Nov. 14, 1950 W. I. KELLY ET AL 2,529,502

TUBE SOCKET

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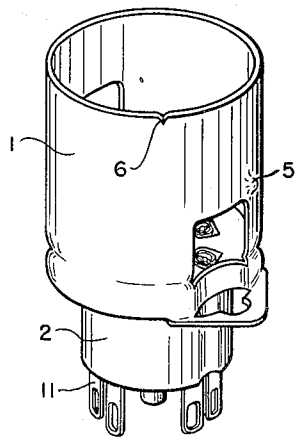


FIG. 1

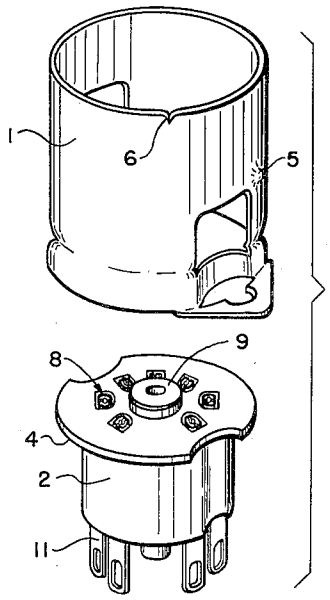
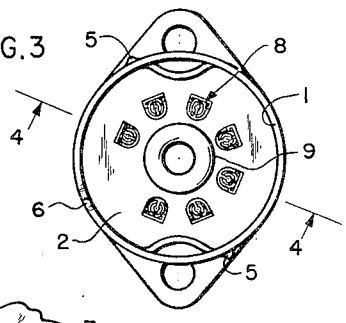


FIG. 2

FIG. 3



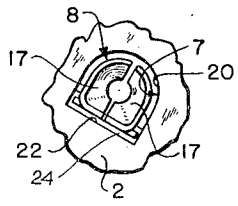


FIG. 3A

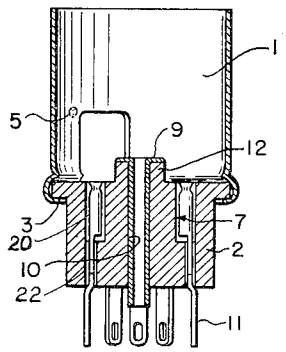


FIG. 4

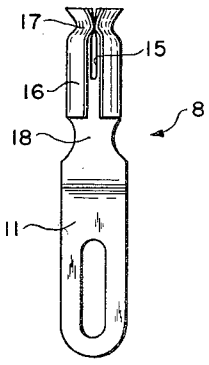


FIG. 5

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TUBE SOCKET

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Continuation of application Serial No. 509,674, November 10, 1943. This application May 28, 1948, Serial No. 29,865

2 Claims. (Cl. 173—328)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

The present application is a continuation of our pending application, Serial Number 509,674, filed on November 10, 1943, now abandoned.

This invention relates to sockets for electron tubes, and particularly to a novel design of such sockets to prevent shock injury to the electron tubes.

A conventional electron tube with a glass envelope has a plurality of electrode terminals or pins protruding therefrom. It is common practice to bring these terminals, or a majority of them, out at the base of the envelope and to insert them in a more or less rigid socket, each terminal or pin fitting into an individual insert or pin clip of said socket. The individual insert provides the proper contact for a particular electrode terminal, and the tube is physically supported by the electrode terminals which are inserted in the socket.

The electrode terminals or pins of such tubes are sealed in the glass at the base of the tube, and any pressure on them sets up strains in the glass envelope. We have found that such strains are caused by forces applied on the tube by inserting or removing the pins from the sockets, or by subjecting the tubes to vibration or shock when properly mounted in such sockets. Tube breakage, caused by the above-described strains, has been the source of considerable failure in electrical circuits, particularly in portable and vehicular radio sets.

It is an object of our invention to furnish a tube socket, for use with existing electron tubes, properly designed to reduce tube breakage to a minimum.

A specific object of our invention is to provide a tube socket which will restrict the excursion of the tube, when subjected to shock or vibration.

A further object of our invention is to provide a socket which will eliminate or reduce the strain producing forces on the glass envelope when the tube is subjected to a maximum amount of excursion.

