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D. R. DE TAR

2,026,420

VACUUM TUBE SOCKET

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Fig. 1.

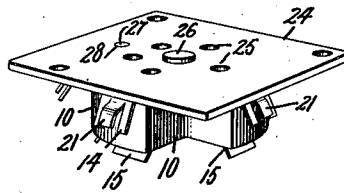


Fig. 2.

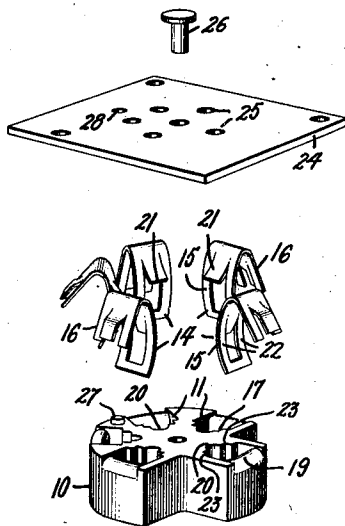


Fig. 3.

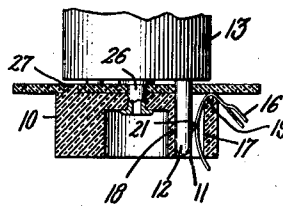
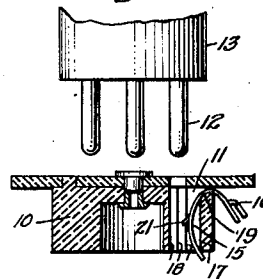


Fig. 4.



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UNITED STATES PATENT OFFICE

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VACUUM TUBE SOCKET

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4 Claims. (Cl. 173—328)

My invention relates to a socket for vacuum tubes or the like apparatus of the type in which a plurality of contact pins or terminals are arranged to engage contact members detachably, and has for its principal object the provision of an improved device of this character which is simple in construction and efficient under all conditions of operation.

In the operation of radio receiving apparatus, for example, radio broadcast receivers, it is necessary that the vacuum tubes be readily removable for inspection or renewal. In providing a tube socket for such purposes, however, difficulties have been encountered heretofore such as shifting of the tube from its proper position in the socket; damaging of contact elements by insertion of the tube in the socket at an angle; short circuits due to contact of the tube terminals or prongs with live parts of the socket when inserting the tube therein; loosening or creeping of the tube in the socket or loss of contact between prongs and contacts due to vibration; poor contact or loss of contact due to weakening of the contact springs or to foreign matter on the prongs or the contact elements. In many cases, further, difficulties in manufacture of the socket have been encountered due to complexity of design, the requirement of a multiplicity of riveting or other fastening operations, or the necessity of precise and extremely accurate forming of contact members or other parts to insure adequate and permanent electrical contact of these members with the tube prongs.

In accordance with my invention these difficulties and others of like nature are avoided by the provision of an improved socket for vacuum tubes or the like comprising contact members held relatively loosely, in position to engage the tube terminals, between a contact supporting and insulating member or molded block having openings to receive the electrodes, and a second insulating member having the form of a plate perforated for the passage of the terminals there-through, the contact members having resilient portions disposed within these openings of the supporting member and portions which extend across relatively thin outer walls of the openings between an end of these walls and the plate of insulating material. These latter portions of the contact members each include a hook-like portion or bend resting on and partially enclosing the above-mentioned end of the thin walls to assist in maintaining the contact members in position in the block before the insertion of the terminals and to prevent the contact portions from being pressed through the openings of the block when the terminals are inserted therein. These bends or hook-like portions are extended outside the boundary of the block to form terminal or circuit connection members disposed radially of the socket.

The contact supporting member and the contact members are so arranged that the tube is held rigidly in position in the socket and the contact members cannot be damaged by inserting the tube at an angle.

No live parts are exposed on that side of the socket from which the tube projects and danger of short circuit resulting from contact of the tube prongs with such parts when inserting the tube in the socket is thereby obviated.

