May 6, 1941. W. W. MATHERN 2,240,658

TUBE SOCKET

Filed March 31, 1938

FIG. 1.

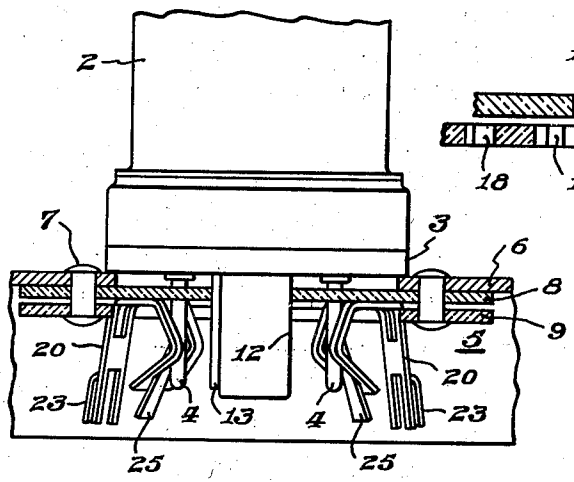


FIG. 3.

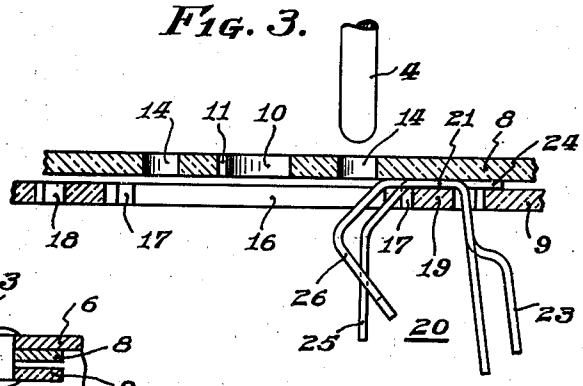


FIG. 4.

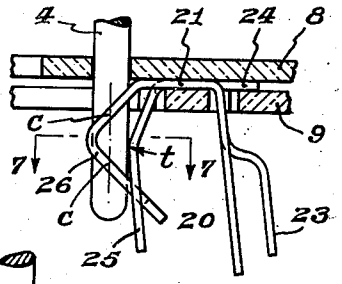


FIG. 2.

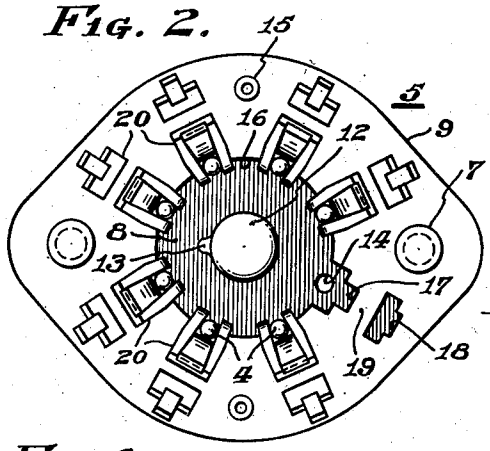


FIG. 8.

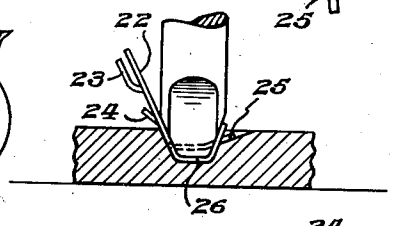


FIG. 6a.

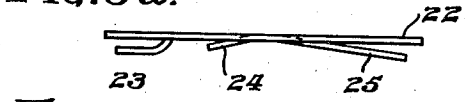


FIG. 6b.

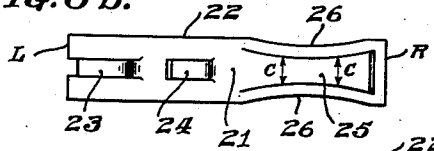


FIG. 7.