For a better understanding of our invention, together with further objects, reference is had in the following description to the accompanying drawings:

Figure 1 is a perspective view of our invention assembled and ready for use;

Figure 2 is a perspective view of our invention with the excursion limiter and a socket or base portion shown separately before being assembled together;

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Figure 3 is a top view of the socket of Figure 1;

Figure 3A is an enlarged fragmentary view of one of the pin clips of Figure 3, in position in the socket;

Figure 4 is a sectional view of the socket taken along line 4—4 of Figure 3; and

Figure 5 is an elevational view of an individual pin clip.

Referring to the figures, in which like numbers refer to like elements, the excursion limiter 1 is higher than conventional shield bases, being ¾-inch high in a preferred embodiment of our invention as adapted to a miniature seven pin tube. This excursion limiter 1 is fastened to socket or base portion 2 by crimping the lower edge 3 of the excursion limiter under the shoulder 4 of said socket portion 2. Outwardly extending protuberances 5 on the excursion limiter 1 are provided for the purpose of attaching a conventional electrical shield thereto. Notch 6 in the top of the excursion limiter 1 facilitates the orientation of a tube to the proper position for inserting into the socket, and eliminates time wasting exploration. An electron tube is mounted in the socket portion 2 and a conventional shield cover (not shown) having the usual bayonet type joint and a spring attached thereto is then placed upon the excursion limiter. This spring exerts an upward pressure on the shield cover and thus keeps it in place. The lateral excursion of the shield and tube is limited by the excursion limiter 1.

The socket portion 2 is a solid piece of insulating material provided with proper cavities 7, receivable to individual pin clips 8. A socket portion 2 for use with the smaller, high frequency tubes may be provided with a tube 9 of conductive material extending through a hole 10 at the center of the socket portion 2 to furnish electrical shielding between the electrode terminals.

As illustrated in Figures 3A and 4, each cavity 7 is sufficiently large so that an individual pin-clip 8 fits loosely therein, allowing both expansion of said pin clip on receiving a tube pin without being restricted by cavity 7 and a certain amount of free excursion within said cavity. This permits a maximum amount of tube excursion before strain-producing forces are transmitted through the pin to the glass envelope of the tube. On assembly, as illustrated by Figure 4, each individual pin clip 8 is inserted from the top of cavity 7, terminal end 11 first, and is crimped below the bottom of the socket portion 2 to retain it loosely therein.

As shown in Figure 5, each individual pin clip 8 is shaped from a unitary strip of resilient metal having identical notches cut into opposing sides in the central portion 18 thereof. The upper edge of the strip is indented longitudinally in the form of a U, as at 15 (see Figure 5), and the sides of the upper portion of the strip are bent into a generally cylindrical shape with the head of the cylinder 16 being warped into the form of lips 17, of lesser inside diameter than the balance of said cylinder, so as to securely clamp an inserted pin of a vacuum tube. The lower edge of the strip is rounded and a slot is cut into the lower portion to enable the soldering of a connecting lead thereto.

As shown in Figure 4, each cavity 7 extending through socket or base portion 2 comprises an upper cup portion 20, which is substantially D-shaped in horizontal cross section (as shown in Figures 3 and 3A), and a slot 22 communicating between the cup portion and the lower surface of socket portion 2, said slot 22 being a straight line in horizontal cross section and in register with the flat surface 24 of the said D-shaped cup portion. When a pin clip 8 is inserted into cavity 7, the cylindrical portion 16 is contained loosely within the cup portion 20 while the notched central portion 18 of pin clip 8 and the upper part of the terminal portion 11 are received within the slot 20, thereby allowing the lower part of the terminal portion 11 of the pin clip 8 to extend below the under surface of the socket portion 2. It will be readily seen that in assembly the insertion of pin clip 8 into cavity 7 is easily accomplished without any forcing action.

A high center 12 is provided on the socket portion 2 to support an electron tube at its base and thereby prevent the pins of the tube from being inserted completely within the socket portion 2. The high center 12 also allows a tube to "rock" when subjected to vibrations and shocks and when it is being removed from a socket, as for replacement. Allowance is made for the pins to make good contact with the pin clips 8, but since they are restricted from being completely inserted within the socket portion 2, any tube excursion will be accompanied by less strain-producing force on the glass envelope. This is due to the increased lever arm between the tube envelope and the point where the pin is fastened to the pin clip 8. Heretofore, in standard tube sockets, the tube pins were inserted in rigid pin clips or through very small holes. Any shock or vibration of the tube socket thus caused the vibration or shock to be transmitted to the glass envelope of the tube. However, in our particular invention there is no such rigidity or restriction. The pin clips 8 are loosely fitted in cavities 7. Each tube pin is electrically connected to its pin clip 8 only at the inner peripheral surface of the lips 17 thereof. Thus any vibration or shock to the tube base will not be transmitted through the glass envelope as readily as in the structures heretofore mentioned, in which the tube pins were rigidly connected to a base socket. Further, each pin clip of the present improved socket is free to adjust its position to the tube pin being inserted as it is free to move laterally in the cavity 7 and it can pivot to a predetermined extent about the inner peripheral surface of the lips 17, the inner diameter of the cylinder 16 being greater than the outer diameter of the tube pin, except at the said lips 17, as already pointed out.

