Nov. 20, 1962 S. M. DEL CAMP 3,065,437

TUBE SOCKET ASSEMBLY

Filed Sept. 14, 1959

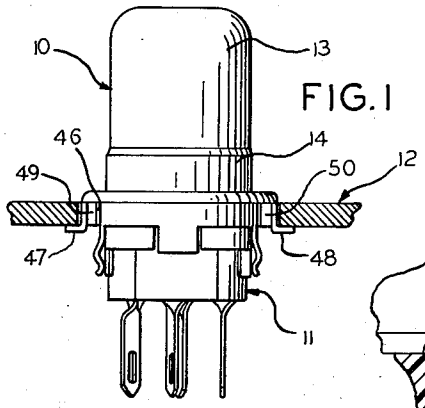


FIG. 1

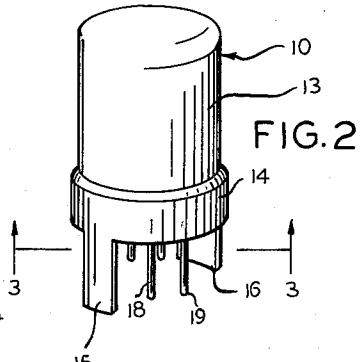


FIG. 2

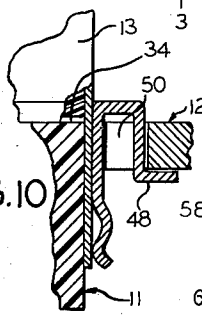


FIG. 10

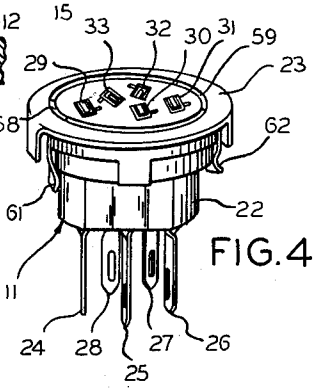


FIG. 4

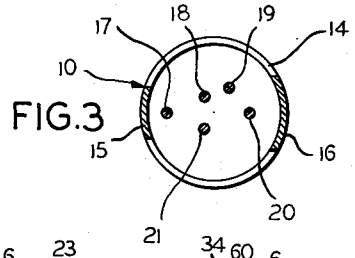


FIG. 3

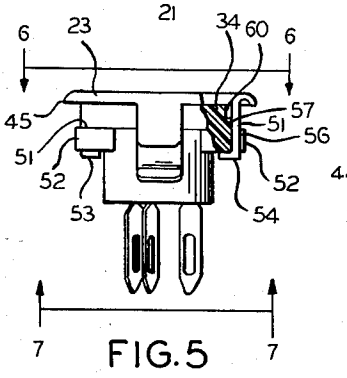


FIG. 5

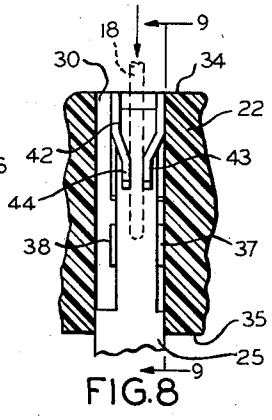


FIG. 8

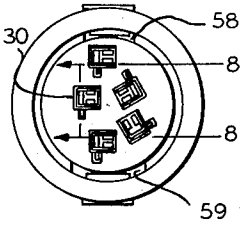


FIG. 6

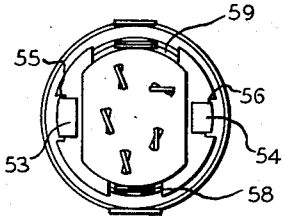


FIG. 7

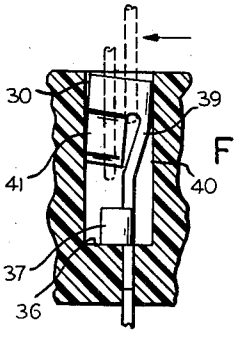


FIG. 9

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TUBE SOCKET ASSEMBLY

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This invention relates to a tube socket assembly, and more particularly to an assembly of such type adapted for use with a shield-equipped tube as, for example, a tube having a metal envelope which serves as the tube shield.

Although the tube socket assembly may be used with tubes of various types and sizes, the particular exemplification considered in detail herein is adapted for use with sub-miniature tubes having a metal envelope adapted to function as the shielding component as well as an enclosure for the elements of the tube. Since the tube is quite small, the prongs projecting therefrom are necessarily delicate and care must be taken to properly orient the several prongs with respect to the contact openings therefor during mounting of the tube in the socket so as to prevent damage to the prongs. In order to enforce proper alignment of the tube with the socket, the tube envelope is equipped with indexing or polarizing ears that prevent insertion of the prongs into the socket openings except when the prongs are properly aligned with the respective openings.

An object of the present invention is to provide a tube socket assembly that utilizes the indexing or polarizing ears as a means for grounding the envelope of such tube. Another object is in the provision of a socket assembly comprising a socket body having contact-equipped openings therein and a conductive mounting member fixedly related with respect to the socket body for securing the socket assembly to a chassis, and in which the mounting member is provided with grounding elements respectively engageable with the indexing ears of such tube envelope to automatically ground the same to such chassis through the mounting member when the tube is mounted in the socket assembly.