The contact members are so shaped that vibration of the socket and tube tends to cause the tube terminals or prongs to creep back more tightly into the socket, thereby making possible the mounting of the tube in a horizontal or other desired position other than the usual vertical position, or even hanging downwardly from the socket.

In the assembly of the socket the parts are held together by a single rivet or other suitable fastening means connecting the insulating plate to the contact supporting member, thereby retaining the contact members in operating position without further fastening means therefor.

The proper functioning of the socket does not depend upon exact forming of the contact members or other parts. Therefore, the considerable variation in shape of the contact members which must be tolerated, due to unavoidable variations in the temper of the bronze from which these contact members are formed, is permissible without danger of detrimental effects in the operation of the device.

The action of the contact members or springs on the tube terminals or prongs is such as to remove foreign material from the surfaces of these members which are in electrical contact when the tube is in position in the socket.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a perspective view of a tube socket constructed in accordance with my invention, Fig. 2 is an exploded view of the socket illustrated in Fig. 1, Fig. 3 is a sectional view of the socket illustrated in Figs. 1 and 2 and showing a portion of a vacuum tube in operating position in the socket, and Fig. 4 is a view similar to Fig. 3 but showing the socket before insertion of the tube terminals therein.

In the embodiment of the invention illustrated in the drawing, a supporting member 10, preferably entirely of insulating material in molded form, is provided with openings 11 arranged in any suitable manner about the center of the member and adapted to receive the terminals, or contact pins or prongs 12, of a vacuum tube or like device the base 13 only of which is indicated in

the drawing. To provide detachable electrical connection between the tube terminals 12 and the various circuits in which the tube may be incorporated, substantially U-shaped contact members 14, preferably of strip bronze, are provided each having a bowed leg portion 15 disposed within one of the openings 11 and adapted to make resilient contact with one of the tube terminals 12, and a terminal portion 16 extending without the contact supporting member 10 for the attachment of suitable circuit leads. To form the openings 11 the contact supporting member 10 is provided with relatively thin outer walls 17 and inner walls 18 between which are disposed resilient bowed contact portions 15 of contact members 14. To assist in retaining the contact members 14 in proper position with respect to the supporting member or block 10 before the insertion of the terminals 12 and to prevent the contact portions 15 from being forced out of the openings 11 by the terminals 12 as the latter are inserted in the block, the portions 16 of these contact members extend across the upper ends 19 of the outer walls 17 and project outwardly of the member 10, these upper ends 19 being preferably rounded and the portions 16 of the contact members having bends or hook-like portions formed therein partially enclosing the ends of the thin walls 17 and preferably being correspondingly shaped to seat firmly upon the rounded portions of the walls.

In order to facilitate the operation of inserting the tube terminals or prongs 12 in the socket and to assist in maintaining the tube in proper position after the insertion of the terminals, the inner walls 18 of the openings 11 are each provided with a guiding surface 20 disposed centrally of the wall 18. This surface 20 is preferably semicylindrical in transverse section to conform to the surface of the tube terminal and extends a substantial distance parallel thereto. To insure sufficiently firm and at the same time sufficiently flexible electrical contact between terminals 12 and inner portions 15 of contact members or strips 14 and to assist in retaining the terminals in position in the socket, contact plates or tongues 21 are provided, preferably formed integrally with portions 15, the free ends of these contact plates or tongues being arranged to extend in the same direction as the free ends of the terminals 12 when the tube is in operative position in the socket. The contact plates 21 are so disposed and supported within the openings 11 that upon insertion of the terminals 12 the free ends of the plates 21 are pressed toward the walls 17 on an arc of a circle having the end 19 of the walls, i. e., the end thereof adjacent the base end of the terminals, substantially as a center. Upon vibration of the socket tending to cause relative motion between a terminal and the free end of a contact plate 21, the terminal tends to move or creep only in the direction of its free end, or inwardly of the socket. This occurs by reason of the above-described mounting of the contact plate whereby its free end tends to swing in an arc having a point near the base end of the terminal as its center. Upon vibration of the terminal and of the contact plate, the terminal may slide relatively freely in the direction away from the center of oscillation of the free end of the contact plate, whereas a wedging action of the contact line or edge of the plate against the surface of the terminal resists tendency of the terminal to move in a direction toward this center of oscillation of the free end of the contact plate.

