

UNITED STATES PATENT OFFICE

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SOCKET FOR RADIO TUBES

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8 Claims. (Cl. 173—328)

The present invention relates to sockets for radio tubes of the type having radial connector prongs wherein rotary movement of the tube is required to establish engagement between the connector clips of the socket and the prongs of the tube.

In tubes of the type referred to the various connector prongs are frequently not at the same level, some being higher or lower axially of the tube than others, nor do they always extend in a plane perpendicularly to the tube axis, some being tilted upwardly and others being tilted downwardly. Also the angular position of the prongs is subject to considerable variations. In spite of these irregularities, however, it is essential that all the prongs of a tube be brought into such engagement with the connector clips of the socket into which the tube is inserted as will provide substantially identical electrical conditions between every one of the tube prongs and the circuit elements with which the tube may be connected, or ground. This is particularly important for tubes which are intended for operation at ultra short waves where even slight differences in the current path between the tube prongs and the connected circuit elements or ground may introduce such varying degrees of inductances or capacitances into the tube circuits as will seriously disturb the performance of the apparatus of which the tube forms a part.

It is an object of the present invention to provide a socket for radio tubes of the type referred to, particularly for tubes intended for ultra short wave operation, where axial or angular disalignment of the tube prongs is automatically and reliably compensated for. It is another object of the present invention to provide a connector clip for such tube sockets wherein the current path between the points of contact of tube prong and clip and connected circuit element or ground will be the same for all prongs in spite of possible axial and/or angular misalignment of any one or all of these prongs. It is another object of the present invention to provide a connector clip of the type referred to wherein the current path between connector prong and connected circuit element or ground will be direct and of the shortest order and will be free from any ambiguity such as may introduce varying amounts of inductance or capacitance into the individual circuits of the tube.

In tubes of the type referred to the connector prongs are frequently covered with poorly conductive layers of metal oxides which are formed during the evacuation process of the tube and

which frequently prevent or seriously impair the operation of the tubes so that they may have to be removed from the sockets in order to scrape the prongs.

It is a further object of the present invention to provide a clip construction for tubes of the type in question where electrically conductive contact between tube prong and clip is automatically and reliably established in inserting the tube into the socket whether the conductor prongs are covered by non-conductive layers or not.

In tubes of the type under discussion, and particularly those intended for ultra short wave operation, it is likewise important that a tube once inserted into the socket remains firmly in its position, that is to say, that it does not get loose and change its position due to vibration or shocks to which it may be subjected during practical use.

It is an additional object of the present invention to provide a connector clip for radio tubes by which the tube is securely held in the position in which it is originally inserted and is not subject to loosening and consequent change of position by vibration or other mechanical disturbances of use.

A preferred embodiment of the present invention will now be described by way of example with the aid of the accompanying drawing, wherein

Fig. 1 is a plan view of a socket in accordance with the invention shown on an enlarged scale;

Fig. 2 is a vertical section of the socket in mounted condition and taken along lines 2—2 of Fig. 1 with a radio tube of the acorn type placed in an operative position thereon;

Fig. 3 is a perspective view, on a still further enlarged scale, of one of the connector clips with which the socket of the present invention is provided;

Fig. 4 is a side elevation, on an enlarged scale of a connector clip in mounted condition, a part of the socket being shown in section;

Fig. 5 is a front elevation of the same connector clip viewed from the center of the socket;

Fig. 6 is the same front elevation of the connector clip as illustrated in Fig. 5 showing a tube prong in engagement with the clip.

Referring to Fig. 1, the socket of the present invention includes a base plate 11 made of any suitable insulating material, preferably of the ceramic type, such as the material known under the trade name "Ceramic Alsimag 196." Other materials such as "Bakelite," "Mycalox" or "Poly-

stearin Resin," etc., may of course be used, depending on the particular purpose for which the socket may be used. In the embodiment illustrated the base plate is rectangular in shape but it may also be round or polygonal. Base plate 11 has a central opening 12 preferably of circular shape so as to receive tube 13 (Fig. 2) which is shown to be of the acorn type and is provided with a plurality of radially extending connector prongs 25.

Base plate 11 has five depressions 14 receding from, and distributed along the periphery of central opening 12. Within each of these depressions there is mounted a connector clip 15 made of spring sheet metal, for example phosphor bronze. Each connector clip has a flat horizontal base portion 16 (Fig. 3) which is secured to base plate 11 by means of a screw 17 (Figs. 1 and 2) protruding through a central hole 17a (Fig. 3) in base portion 16 and a corresponding hole in the base plate 11.

In the direction facing tube 13 base portion 16 of the clip is provided with a resilient lip 18 extending upwardly at an oblique angle of preferably 45°. In the particular embodiment shown base portion 16 and lip 18 are made of an integral piece of sheet metal, holes 19a and 19b being provided to render their bend line more flexible. Due to the oblique angle at which lip 18 extends upwardly, edge 20a of its upper end is placed somewhat higher than edge 20b thus acting like a vertically directed cutting knife (Figs. 2 and 4).

