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2,575,601

GUARD FOR VACUUM TUBES

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FIG. 2.

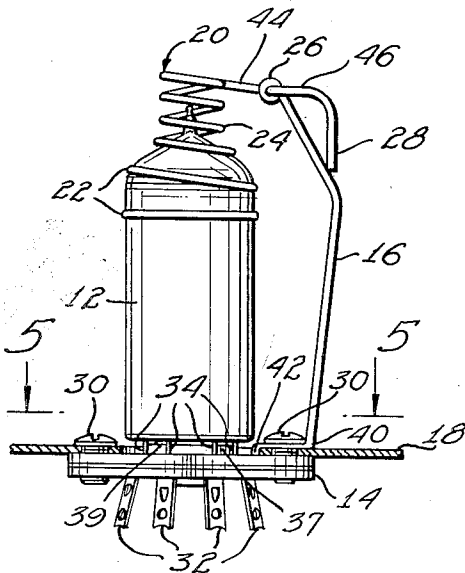


FIG. 1.

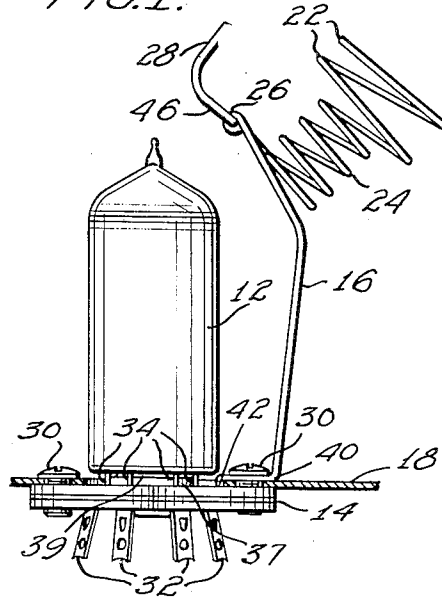


FIG. 4.

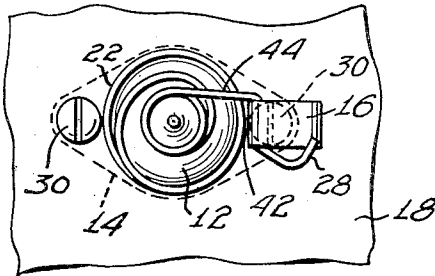


FIG. 3.

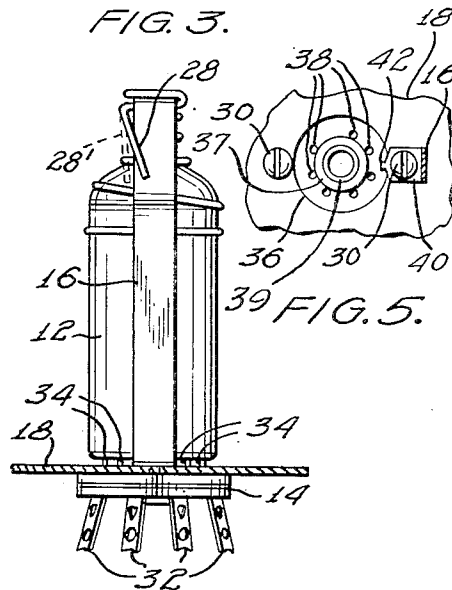
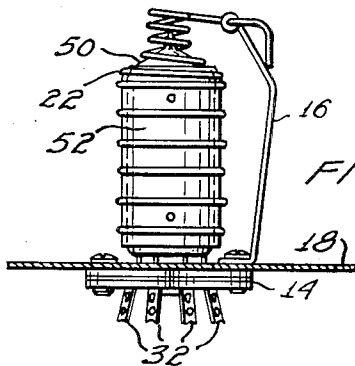


FIG. 6.



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GUARD FOR VACUUM TUBES

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5 Claims. (Cl. 173—328)

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This invention relates to vacuum tube mountings, especially for miniature vacuum tubes, and more particularly to an inexpensive guard for holding a vacuum tube against loosening in its socket under vibration.

In many uses, including radio receivers of modern type, vacuum tubes are used in horizontal and even in inverted position. There is a tendency for the tube to loosen in its socket or even to fall out of its socket, particularly where there is considerable vibration, as for example, in automobile and other portable radio receivers. The problem has been aggravated with the adoption of miniature vacuum tubes. Such tubes do not have a molded plastic base with tubular prongs projecting therefrom. Instead, relatively thin lead-in wires project directly through the glass bottom of the tube envelope, and act as prongs. To accommodate the slender prongs, the construction of the vacuum tube socket is not comparable to that used with the larger tubes, and the grip of the socket on the prongs is less secure.