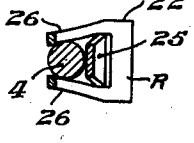
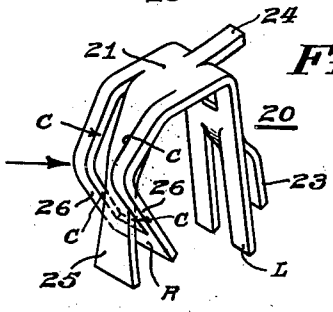


FIG. 5.



Inventor

William W. Mathern

By

Attorney

Patented May 6, 1941 2,240,658

UNITED STATES PATENT OFFICE

2,240,658

TUBE SOCKET

William W. Mathern, Maple Shade, N. J., assignor to Radio Corporation of America, a corporation of Delaware

Application March 31, 1938, Serial No. 199,155

3 Claims. (Cl. 173—328)

My invention relates to electric plug and socket connections, and more particularly to sockets for electron discharge devices of the type having terminal pins or prongs extending from the base thereof.

Since the introduction of metal thermionic tubes, a much smaller tube has been available. Moreover, while the dimensions of a metal tube are much smaller than its predecessor, the glass tube, the number of elements within the tube have, in many instances, been increased and, likewise, the number of terminal pins or prongs extending from the base thereof. Thus, a reduction in the diameter and/or length of the terminal pins or prongs was necessary in view of a much smaller tube base and a greater number of pins or prongs extending therefrom.

For the above reasons, analogous tube sockets of the prior art were not altogether satisfactory for use with tubes of the metal type by reason of the fact that such tubes had, among other things, a tendency to work out of the socket. This has been true, especially in applications where the tube is subject to considerable vibration or where the tube is supported in a horizontal or inverted position.

It is, accordingly, an object of my invention to provide a tube socket of the character specified, which will securely retain the terminal prongs of a vacuum tube or the like in operative position.

A further object of my invention is to provide a tube socket, as specified, wherein each contact member comprises a unitary resilient member.

A still further object of my invention is to provide a tube socket, as specified, which may be produced and assembled at low cost.

A further object of my invention is to provide a tube socket, as specified, wherein the contact members are adapted to establish a five point contact on and about the periphery of the terminal prongs extending from the base of a thermionic tube or the like.

A still further object of my invention is to provide a tube socket, as specified, wherein the contact or prong engaging members are not permanently distended or deformed by reason of frequent insertion and withdrawal of a thermionic tube or the like.

A further object of my invention is to provide a tube socket of the character specified, wherein the contact members are adapted to cooperate with the small prongs of a metal thermionic tube in such a manner that the prongs of the tube are not flexed or sprung out of their normal spacing or alignment.

A still further object of my invention is to provide a tube socket, as specified, wherein the contact or prong engaging members are substantially free to shift relatively to a supporting surface therefor whereby perfect alignment with the prongs of a tube is possible, irrespective of any variation in the spacing of the prongs, upon insertion thereof into the socket.

A further object of my invention is to provide a tube socket, as specified, wherein the contact or prong engaging members are adapted to establish a five point contact, said points of contact being circumferentially and longitudinally spaced on the periphery of each thermal prong.

With the above and other objects in view, my invention resides in a prong contact member which consists of an inverted, rectangular, unitary, substantially U-shaped member of resilient material having good conductivity and wherein one leg of the U-shaped member is so formed and arranged that a plurality of substantially radially disposed edges and/or surfaces exert pressure on and about the periphery of the terminal prong whereby the prong is clutched much after the manner in which a small twist drill is held in a drill chuck.

Other objectes, features and advantages of my invention will appear from the following description taken in connection with the accompanying drawing, in which

Figure 1 is a sectional view of a tube socket embodying my invention shown secured to a fragmentary portion of a support therefor and with only two prongs of a vacuum tube in engagement with a like number of contact members for the purpose of clearly illustrating my invention;

Figure 2 is a full bottom plan view of a tube socket embodying my invention minus one contact member for illustration purposes;

Figure 3 is a fragmentary sectional view illustrating a contact member before a terminal prong is associated therewith;

Figure 4 is a similar view illustrating a terminal prong in engagement with a contact member constructed in accordance with my invention;

Figure 5 is a perspective view of a contact member per se;

Figure 6*a* is an edge view of a pierced blank prior to final formation;

Figure 6*b* is a plan view of the same;

Figure 7 is a sectional view taken on the line 7—7 of Fig. 4; and

Figure 8 is an elevational view illustrating the

blank, shown in Fig. 6, after the first bending operation.