Base portion 16 is also provided with a lateral extension 21 protruding upwardly therefrom and arranged to support a vertical lip 22 of sheet metal placed a distance above edge 20a and extending substantially parallel with said edge 20a. The bend line between base portion 16 and lateral extension 21 is such that extension 21 may yield laterally. My clip construction should preferably be such that both lips have approximately the same degree of resiliency vertically. Due to the fact that lower end 23 of upper lip 22 is a longer distance away from its axis of rotation than the distance by which edge 20a is removed from the axis of rotation of lower lip 18, upper lip 22 would yield somewhat more readily than the lower lip due to increased leverage. To compensate for this inequality I provide perforations 19a and 19b in the bend line of base portion 16 and lower lip 18 as heretofore described.

The depressions 14 in base plate 11 within which the connector clips are mounted are of such depth that lips 18 will protrude slightly above the upper surface of the plate. The bottom area of the depressions is just sufficient to accommodate the connector clip but its wall 24 has a slight taper widening towards the top so as to leave space for a limited lateral movement of extension 21 of the connector clip (Figs. 5 and 6).

As may be seen from Fig. 2, central opening 12 of base plate 11 is of such size and connector clips 15 are so positioned relative to the tube that lips 18 and 22 of the connector clips will engage the connector prongs of the tube as closely as possible to the points where the prongs 25 protrude from the glass of the tube. This shortens the current path from the inner electrodes of the tube to the connected circuit elements or ground and thus reduces the danger of introducing unwanted inductance or distributed capacitance into the tube circuits.

The horizontal length of the two opposing lips

18 and 22 should be sufficient to accommodate a tube prong and make ample allowance for any angular misalignment of same, and the distance between the lower end 23 of lip 22 and the upper edge 20a of lip 18 should, in the inoperative position, be appreciably smaller than the diameter of the tube prong which clip is to engage. The entering edges of one or both of the lips should be rounded off, as shown in the drawing, in order to facilitate entrance of the prong.

When a tube is to be mounted on the socket construction described above it is inserted into the central opening 12 so that its prongs rest on base 11, each prong placed opposite the open end of its proper connector clip. By a lateral twist of the tube each prong is then pushed into its clip forcing lower lip 18 to yield downwardly around an axis perpendicularly to the direction of the tube prong and forcing upper lip 22 to yield upwardly around an axis parallel to the prong (Figs. 2 and 6). If a prong is of the proper level axially of the tube, the two lips will yield to approximately the same extent, but if a tube prong is axially displaced compared with other prongs of the same tube, one of the lips will yield to a greater extent than the other depending on direction and degree of the axial displacement of the particular prong. Due to the position of lower lip 18 with its edge 20a so disposed as to have its sharpness directed substantially normal to the prong, edge 20a will cut into, rather than yield too readily to the tube prong. Hence it will penetrate any layers of poorly conductive material that may cover the surface of the prong and thus reliably establish conductive contact between tube prong and clip. Thus it is unnecessary to provide lower lip 18 with a special cutting blade. The lower end 23 of upper lip 22 on the other hand faces the tube prong with the full thickness of the material from which it is made so that any cutting action is considerably reduced.

If in inserting the tube into the socket, there is a tendency to turn the tube too far, one or more of the tube prongs will ultimately strike lateral extension 21 of the connector clip and thus be stopped from any further angular movement so that there is no danger of any one of the tube prongs being accidentally pushed through and out of contact with the connector clip.

As shown in Fig. 2 the socket arrangement of the present invention is such that screws 17 directly connect their clips with ground as represented by metal frame 26 or condenser 27 respectively, formed by condenser plate 27a and frame 26 with mica plate 27b interposed. In order to establish contact with the desired electrode of the condenser the opening 28 of metal frame 26 through which screw 17 protrudes should be sufficiently wide to exclude accidental contact between screw 17 and metal frame 26. Hence, the use of lead wires such as have heretofore been used for the connection of tubes with circuit elements or ground, and as invariably introduced such amounts of undesired inductances or stray capacitances as are definitely harmful in ultra short wave operation, have been completely superseded.

Thus, the construction of my clip and socket arrangement is such that I reliably secure conductive contact between tube prong and one predetermined place of the connector clip, namely the upper edge 20a of lower lip 18, no matter what the axial or angular disalignment of a

particular tube prong may be and no matter whether the tube prong may be covered with nonconductive material or not. Furthermore, my construction is such that the current path from this place of contact to screw 17 which establishes contact with other circuit elements or ground is of the shortest feasible length and is free from any sharp bends or turns so that there is no danger of varying and excessive amounts of inductances and capacitances to be introduced into the tube circuits; and what small amount of stray capacitances or stray inductances may be introduced into the particular tube circuits will always be substantially the same for all connector clips and all tube prongs whether of the same tube or of replacement tubes. Moreover, due to the fact that the space between the two lips of my connector clip is smaller than the diameter of the tube prongs so that force is required to push the prongs into their places, and due to the biting action of upper edge 20a of the lower lip 18 on the connector prong, the tube once placed into its proper position is held firmly in its place and will not be loosened or dislodged therefrom by vibration or shocks such as may occur during practical use.