The primary object of the present invention is to overcome the foregoing difficulty, and to prevent loss of a tube from its socket. A further object is to prevent loosening of a tube in its socket, such as may spoil the electrical contact between one or more of the prongs and the socket. A more specific object is to accomplish the foregoing with miniature vacuum tubes.

Another object is to accomplish the desired result while providing a resilient or shock-resistant mounting for the tube, in contrast with a rigid, non-yielding support.

Still another object is to provide a guard of the character specified, which is readily releasable for insertion or replacement of a vacuum tube.

Further objects of the invention are to provide a guard of the type specified, which will be inexpensive, light in weight, require a minimum of material and relatively simple manufacturing operations, and which may be secured to the chassis or/and vacuum tube socket without necessitating the use of extra eyelets or like fastening means.

In modern receivers most of the tubes do not require shielding, and it is accordingly a further object of my invention to provide a guard of the character specified, which will operate on an unshielded vacuum tube. However, in accordance with a further feature and object of the invention, the guard will also work on a shielded vacuum tube, and in fact, may in such case be

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employed for the added function of grounding the shield of the tube to the chassis.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the vacuum tube guard elements and their relation one to the other, as are hereinafter more particularly described in the following specification. The specification is accompanied by a drawing, in which:

Fig. 1 is a partially sectioned side elevation showing the guard in open condition;

Fig. 2 is a similar view, showing the guard in closed condition;

Fig. 3 is a side elevation with the guard in closed condition;

Fig. 4 is a plan view;

Fig. 5 is a horizontal section taken approximately in the plane of the line 5—5 of Fig. 2; and

Fig. 6 shows the invention applied to a shielded vacuum tube.

Referring to the drawing, the guard is intended to hold a vacuum tube 12 in its socket 14. The guard comprises a generally upright support 16 extending collaterally of the tube 12 at one side of the tube. The support is secured at its lower end to the socket 14 or/and the chassis 18 holding the tube 12. The upper end of the support carries a compression spring 20 which in the closed position shown in Figs. 2 and 3, bears downwardly against the upper end of the tube 12.

It will be noted that the spring 20 is a helical spring having relatively large-diameter convolutions 22 at the lower end thereof, said convolutions encompassing the upper end of the tube 12, and thereby locating the spring relative to the tube and discouraging any sideward tilting of the tube. The spring also has smaller-diameter convolutions 24 thereabove for bearing against the top of the tube.

The spring is pivotally mounted on the support 16 in a bearing 26, and is provided with a lock 28 which bears against the support 16 in such a manner as to hold the spring compressed against the tube. It is only by releasing the lock 28 that the spring may be turned to the outward or inoperative position shown in Fig. 1, at which time the spring is out of the way of the tube so far that the tube may be removed from or replaced in the socket.

Considering the arrangement in greater detail, the socket 14 is a conventional socket made of laminations of insulating material stamped to the approximately diamond-shaped configuration

shown in Fig. 4, and secured to the chassis 18 by means of a pair of fasteners 30. The details of the socket are not important to the present invention, but it may be mentioned that soldering lugs 32 are provided for each of the pins 34 of the tube, the upper ends of said lugs being appropriately shaped to form clips which frictionally grip the pins when the latter are pressed through mating holes in the socket. The chassis plate 18 may be made of metal, and has a relatively large hole cut therethrough at the socket, this being indicated at 36 in Fig. 5. The socket holes 38 for the tube prongs, as well as insulation guide washer 37 and metal assembly eyelet 39, are all exposed by the opening 36.

In the specific form here shown, the support 16 is a strip of relatively stiff sheet metal. It is bent at its lower end to form a foot 40 having a hole therethrough for the screw 30. Thus the foot is secured to the chassis by the same screw 30 as is used to hold the socket. The end of the foot is preferably provided with a downwardly bent tang 42, said tang engaging the periphery of the opening 36 in the chassis and thereby preventing rotation of the support 16 about the fastener 30. Tang 42 is best shown in Figs. 1, 2, and 5.

The upper end of support 16 is shaped to provide a bearing 26, and in the present case this is done by simply curling the end of the metal strip around.

Since the support 16 is preferably offset from the axis of the tube, while the spring 20 is preferably located on the axis of the tube, the spring is carried by a support arm 44. This arm is most simply and inexpensively formed by extending the spring wire at one end. The wire is bent substantially at right angles, thus forming a journal portion which passes through the bearing 26. At the opposite side of the bearing the extended wire is bent outwardly at 46 and then downwardly and sidewardly to form the lock 28 previously referred to.

