flared to

form a conical seat the base of which is above the top of the vacuum tube base, a flexible ring of "Silicone" like plastic material and which is characterized to withstand a relatively high temperature without loss of flexibility, said ring dimensioned to slip over the vacuum tube body and its outer surface made wedge shaped to fit said conical seat of said tubular member, and said ring having a grooved inner surface to provide ventilation for the vacuum tube when the ring is slipped over the tube and seated in said tubular member.

4. A support for protection of a metal type vacuum tube against vibration and impact when the tube is inserted in a socket secured to a base plate, comprising, a metal annular shell secured to said base plate coaxial with said tube when it is inserted in the socket, said shell having an inside diameter to surround the tube and its base with a given clearance and of a length to extend along the tube a given distance above the tube base, the free end of said shell expanded to form a conical seat with the base of the seat above the tube base, a ring of soft plastic like flexible material which is characterized to withstand a relatively high temperature with no loss of flexibility, said ring having an inside diameter to permit the ring to be slipped on the tube body and an outer surface made wedge shaped to fit said conical seat of the shell when the ring is slipped over the tube, said ring having its inner surface grooved to give ventilation to the tube, and said shell provided with perforations below the conical seat to aid in the ventilation of the tube.

5. A support for protection of a metal type vacuum tube against vibration and impact when the tube is inserted in a socket mounted on a housing panel, comprising, a metal annular shell having an inside diameter to permit the shell to surround the tube with some clearance, said shell having ears on one end securing the shell to said panel coaxial with said tube when it is inserted in said socket, said shell having its free end expanded to provide a conical seat, a ring of flexible "Silicone" compound material which is characterized by maintaining its flexibility at relatively high temperatures, said ring having an inside diameter that permits the ring to be slipped over said tube with a snug fit and its outside surface shaped to fit said seat of said shell, and said ring having a width for the ring to extend above the free end of said shell to aid in loosening the ring when the tube is removed from its socket.

6. A support for protection of a vacuum tube against vibration and impact when the tube is inserted in a socket mounted on a housing panel, comprising, a metal annular shell having an inside diameter to permit the shell to surround the tube with a given clearance, said shell secured at one end to said panel coaxial with the tube when it is inserted in said socket, said shell of a length for its free end to extend a given distance above the tube base and having its free end expanded to form a seat, a ring of flexible "Silicone" like material, said ring being characterized by maintaining its flexibility at relatively high temperatures, said ring adapted to slip over said tube with a snug fit and having its outer surface formed to fit said seat of said shell, and of a width to extend a little above the free end of the shell when in place on said shell seat, and said ring formed with grooves and said shell formed with perforations to ventilate the tube.

7. A support for protection of a vacuum tube against vibration and impact when the tube is inserted in a socket mounted on a housing panel, comprising, a metal annular shell having an inside diameter to permit the shell to surround the tube with a given clearance, a plurality of spade lugs secured to one end of said shell and having their free ends threaded, said panel provided with openings to secure said shell to said panel coaxial with said tube when inserted in its base by nuts run down on the threaded portions of said lugs, said shell of a length to extend a given distance up along the tube and having its free end flared to form a seat, and a ring of flexible "Silicone" like material, said ring having an inside diameter only slightly greater than the outside diameter of the tube and having its outer surface formed to fit said seat of the shell for said ring to slip over the tube and fit onto the seat of the shell.

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