

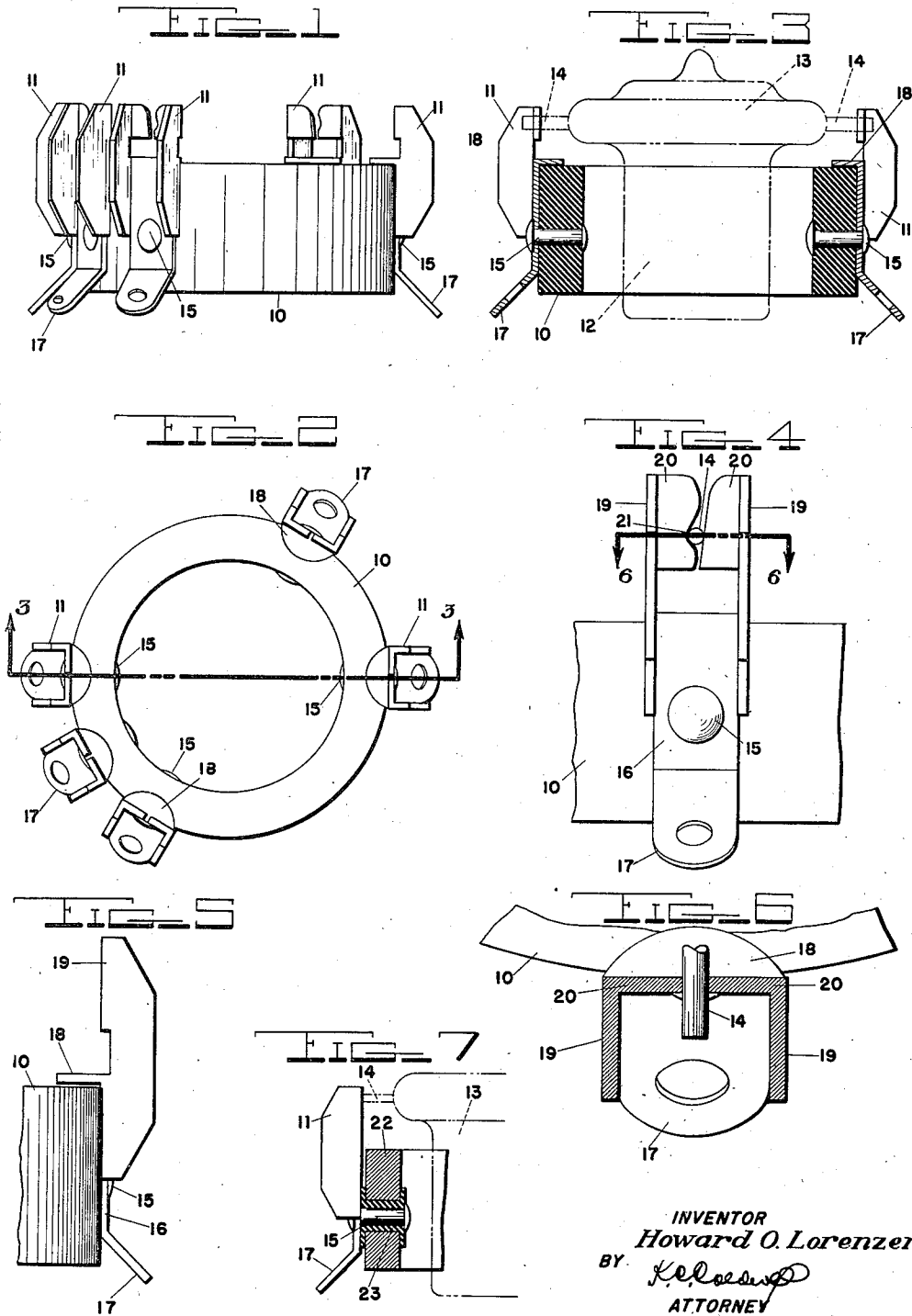
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RADIO TUBE SOCKET

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RADIO TUBE SOCKET

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This invention relates to tube sockets and more particularly to sockets for thermionic tubes of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof.