Referring to Fig. 3, to release the spring, it is merely necessary to bend the lock outwardly slightly from the solid-line position 28 to the dotted-line position 28', whereupon the spring is readily turned outwardly to the position shown in Fig. 1. The tube may then be removed for examination or replacement. To restore the holding action on the tube, it is merely necessary to press the top of the spring downwardly toward the tube, for when this is done, the lock 28 will automatically move past the support 16 and snap into the locked position shown in Figs. 2, 3 and 4.

In Figs. 1 through 5, the tube is unshielded. However, the invention may be used with a shielded tube, and this is shown in Fig. 6, in which the tube 50 is provided with a metal shield 52. The particular shield shown is of the type described and claimed in my co-pending application Serial Number 10,957, filed February 26, 1948, now Patent No. 2,499,612 issued March 7, 1950. When the shield is used, the large-diameter convolutions 22 of the spring fit around the shield. The guard thus serves to prevent movement of the shield off the tube, and also acts as an effective contact means to maintain a ground connection between the shield 52 and the chassis plate 18. If the guard is not employed, it is necessary to use special connector means on the socket or chassis for establishing and maintaining a ground connection. Such connector means may be eliminated when using the guard here described.

For a particular diameter and base construc-

tion, the miniature tubes are made of different length. At present three different lengths are standard. For maximum efficiency, the guard of the present invention is made in three different sizes, but it may be pointed out that the spring with its associated arm and lock may be the same in all three cases. The difference resides solely in the length of the support 16, and this is preferably made in three lengths corresponding to the three lengths of tube envelope.

In the drawing, the fastening means 30 are shown as screws, but it will be understood that in conventional radio construction practice, eyelets are used. The eyelets simply replace the screws shown.

In the drawing, the upright portion 16 is shown sloping away from the tube somewhat. In actual practice the upright may be, and more usually is made vertical in order to minimize the space requirements between tubes. This is a significant factor in very compact or miniature receivers, and the present device when made with a vertical support, requires a clearance of only $\frac{1}{8}$ of an inch more than what is anyway occupied by the tube socket.

The metal strip constituting the upright is shown in the drawing in the form of a flat strip, but in practice the material along the upright 16 may be longitudinally indented or channeled slightly toward the tube, thereby stiffening and rigidifying the support without necessitating the use of thick metal.

In the drawing, a tang 42 is shown to prevent rotation of the support about the fastening means 30. It will be understood that the foot of the upright is made without such a tang, for use in those cases in which the tube socket has a molded head which projects above the top of the chassis, and in such case the plain edge of the foot bears against the edge of the socket. The end of the foot may be curved to conform to the curved periphery of the socket.

It may be mentioned that the top of the support and spring are only $\frac{1}{8}$ of an inch above the top of the tube, so that there is no appreciable increase in space requirement in a vertical direction as well as in a horizontal direction.

It is believed that the construction and method of use of my improved vacuum tube guard, as well as the advantages thereof, will be apparent from the foregoing detailed description. The guard holds the tube in its socket, and prevents escape or loosening of the tube even when the tube is used in inverted or sideward position, and regardless of vibration conditions. The guard provides a yieldable rather than rigid mounting for the tube, thereby minimizing the likelihood of tube damage under shock. The guard uses a minimum of material, and is easily fabricated at slight cost. It is secured to the chassis or/and socket without the need for additional eyelets or mounting means. The guard is readily releasable for replacement of a tube. It may be used with either unshielded or shielded tubes, and in the latter case itself acts as a ground connection for the shield. It further guards against escape of the shield from the tube.

It will be seen that the wire of the spring which passes through the bearing is extended to form a finger which is normally disposed in front of one side of the support and which may be moved past the support to abut the opposite side of the support in order to locate the coil in its operative position bearing downwardly

against the top of the tube. More specifically, it may be said that the support has two opposed edge walls and two opposed face walls, and that the aforesaid finger extending in the general direction of the support at first lies outside an edge wall at the portion nearer the bearing and then extends over in front of a face wall at the end portion which is further from the bearing. This finger is biased so that it may be snapped past the edge wall in order to abut and press against that one of the face walls of the support which takes the reaction of the spring pressure when said spring bears downwardly against the top of the tube. The arrangement is such that when the said finger is manually displaced side-wardly against its bias it may be snapped around and past the edge wall in order to miss and no longer abut the support, whereupon the spring may be turned freely about the axis of the bearing and thereby turned out of the way for removal or insertion of a tube.