Therefore with the contact plates 21 disposed as described herein with reference to their corresponding terminals 12, vibration of the socket tends to seat the terminals more firmly therein. The contact plates 21 may be formed from part of a strip punched out centrally of the portions 15 of the contact members 14, in such a manner that relatively narrow strips 22 are left at the sides of portions 15, these strips 22 being so bent that when the contact members 14 are in position in the socket ready to receive the prongs 12, the portions 15 are in contact at their extremities with the outer walls 17 and closely adjacent to or in contact with the inner walls 18 at a point intermediate their ends. Suitable clearance for the contact plates 21 within the openings 11 may be provided by recesses 23 formed adjacent the semicylindrical surfaces 20 in the inner walls 18.

To retain the contact members or strips 14 in position in the socket and to prevent the occurrence of short circuits when inserting the tube in the socket a second insulating member 24 of insulating material, preferably a plate, is provided having holes 25 for the passage of the terminals 12 therethrough, this plate extending a substantial distance beyond the periphery of the contact supporting member or block 10. The plate 24 may be fastened to the block 10 by a single rivet 26 disposed centrally thereof and the members 24 and 10 may be assembled in proper radial position and prevented from turning with respect to each other by a lug 27 molded on block 10 and seating in a hole 28 formed in plate 24. When the perforated plate 24 is fastened to the contact supporting member 10, the upper ends of the openings 11 in this member 10 are closed by the plate and the contact portions 15 of contact members 14 are held in operative position in the socket and adjacent the walls of openings 11 ready for the contact plates 21 to be engaged by the tube terminals 12, the members 14 being disposed between the plate 24 and the upper ends 19 of the outer walls 17 at a point on these members 14 intermediate the free ends thereof. As the prongs 12 are forced into position against the contact plates 21 and tend to drive these plates downwardly, the contact members 14 are retained in position within the block 10 by the upper ends 19 of the walls 17, over which the portions 16 of the contact members pass.

In the assembly of the socket hereinbefore described, it will be observed that the contact members 14 are aligned in the socket between the walls 17 and 18 of the supporting member 10 and are retained securely in the socket by the insulating plate 24, no rivet or other fastening means being required to hold the contact strips in position other than the means for connecting the plate 24 to the member 10, which may be merely the single rivet 26. When the socket is in position in the radio receiver ready for the insertion of the tube it is impossible to manipulate the tube in such a manner as to cause a short circuit due to the prongs 12 touching live parts 14 of the socket, since these live parts are effectually separated from the tube side of the socket by the plate 24.

In inserting the tube in the socket the prongs 12 are guided into position between the semicylindrical portions 20 of inner walls 18 and the resilient plates 21 connected to the portions 15 of the contact strips 14, and these portions 15 are pressed closely against the outer walls 17 of block 10 as the plates 21 are forced outwardly 75

toward these outer walls with a wiping contact by the prongs, the disposition of the socket parts thus being such that no damage can result to the contact strips 14 if the attempt is made to insert the prongs at an angle to the center line of the openings 11.

After the tube is inserted in the socket and is in operating position it is retained rigidly in this position since the prongs 12 are properly aligned by the guiding surfaces 20 of the inner walls 18 and maintained in the aligned position by the pressure of the contact plates 21 exerted inwardly of the outer walls 17. The clamping and virtual ratchet action of the inwardly directed contact tongues or plates 21 facilitates the insertion of the prongs and retards the withdrawal thereof and tends, further, to cause the prongs 12 to creep more tightly into the socket under the influence of vibration.