Sockets that have been provided heretofore for thermionic tubes of the above type comprise a circular disk-like member into which the tube is adapted to extend, having a plurality of tube terminal supporting members mounted on the surface of the disk in a plane parallel to the plane of the tube terminals, for receiving the terminals to support the tube and to maintain electrical contact therebetween. Such prior socket constructions have large overall dimensions in comparison with the size of the tube and therefore become bulky assemblies which is especially disadvantageous when the tube has very small overall dimensions, such as the acorn type. Moreover, the sockets provided heretofore are of such character that the tube terminals must extend beyond the casing of the tube a relatively great distance in order to form a substantially rigid electrical connection between the tube terminals and corresponding supporting members therefor. The long terminals required and long associated connecting leads cause poor electrical efficiency, and, when a socket of the conventional construction is utilized for electrically supporting a thermionic tube of the acorn type additional disadvantages arise. Tubes of the acorn type have extremely small electrodes with minute clearances therebetween and are thus capable to operate on ultra high frequencies. In installations utilizing such tubes it therefore becomes desirable to provide an assembly for the tubes wherein very short connecting leads to the tube electrodes may be employed in order that advantages of minute tube construction will not be negated.

The above mentioned type of thermionic tubes are not uniformly constructed and certain variations or tolerances exist between similar types of this class of tubes. In some instances, all of the tube terminals do not extend radially from the central normal axis of the tube, while variations between the angular displacement of the tube terminals may also exist. Sockets of the prior construction do not provide means for compensating for such variations and thus do not provide sufficient electrical contact between the terminals and corresponding supporting members. For this reason the commercial sockets are inadequate since it is usually required to bend the terminals to conform with the alignment of the tube terminal supported members before a sub-

stantial connection is obtained, this procedure may cause the glass wall of the tube adjacent the terminals to crack and thus destroy the tube. Also, in some instances, when the variations are great, it has been necessary to construct custom sockets for particular tubes before sufficient mechanical and electrical contact between the supporting members and the terminals could be obtained.

It is therefore an object of the present invention to provide a tube socket constructed in a novel manner to overcome the disadvantages enumerated heretofore.

Another object is to provide a socket for tubes of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof that has comparatively small dimensions thus reducing the length of the tube terminals to a minimum.

Another object of the invention is to provide a socket for thermionic tubes of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof having novel means for compensating for certain variations in the position of the tube terminals whereby a rigid connection with a high degree of electrical contact is maintained between the terminal supporting members and the terminals.

Another object is to provide in a socket of the foregoing character novel means for compensating for variations in the radial displacement of the tube terminals.

Another object is to provide in a tube socket of the foregoing type novel means for adjusting the supporting members to compensate for variations in the angular displacement of the terminals.

Still another object of the present invention is to provide a tube socket having a cylindrical member into which the tube is adapted to extend and a plurality of supporting members disposed about the periphery thereof for receiving the terminals of the tube.

Still another object is to provide a tube terminal supporting member of such construction that a positive rigid connection is maintained between the member and the tube terminal with a high degree of electrical contact.

Still another object is to provide a tube terminal supporting member of the above type having a high unit of pressure over minimum area of contact between the terminal and the supporting member.

Still another object is to provide a tube supporting member of the foregoing construction

wherein the supporting members engage the terminals with a scraping or biting action to automatically clean the contacting surfaces whereby a high degree of electrical contact is obtained.

Still another object of the invention is to provide a tube socket and tube terminal supporting members therefor that may be easily manufactured at a relatively low cost.

Other objects and features of the invention will appear more fully from the following detailed description when considered together with the accompanying drawing which discloses several embodiments of the invention. It is to be expressly understood, however, that the drawing is designed for purposes of illustration only and not as a definition of the limits of the invention, reference for the latter purpose being had to the appended claims.

In the drawing, wherein similar reference characters denote similar parts throughout the several views:

Fig. 1 is a diagrammatic showing of a tube socket embodying the principles of the present invention;

Fig. 2 is a plan view of the socket disclosed in Fig. 1;

Fig. 3 is a cross-sectional view through line 3—3 of Fig. 2;

Fig. 4 is a diagrammatic showing of a tube terminal supporting member constructed in accordance with the principles of the present invention;

Fig. 5 is a profile view of the structure disclosed in Fig. 4;

Fig. 6 is a cross-sectional view through line 6—6 of Fig. 4, and

Fig. 7 is a diagrammatic showing of a further embodiment of the invention.