While I have described and illustrated my invention with the aid of a particular embodiment thereof and applied to a particular type of tube, I do not limit myself thereto. My invention may be used in equivalent structures without departing from the scope of the appended claims.

Having described my invention what I claim is:

1. A connector clip for sockets for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which connector clip includes in combination a base portion for attachment to a socket, a lip extending upwardly from said base portion at an oblique angle and culminating in an edge, and a prong retaining element disposed above said edge, said lip and said retaining element being arranged to yield downwardly and upwardly respectively around axes substantially at right angles to one another.

2. A connector clip for sockets for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which connector clip includes in combination a base portion for attachment to a socket, a lower lip extending upwardly from said base portion at an oblique angle and culminating in an edge, an upper lip supported from said base portion and disposed above said edge, said lower lip being arranged to yield downwardly around an axis substantially parallel to its edge and said upper lip being arranged to yield upwardly around an axis substantially at right angles to said edge.

3. A connector clip for sockets for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which connector clip includes in combination a base portion for attachment to a socket, a lower lip extending upwardly therefrom at an oblique angle and culminating in an edge, a laterally situated extension of said base portion rising upwardly therefrom, and an upper lip supported by said extension above the edge of said lower lip, said lower lip being arranged to yield downwardly around an axis substantially parallel to its edge and said upper lip

being arranged to yield upwardly around an axis substantially at right angles to said edge.

4. A connector clip for sockets for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which connector clip includes in combination a base portion for attachment to a socket, a lower lip extending upwardly therefrom at an oblique angle and culminating in a straight edge, a laterally situated extension of said base portion rising upwardly therefrom, and an upper lip supported by said extension parallel to and above the edge of said lower lip, said lower lip being arranged to yield downwardly around an axis substantially parallel to its edge and said upper lip being arranged to yield upwardly around an axis substantially at right angles to said edge with substantially equal degrees of resiliency vertically.

5. A socket for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which socket includes in combination a mounting plate having a central opening to accommodate a tube and a plurality of connector clips arranged circumferentially of said central opening, each of said clips including a horizontal base portion for attachment to said mounting plate, a lip resiliently connected to and extending upwardly from said base portion at an oblique angle, said lip culminating in an edge extending substantially tangentially to said opening for engaging a tube prong by rotary movement of said tube, and a prong-retaining element disposed a distance above said edge.

6. A socket for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which socket includes in combination a mounting plate having a central opening to accommodate a tube and a plurality of connector clips arranged circumferentially of said central opening, each of said clips including a horizontal base portion for attachment to said mounting plate, a lower lip resiliently connected to and extending upwardly from said base portion at an oblique angle, said lower lip culminating in a straight edge extending substantially tangentially to said central opening for engaging a tube prong by rotary movement of said tube, a laterally situated extension of said base portion rising upwardly therefrom, and an upper lip resiliently supported by said extension parallel to and a distance above the edge of said lower lip.

7. A socket for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which socket includes in combination a mounting plate having a central opening to accommodate a tube and a plurality of connector clip constructions arranged circumferentially of said central opening, each of said clips including a horizontal base portion for attachment to said mounting plate, a lower lip extending upwardly from said base portion at an oblique angle and culminating in a straight edge extending substantially tangentially to said central opening for engaging a tube prong by rotary movement of said tube, a laterally situated extension of said base portion rising upwardly therefrom, and an upper lip supported by said extension parallel to

and a distance above the edge of said lower lip, said lower lip being arranged to yield downwardly around an axle substantially parallel to said edge and said upper lip being arranged to yield upwardly around an axis substantially radially of said opening.

8. A socket for radio tubes of the type in which radial connector prongs of a radio tube are engaged with the connector clips of the socket by rotational movement of the tube relatively to the socket, which socket includes in combination a mounting plate having a central opening to accommodate a tube, and a number of tapered depressions circumferentially of said central opening, a connector clip disposed in and fitting each of said depressions, each of said connector clips including a base portion for attachment to said

5 mounting plate, a lip extending upwardly at an oblique angle and culminating in a straight edge disposed slightly above the upper surface of said mounting plate and extending substantially tangentially to said central opening for engaging a tube prong by rotational movement of the tube, a laterally situated extension of said base portion rising upwardly therefrom, an upper lip supported by said extension parallel to and above the edge of said lower lip, said lower lip being arranged to yield downwardly around an axis substantially parallel to said edge and said upper lip being arranged to yield upwardly around an axis substantially radially of said opening with substantially equal degrees of resiliency.

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CERTIFICATE OF CORRECTION.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 7, after "which" insert --the--; line 49, for "accidentally" read --accidentally--; page 4, first column, line 3, claim 7, for "axle" read --axis--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of September, A. D. 1942.

((Seal) .

Henry Van Arsdale,
Acting Commissioner of Patents.