It will be apparent that while I have shown and described my invention in a preferred form, changes may be made in the structure disclosed, without departing from the spirit of the invention as sought to be defined in the following claims. In the claims, the tube and support are assumed to be in upright position for convenience of description. However, the relationship of the parts is intended to be merely relative, for the tube and support may be used in horizontal or inverted position, and in fact, that is a most important use for the vacuum tube guard.

I claim:

1. A guard for use in combination with a vacuum tube having contact prongs projecting from its lower end, and a socket, said guard serving to yieldably hold the tube in the socket, said guard comprising a support disposed near the tube and extending in the general direction of the insertion of said tube and having a bearing disposed substantially at right angles to the axis of said support, a helically coiled wire spring for bearing downwardly against the top of the tube, the wire of said spring being extended at one end to provide a support arm passing through and rotatable in said bearing, said support arm being extended to form a finger normally in front of one side of said support whereby it may be moved past the support to abut the opposite side of said support to locate the coil in its operative position bearing downwardly against the top of the tube.

2. A guard for use in combination with a vacuum tube having contact prongs projecting from its lower end, and a socket, said guard serving to yieldably hold the tube in the socket, said guard comprising a support disposed near the tube and extending in the general direction of the insertion of said tube and having a bearing disposed substantially at right angles to the axis of said support, a helically coiled wire spring for bearing downwardly against the top of the tube, the wire of said spring being extended at one end to provide a support arm passing through and rotatable in said bearing, said support arm being extended to form a finger normally in front of one side of said support whereby it may be moved past the support to abut the opposite side of said support to locate the coil in its operative position bearing downwardly against the top of the tube, said helically coiled wire spring having large diameter convolutions at the bottom for encompassing the upper end of the tube, and a

smaller diameter convolution for bearing against the top of the tube.

3. A guard for use in combination with a vacuum tube having contact prongs projecting from its lower end, and a socket secured to a chassis by means of one or more fastening means, said guard serving to yieldably hold the tube in the socket, said guard comprising a support disposed near the tube and extending in the general direction of the insertion of said tube and having a bearing disposed substantially at right angles to the axis of said support, said support being made of a strip of sheet metal bent at its lower end to form a foot which is secured to the chassis by means of one of the fastening means of the socket, said foot being provided with additional means to prevent rotation of the support about the fastening means of the socket, a helically coiled wire spring for bearing downwardly against the top of the tube, the wire of said spring being extended at one end to provide a support arm passing through and rotatable in said bearing, said support arm being extended to form a finger normally in front of one side of said support whereby it may be moved past the support to abut the opposite side of said support to locate the coil in its operative position bearing downwardly against the top of the tube.

4. A guard for use in combination with a vacuum tube having contact prongs projecting from its lower end, and a socket, said guard serving to yieldably hold the tube in the socket, said guard comprising a support disposed near the tube and extending in the general direction of the insertion of said tube and having at its upper end a bearing disposed substantially at right angles to the axis of said support, a helically coiled wire spring for bearing downwardly against the top of the tube, the wire at the upper end of said spring being extended to provide a support arm having a journal part bent substantially at right angles to the arm and passing through and rotatable in said bearing, said support arm and journal part being further extended and bent downwardly to form a finger normally in front of that side of said support which is adjacent the tube, whereby it may be moved past the support to abut that side of said support which is remote from the tube in order to locate the coil in its operative position bearing downwardly against the top of the tube.

5. A guard for use in combination with a vacuum tube having contact prongs projecting from its lower end, and a socket, said guard serving to yieldably hold the tube in the socket, said guard comprising a support disposed near the tube and extending in the general direction of the insertion of said tube and having two opposed edge walls and two opposed face walls and having a bearing disposed substantially at right angles to the axis of said support, a helically coiled wire spring for bearing downwardly against the top of the tube, the wire of said spring being extended at one end to provide a support arm passing through and rotatable in said bearing, said support arm being extended to form a finger extending in the general direction of the support and first outside an edge wall at the portion nearer the bearing and then over in front of a face wall at the end portion further from the bearing and being biased so that it may be snapped past said edge wall in order to abut and press against that one of the face walls of the support which takes the reaction of the spring pressure when said spring bears downwardly

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against the top of the tube, the arrangement being such that when the said finger is manually displaced sidewardly against its bias it may be snapped around and past the edge wall to miss and no longer abut the support, whereupon the spring may be turned freely about the axis of the bearing, and thereby turned out of the way for removal or insertion of a tube.

EDWARD F. STAYER.

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