With reference more particularly to Figs. 1, 2 and 3 of the drawing, a socket for thermionic tubes of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof is disclosed therein including a cylindrical member 10 of suitable insulating material which is adapted to be secured to a stationary member not shown. A plurality of tube terminal supporting members 11 are disposed about the outer periphery of member 10, extending outwardly beyond the upper face thereof, and are angularly disposed in substantially the same relation as the angularly positioned tube terminals whereby the supporting members 11 may receive and rigidly contact a corresponding tube terminal. As will appear more fully hereinafter the terminal supporting members 11 are of such construction that the tube is rigidly supported in member 10 and a high degree of electrical contact is maintained between the terminals and the supporting members. As shown in Fig. 3, cylindrical member 10 has such dimensions that body portion 12, of tube 13, may extend therein with limited horizontal movement, and tube terminals 14 terminate beyond outer periphery of the member for purposes that will appear more fully hereinafter.

As heretofore stated, commercial thermionic tubes of the type for which sockets embodying the principles of the present invention are adapted, are constructed in such a manner that inevitable variations and tolerances exist in the positions of the tube terminals. Such variations may be present in the angular position of the terminals or may exist in the radial disposition thereof. As was also mentioned heretofore, serious difficulties had arisen when utilizing the

above type of tubes since the prior tube sockets did not provide means for compensating for such variations. In accordance with the present invention a tube socket of novel construction is provided having means for compensating for angular as well as radial variations in the position of the tube terminals whereby a rigid connection with a high degree of electrical contact may be readily obtained between the terminals and the supporting members therefor without necessitating displacement of the tube terminals.

In order to compensate for radial variations in the positions of the tube terminals the cylindrical member 10, as mentioned heretofore, is of such dimensions that the tube may extend therein with limited horizontal movement in all directions, and that tube terminals 14 extend outwardly beyond the outer periphery of member 10. Since the supporting members 11 are of such construction that only a minimum area of contact is necessary between the tube terminals and the supporting members, it can be readily seen, from Fig. 3 of the drawing, that the tube may be easily moved in a horizontal plane to compensate for radial variations in the position of the tube terminals. The means disclosed by the present invention for compensating for angular variations in the position of the tube terminals comprises the method of securing the tube terminals supporting member 11 to the outer periphery of member 10. Each of the supporting members are secured to member 10 by any suitable means such as rivets 15 in such a manner that the members 11 are allowed to rotate a limited amount about the respective rivets. With the foregoing construction, when angular variations are present between the tube terminals, the socket may be easily adjusted to compensate for such variations by moving the proper supporting members until the same are in correct angular alignment with the corresponding terminals. As will appear more fully from the following description the supporting members are designed in such a manner to automatically adjust themselves to compensate for angular variations of a small degree.

In accordance with the present invention, the tube terminal supporting members 11 provide a rigid connection having a high degree of electrical contact between the tube terminals and a supporting member with a high unit of pressure over minimum area of contact therebetween. More particularly, as shown in Figs. 4 and 5, each of the supporting members 11 includes a body portion 16 constructed of suitable metallic material, having a soldering tab 17 angularly disposed from the lower end thereof, and secured to member 10 by rivets 15 in a manner fully described heretofore. A tongue 18 extends from the upper portion of body portion 16 at right angles thereto toward the inner periphery of member 10. As shown in Fig. 5, a slight clearance is provided between the upper end of member 10 and tongue 18 to allow limited rotational movement of the supporting members 11. A pair of arms 19, 19, of resilient material, extend outwardly and upwardly from each edge of body portion 16 at one end thereof at right angles to the plane of the body portion. From each of the resilient arms 19 a portion 20 protrudes inwardly therefrom, in the plane of body portion 16, with the ends thereof terminating adjacent each other in such relation that the tube terminals may be inserted and rigidly contacted therebetween. A recess, designated by numeral 21 of the drawing, which conforms with the outer dimensions

of the tube terminals, is provided in one of the portions 20 near the lower end thereof. The recess provides a stop which limits the downward movement of the terminals relative to the supporting members, as well as maintaining or locking the terminals between portions 20, 20.