Referring to Fig. 1, a metal type thermionic tube 2 comprising a base 3 having terminal pins or prongs 4 extending therefrom is shown inserted in a tube socket 5, embodying my invention and attached to the underside of a suitable support 6, as by means of rivets 7 or the like.

The tube socket 5 comprises an upper and lower plate 8 and 9, respectively, formed of fiber or other suitable or preferred insulation material. The upper plate 8 is provided with a central aperture 10 having a key slot 11 formed in the edge defining said aperture whereby a centering stem 12, extending centrally from the tube base 3 and provided with a longitudinal guide key 13, is adapted for passage therethrough for a purpose well known to those skilled in the art. Similarly, a plurality of relatively small circumferentially spaced apertures 14 adapted to register with and to provide passages for the tube prongs 4 are also formed in the plate 8 concentrically with the central aperture 10 and radially disposed with respect thereto.

The lower plate 9, secured to the plate 8 in concentric relation therewith by means of rivets 15 or the like, is provided with a large central opening 16 having its defining edge provided with a plurality of spaced, substantially rectangular notches or slots 17 so positioned as to be in vertical alignment with the prong apertures 14 in the plate 8. A like number of spaced, substantially rectangular apertures 18 are further provided in the plate 9 in radial alignment with the slots or notches 17 but spaced therefrom on a greater radius whereby to provide intervening supporting surfaces 19 therebetween. The slots 17 and the apertures 18 constitute two separate sets of openings, one of each set being provided for the reception of one of the two substantially parallel legs or arms of each of a plurality of inverted, substantially U-shaped contact members 20 with the transverse or base portion 21 of each member supported by one of the intervening surfaces 19, as clearly shown in Figs. 3 and 4.

It will be apparent from an inspection of Figs. 3 and 4 that the contact members 20 are not secured to one or the other of the plates 8 and 9 constituting the base, said members 20 being sandwiched between the joined base plates and so retained as to be substantially free for limited movement within their respective slots relatively to the prong openings 14 formed in the upper base plate 8.

The structure and the method of forming one of the U-shaped contact members 20 will now be described in connection with a terminal prong 4 of a thermionic device 2 shown in Fig. 1.

In carrying out my invention, a suitable blank 22 of spring brass, for example, is pierced along linear and arcuate paths extending longitudinally of the blank, as indicated at 23, 24 and 25 in Figs. 6*a* and 6*b* in suitable dies provided for this purpose. Simultaneously with the piercing of the metal blank 22, the marginal edge portions 26 of the blank 22, opposite each side of the element 25, are cut along arcuate paths extending short of the right hand free end of the blank, as viewed in Fig. 6*b*. During this piercing and cutting operation, the elements 23, 24 and 25 are biased out of the plane of the blank 22 substantially as shown in Fig. 6*a*. The element 23 constitutes a wiring terminal tab, the element 24 a stabilizing toe, and the element 25 a contact tongue, all for a purpose hereinafter set forth.

After the blank 22 has been pierced and cut along arcuate and linear paths, respectively, the blank 22 is ready for the first of two bending operations.

Describing now the first bending operation, the right hand end portion R of the blank 22 which is pierced and cut along arcuate paths is placed between suitably formed complementary die elements (Fig. 8) to bend the tongue 25 into its final predetermined position and, at the same time, to bend said tongue slightly at a point midway of its length. Simultaneously therewith, the remaining portions 26 of the blank 22 adjacent to the tongue 25 are bent into a position where they extend across the plane of the tongue 25 to complete the prong engaging leg of the contact member 20, as will be clearly understood from an inspection of Figs. 5 and 8.