In the socket just described, the excursion limiter 1 and shield (not shown) are preferably of metal so as to act as an electrical shield. In addition however, the excursion limiter 1 should be high enough, and have an inside diameter of such size that it will allow a vacuum tube a certain amount of lateral excursion, but will prevent any excursion beyond safe predetermined limits.

As already explained above, the present socket is so designed that each of the pins of a vacuum tube is able to pivot relative to the pin clip 8 into which it is inserted and each of said pin clips 8 is able to "float" relative to the socket portion 2. Hence a vacuum tube is free to undergo a certain amount of lateral excursion when subjected to shocks or vibrations. Such lateral excursion is further encouraged by the high center 12 of the socket portion 2, as it keeps the pins of a tube from being inserted too far into the pin clips 8 and it also acts as a fulcrum about which the tube may "rock."

This lateral excursion is desirable as it helps to absorb shocks and vibrations which otherwise would be transmitted to and injure the glass envelope and/or the internal structure of a tube. It will be appreciated however that, if the tube pins are pivoted beyond the point allowed by the design of the pin clips 8 and socket portion 2, said pins will be bent and/or the glass envelope will be strained. The excursion limiter 1 is therefore incorporated in the present socket to define limits within which lateral excursion is safe and desirable, but beyond which such excursion would be likely to damage a tube.

Obviously, for the purpose aforesaid, the diameter of an excursion limiter 1 will depend upon its height; the greater the height the greater the permissible inside diameter. However, as tubes are inserted and withdrawn by hand, a certain amount of a tube should extend beyond the excursion limiter. Tests have dictated that an excursion limiter of about ¾-inch is satisfactory for conventional miniature tubes.

We have shown a combination of improvements in a tube socket, which will allow a desirable excursion of an electron tube, but which will keep such excursion within safe limits and thereby will materially reduce strain on the glass envelope thereof, when said electron tube is mounted in said tube socket. Tests have shown that this combination effects a substantial reduction in breakage of electron tubes by shock and vibration and in damage sometimes resulting when a tube is inserted or withdrawn from a socket.

Although we have shown and described a specific embodiment of our invention, we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

We claim:

1. In an electron tube socket having a base portion of insulating material, said base portion provided with a plurality of cavities including a like plurality of resilient pin clips, said pin clips each having an upper portion adapted to securely receive the pins of a tube, a constricted central portion and a lower terminal portion, said cavities in said base portion having an upper cup portion dimensioned so as to loosely contain the upper portion of said clips and a narrow portion dimensioned so as to loosely contain the constricted portion of said clips, the combination of means comprising a high center on said socket portion

for fixing the extent to which a tube may be inserted into said socket and about which a tube may be rocked, limiter means for limiting the amount of rocking of a tube about said high center after its insertion into said clips, and wherein the excursion limiter consists of a tubular member fixed to the base, and extending upwardly therefrom, said tubular member having an inner diameter larger than the upper diameter of the electron tube surrounded by the tubular member, the difference in the said diameters permitting a predetermined limit of lateral excursion of an electron tube operably positioned in said socket.

2. In an electron tube socket the combination of an insulating base portion provided with a plurality of cavities, a plurality of resilient pin clips adapted to securely receive the pins of a tube, said clips having a constricted central portion, and a pin-gripping top portion, said cavities having an upper cup portion dimensioned so as to loosely contain the cylindrical portions and a narrow lower portion dimensioned to loosely contain the constricted portion of said clip whereby a tube operably positioned in said socket may rock, a raised portion in the center of said base portion to provide a fulcrum about which said tube may rock; and means for limiting the extent to which a tube may be rocked while positioned in said socket, said last-named means comprising

a tubular member fixed with and extending upward from said base and having an inner diameter larger than the upper diameter of the tube surrounded by the tubular member, the difference in said diameters permitting a predetermined safe limit of movement of a tube while operably positioned in said socket.

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JOHN R. LIVINGOOD.

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