In order to reduce the force required to deflect resilient arms 19, 19, when the tube terminal is inserted between portions 20, 20, the adjacent edges of the latter portions are longitudinally inclined in opposite directions with respect to the plane of arms 19, 19, thus forming a substantially V-shaped opening between portions 20, 20. The foregoing construction provides ample mechanical advantage whereby the tube terminals may be readily inserted into the supporting members without injury to the tube. In order to facilitate the removal of the tube terminals from the supporting members 11 the terminating edge adjacent the recess 21 is inclined upwardly in the proper direction to form a substantially V-shaped opening whereby deflection of resilient arms 19, 19 may be readily accomplished upon removal of the tube. The edges of portions 20, 20, which define the open end of the substantially V-shaped opening between the latter portions, are rounded in order to allow the terminal to automatically center the supporting member when the latter is not in proper angular alignment with respect to the corresponding tube terminal.

As heretofore stated, the present invention provides tube terminal supporting members having means for forming a rigid connection with a high degree of electrical contact between the tube terminals and the supporting members therefor, with a minimum area of contact. In order to provide such a connection, the terminating edges of portions 20, 20 are perpendicular to the plane of these portions as well as to the plane of body portions 16. Also, in this regard, the resilient arms 19, 19 are in parallel relation when a tube terminal is inserted between portions 20, 20 and, as stated heretofore, are perpendicular to the plane of body portion 16. With such construction, as shown in Fig. 6, the contacting edges of portions 20, 20 are perpendicular to the faces thereof and to the longitudinal axis of tube terminal 14, whereby the terminal is engaged on opposite sides by said terminating edges throughout the width of portions 20, 20. Since the resilient arms 19, 19 are in parallel relation the foregoing relationship between the contact edges of portion 20, 20 will remain the same when arms 19, 19 are deflected upon insertion of a tube terminal into the V-shaped opening between portions 20, 20.

A further embodiment of the invention is shown in Fig. 7. In this embodiment a circular member 22, of suitable metallic material, is provided which functions as supporting means for the tube terminal supporting members 11 as well as means for mounting the socket upon a stationary member, not shown. The tube terminal supporting members are secured to the periphery of member 22, by means of rivets 15, as in the previous embodiment, and a bushing 23, of suitable non-conductive material is positioned between each of the rivets and member 22 to provide insulating means therebetween. The insulating material is to be so selected that the tube terminal supporting members are adequately insulated from metallic circular member 22 with a substantially rigid mechanical connection therebetween. By selecting the insulating mate-

rial of the proper thickness and dielectric constant any desired capacity between the tube terminal supporting members and member 22 may be obtained whereby the electrical circuit is provided with suitable radio frequency by-passing means without the use of external radio-frequency by-passing condensers.

When utilizing a socket embodying the principles of the present invention for supporting a thermionic tube of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, a plurality of tube terminal supporting members 11, equal in number to a number of terminals radially protruding from the tube, are pivoted on member 10 in substantially the same angular relation as the position of the tube terminals. If angular variations are present between tube terminals and corresponding tube terminal supporting members, the supporting members may be radially moved about their respective pivots until proper alignment with the tube terminal is obtained. The tube is then inserted into member 10 and if radial variations in the position of the tube terminals are present, the tube may be horizontally shifted to compensate for such variations. The terminals are then forced into the substantially V-shaped openings between portions 25 until the terminals are received by recesses 21. When the terminals are forced into the V-shaped opening a scraping or biting action occurs between the contacting surfaces of the terminal and portions 20, 20; such action cleans the contacting surfaces and thus provides a high degree of electrical contact. Since the upper ends of portions 20—20 are rounded, the tube terminals may easily enter the substantially V-shaped opening between these portions, and thus automatically adjust the supporting members to perfect alignment with corresponding tube terminals. The substantially V-shaped opening between portions 20—20 provide a mechanical advantage whereby resilient arms 19—19 may be easily deflected to allow the tube terminals to enter recesses 21, without necessitating a force on the tube that may impart injury thereto. The resilient arms 19—19 maintain the terminating edges of portions 20—20 against the tube terminal to provide a high degree of electrical contact therebetween, while also maintaining the terminals in recesses 21. When it is desired to remove the tube from the socket, the necessary force is applied thereto in order to deflect arms 19, 19, and due to the substantially V-shaped opening, this force is of such value that the tube may be readily removed without imparting injury thereto.