In the final bending operation, the opposite end portion L of the blank 22 is placed in another die (not shown) to bend said opposite end portion substantially at right angles to the intermediate blank portion 21, whereby a substantially U-shaped contact member is formed. In this final bending operation, the element 24, which is biased substantially out of the plane of the blank 22, remains in this position whereby it forms an extension of the intermediate or base portion 21 of the U-shaped contact member 20 and serves as a stabilizing toe whereby any tendency of each contact member to rock or tilt on its supporting surface 19 is obviated and the legs thereof are maintained substantially normal to the base plates 8 and 9 when a terminal prong 4 is forced into and out of engagement with each of said contact members 20.

The stabilizing toe, indicated at 24 (Fig. 5), is slightly biased or canted upwardly out of the plane of the intermediate or base portion 21 of the contact member 20 in order to counteract the downward pressure to which the prong engaging leg of each contact member may be subjected by the forced entry of a terminal prong into engagement therewith.

Referring again to Figures 3 and 4, the cooperable action between a terminal prong 4 and a contact member 20 is as follows:

Upon entrance of a terminal prong 4 into one of the prong openings 14, the end of the prong first contacts the upper portion of the tongue 25. Continued downward movement of the prong 4 causes the tongue to be deflected radially outwardly of the prong. While the tongue is being deflected out of its normal position, the prong 4 passes the narrowest point between the bent marginal portions 26. When the prong passes this narrow point, the marginal portions 26 are sprung slightly apart whereby torsional tension is imparted thereto. Moreover, the tongue 25 contacts the inner transverse edge of the end portion R and draws inner prong engaging edges of the bent marginal portions 26 into firm contact with the prong 4 and aids to maintain the trapezoidal formation of the marginal portions 26.

Referring to Figure 7 it will be observed that the marginal portions 26 do not contact the prong 4 at the point indicated by the arrow. This is due to the cylindrical configuration of the prong 4, whereby the points of contact occur at a plurality of diametrically opposite points about its periphery and lengthwise thereof as indicated at *c*. The above noted points of contact total four, the

fifth point occurs at *t* where the intermediate portion of the tongue **25** remains in contact with the prong **4**. It will also be observed that the fifth point of contact *t* occurs on the prong substantially intermediate the spaced, diametrically opposite points of contact *c*.

Referring again to Figure 5, it is to be observed that the outwardly concaved marginal edges of the tongue **25** do not contact the outwardly concaved edges of the marginal portions **26** extending across the plane of the tongue **25**. This is accomplished by piercing the blank along arcuate paths longitudinally thereof and the bending of the marginal portions **26** so as to extend across the plane of the tongue **25**.

It is also to be observed that the smallest distance between the bent marginal portions **26** occurs at the point indicated by the arrow in the above noted figure.

In order to obviate the possibility of electrical leakage between any two contact members **20** in the socket **5**, the outer edge of the marginal portions **26** are also cut along arcuate paths whereby sufficient clearance between the assembled contact members **20**, as viewed in Figure 2, is afforded.

Although I have shown and described certain specific embodiments of my invention, I am fully aware that many modifications thereof are possible. My invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the appended claims.

What I claim is:

1. A contact for receiving a cylindrical prong, said contact comprising a resilient strip having a central tongue, marginal portions extending along the sides of said tongue and a web connecting said marginal portions adjacent the free end of the tongue, said marginal portions being bent intermediate their length to provide angular portions extending across the plane of the tongue and forming with the tongue a prong receiving channel extending lengthwise of the tongue with the web positioned rearwardly of said tongue and providing a stop for said tongue when said prong is inserted in said channel.

2. The invention as set forth in claim 1 and wherein the adjacent edges of said marginal portions diverge in opposite directions from the point at which they are bent.

3. The invention as set forth in claim 1 wherein the tongue portion of said channel is biased in a direction opposite to the direction in which said marginal portions are bent whereby said tongue is maintained in contact with said prong.

WILLIAM W. MATHERN.