It will be noted further that a considerable latitude in the shape of the contact members 14 in the manufacture of a socket in accordance with my invention is possible, since the side strips 22 of contact portions 15 and the contact plates 21 are preferably bent initially before insertion of contact members 14 in block 10 considerably more than is necessary to insure adequate electrical contact of plates 21 with the prongs 12, thus providing a large reserve of resiliency in these contact elements.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a socket for a vacuum tube or the like having a terminal prong, a contact supporting member having an opening relatively long axially of said member, a cover plate apertured for the passage of said prong into said opening, and a contact strip of thin, flexible and resilient conductive material, said strip having a bowed portion extending within said opening, one of the walls of said opening having a surface adapted to guide said prong into contact with said bowed strip portion, said bowed portion being maintained loosely laterally of said opening in position to make resilient contact with said prong, said bowed portion being between said wall and the wall opposite thereto of said opening, said strip having a hook portion bending over and extending across that end of said second-named wall which is adjacent said cover plate, said hook portion being maintained loosely in position between said second-named wall and said cover plate before said prong is inserted in said socket.

2. In a socket for a vacuum tube or the like having a base and a terminal projecting from said base, a contact supporting member having an opening therein to receive the terminal, said member having a wall extending along a side of said opening a substantial distance parallel to said terminal, and a contact member having a portion extending across an end of said wall adjacent the base end of said terminal to assist in holding the contact member loosely within the socket before the terminal is pressed thereinto and to prevent said contact member being pushed through the socket when the terminal is pressed into position therein, said contact member having a contact plate resiliently supported within said opening and extending substantially in the direction of the free end of said terminal, said

contact plate having a free end abutting said terminal, said contact plate being so supported within said opening that upon insertion of the terminal in the socket said free end is pressed toward said wall on an arc of a circle having said end of the wall substantially as a center, whereby upon vibration of said terminal and socket tending to cause slight relative motion therebetween a virtual ratchet action is produced between the contact plate and the terminal tending to retain the terminal in the socket.

3. In a socket for a vacuum tube or the like having a base and a terminal projecting from said base, a contact supporting member having an opening therein to receive the terminal, said member having a wall extending along a side of said opening a substantial distance parallel to said terminal, and a contact member having a portion extending across an end of said wall adjacent the base end of said terminal to assist in holding the contact member loosely within the socket before the terminal is pressed thereinto and to prevent said contact member being pushed through the socket when the terminal is pressed into position therein, said contact member having a resilient portion adapted to be pressed into close contact at points adjacent its ends with said wall, said resilient portion having a resilient contact plate intermediate the ends thereof and extending diagonally outwardly from said resilient portion and substantially in the direction of the free end of said terminal, said resilient contact plate having a free end abutting said terminal, said free end upon insertion of the terminal in the socket being pressed toward said wall on an arc of a circle having said end of the wall substantially as a center, whereby upon vibration of said terminal and socket tending to cause slight relative motion therebetween a virtual ratchet action is produced between the resilient contact plate and the terminal tending to retain the terminal in the socket.

4. In a socket for a vacuum tube or the like having a base and a plurality of terminals projecting therefrom, a contact supporting member of insulating material having a plurality of inner wall portions and outer wall portions defining openings in said supporting member to receive the terminals, each of said inner walls having a terminal guiding surface, a plurality of contact members each having a resilient portion extending within one of said openings, each of said contact member portions including a resilient contact plate extending in the direction of the free end of the corresponding terminal and having a free end abutting said corresponding terminal and pressed thereby toward the corresponding outer wall portion on an arc of a circle having the end of said outer wall portion adjacent the base end of said corresponding terminal as a center, each of said contact members having a hook-like portion extending outwardly of said socket over that end of the corresponding outer wall portion adjacent the base end of the corresponding terminal, and an insulating plate having openings therethrough for the passage of the terminals and connected to said contact supporting member to retain said contact members in position loosely within said socket.

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