There has thus been provided by the present invention a novel tube socket for thermionic tubes of the type having a plurality of tube terminals protruding radially therefrom in a plane perpendicular the normal axis therefrom having small overall dimensions thus allowing short tube terminals and therefore increasing the electrical efficiency of the circuit in which the tube is utilized. The socket is of such construction that certain variations inherent in commercial thermionic tubes of the above character may be radially compensated without displacement of the tube terminals. Moreover, the present invention provides a novel socket construction characterized by novel tube terminal supporting members wherein a rigid connection with a high degree of electrical contact is maintained between the supporting members and the tube terminals with a

minimum area of contact, and wherein the tube terminals may be readily inserted into and removed from the supporting members without injury to the tube.

Although several embodiments of the invention have been disclosed and described in detail heretofore, it is to be expressly understood that various changes and substitutions may be made therein without departing from the spirit of the invention, as well understood by those skilled in the art. For example, the socket may be used with other types of tubes other than the acorn type, shown herein, and any number of supporting members 11 may be secured to the outer periphery of member 10 thus providing a socket for other types of thermionic tubes of this class. Reference therefore will be had to the appended claims for a definition of the limits of the invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. A socket for a thermionic tube of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member of insulating material into which the tube is adapted to extend, a plurality of tube terminal support means secured to the outer periphery of said cylindrical member, extending above said member and parallel to the central axis thereof, each of said supporting members being bifurcated to form an open ended, terminal engaging, slot.
2. A socket for a thermionic tube of the type having a plurality of angularly disposed terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member into which the tube is adapted to extend, a plurality of tube terminal supporting members positioned on the outer periphery of said cylindrical member, each of said supporting members including a body portion secured to said cylindrical member and extending parallel to the central axis thereof, said body portion having a pair of parallel resilient arms extending therefrom and terminating beyond the upper face of said cylindrical member, and a lateral projection extending inwardly from each of said arms at the upper ends thereof and terminating adjacent each other for receiving said terminals.
3. A socket for a thermionic tube of the type having a plurality of angularly disposed terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member into which the tube is adapted to extend, a plurality of tube terminal supporting members positioned on the outer periphery of said cylindrical member, each of said supporting members including a body portion, means pivotally

securing said body portions to the outer periphery of said cylindrical member parallel to the central axis thereof, said body portions containing a pair of parallel resilient arms extending at right angles therefrom and terminating beyond the upper face of said cylindrical members with each of said arms containing a lateral projection extending inwardly and terminating adjacent each other in the plane of said body portion for receiving said terminals.

4. A socket for a thermionic tube of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member into which the tube is adapted to extend, and a plurality of supporting members secured to the outer circumferential surface of said member, extending above said member and parallel to the central axis thereof, each of said supporting members being bifurcated to form an open ended, terminal engaging, slot.

5. A socket for a thermionic tube of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member into which the tube is adapted to extend, a plurality of terminal supporting members, each of said supporting members being bifurcated to form an open ended, terminal engaging, slot, and means for pivotally securing said supporting members to the outer circumferential surface of said cylindrical member so that said terminal engaging slot extends above said cylindrical member and parallel to the central axis thereof.

6. A socket for a thermionic tube of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a metallic cylindrical member into which the tube is adapted to extend, a plurality of supporting members secured to the outer circumferential surface of said cylindrical member, extending above said member and parallel to the central axis thereof, each of said supporting members being bifurcated to form an open ended, terminal engaging, slot, and means for insulating said supporting members from said cylindrical member.

7. A socket for thermionic tubes of the type having a plurality of terminals protruding radially therefrom in a plane perpendicular to the normal axis thereof, comprising a cylindrical member into which the tube is adapted to extend, a plurality of supporting members being bifurcated to form an open ended, terminal engaging, slot, and means for mounting said supporting members on the outer circumferential surface of said cylindrical member so as to extend above said cylindrical member parallel to the central axis thereof, said mounting means allowing said supporting members to be moved out of parallelism with the axis of said cylindrical member.

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