Still another object is that of providing a socket assembly in which the face of the socket body is aligned with the surface of the chassis when the mounting member is secured to the chassis, and in which such alignment protects the tube (and especially the prongs thereof) during insertion of the prongs into the socket openings, and more especially just prior to such insertion, by preventing cocking or tipping of the tube which otherwise would occur if the indexing ears were respectively disposed above the chassis and socket and pressed downwardly into engagement therewith since such location of the tube would then position at least some of the tube prongs adjacent and in engagement with either the perimetric edge portion of the socket assembly or surrounding edge of the chassis, with the likelihood of damage occurring to the prongs.

A further object of the invention is to provide a socket assembly having a plurality of contact-equipped openings in the socket body thereof, and in which such openings are oriented in an irregular configuration such that initially all of the prongs of the tube simultaneously engage the rear edge portions of the respective openings and are cammed or guided by the contacts therein during further insertion of the prongs toward the forward edge portions of the openings so as to assure a good frictional and electrical engagement of the prongs with the contacts. Additional objects and advantages of the invention will become apparent as the specification proceeds.

An embodiment of the invention is illustrated in the accompanying drawing, in which—

FIGURE 1 is a side view in elevation of a socket assembly embodying the invention, shown mounted in a chassis and with a tube positioned in the assembly; FIGURE 2 is a perspective view of the tube; FIGURE 3 is a bottom plan view of the tube taken generally along the line 3—3 of FIGURE 2; FIGURE 4 is a perspective view of the socket assembly prior to the mounting thereof in a chassis; FIGURE 5 is a side view in elevation of the socket assembly as illustrated in FIGURE 4, and in which a portion of the structure is broken away and is shown in section; FIGURE 6 is a top plan view of the socket assembly taken along the line 6—6 of FIGURE 5; FIGURE 7 is a bottom plan view of the socket assembly taken along the line 7—7 of FIGURE 5; FIGURE 8 is an enlarged, vertical sectional view of a contact-equipped opening in the socket; and is taken along the line 8—8 of FIGURE 6; FIGURE 9 is an enlarged, vertical sectional view taken along the line 9—9 of FIGURE 8; and FIGURE 10 is an enlarged, fragmentary sectional view illustrating one of the indexing ears in engagement with the grounding element therefor.

Considering now the structural composition in detail, the tube is denoted with the numeral 10, the socket assembly with the numeral 11 and the chassis with the numeral 12. The specific tube shown is of the sub-miniature type, and is equipped with a metal envelope 13 having an enlarged annular base 14 provided with depending ears 15 and 16 diametrically oriented along the base 14. The envelope 13 encloses the various elements of the tube and also serves as the tube shield for grounding both electrostatic and electromagnetic fields. The ears 15 and 16 serve as indexing or polarizing elements, and in this respect the ear 16 has a greater arcuate width than the ear 15, and the specific reason therefor will be described hereinafter. The tube is also provided with a plurality of prongs or pins connected with the tube components disposed within the envelope 13, and for identification the pins are respectively designated with the numerals 17 through 21.

The socket assembly 11 includes a socket body 22, a mounting ring or mounting member 23 and a plurality of contacts (one for each of the prongs 17 through 21), and such contacts are denoted as 24 through 28. In the form shown, the socket body 22 is a casting formed of insulating material, and is provided with a plurality of openings therein respectively receiving the contacts 24 through 28. The contact openings are denoted with the numerals 29 through 33, and FIGURES 8 and 9 best illustrate the structural features of the contacts and the positioning thereof within the openings therefor.

Referring to FIGURES 7 through 9 in particular, it will be apparent that each of the contacts extends substantially from the face 34 of the socket body 22 to the bottom surface 35 thereof, and is equipped with a tail projecting beyond the socket body that is preferably provided with an opening therein to facilitate connection of a conductor thereto. Each of the openings has a restricted portion adjacent the lower surface 35 of the socket body dimensioned to permit passage of the contact tail therethrough, and the tail may then be twisted (as seen in FIGURE 7) to prevent inadvertent withdrawal of each contact from the opening therefor. Movement of the contact downwardly is prevented by abutment of the lower surface 36 of the opening with ears 37 and 38 which extend laterally from the plane of the contact. It will be noted that each of the contacts has an angularly oriented neck 39 which inclines upwardly and toward the rear edge 40 of the opening. Extending forwardly from the upper end of the neck 39 are a pair of spaced legs 41 and 42, and such legs are equipped with depending portions extending generally along the neck 39 and converge at the lower end portions thereof to form gripping

segments 43 and 44 adapted to frictionally engage and thereby establish a good electrical connection with a prong of the tube 10, as shown in FIGURE 8.

It will be noted that the openings 29 through 33 are disposed in an irregular pattern or are in a nonsymmetrical orientation with respect to the center of the socket body 22, and further with respect to the locations of the rear edge 40 of each opening. Consequently, the same irregular orientation is imposed on the contacts which are respectively disposed in the openings. The orientation is such that when the prongs 17 through 21 of the tube are aligned with the respective openings and contacts therein, movement of the tube toward the face 34 of the socket body to insert the prongs into the contact openings effects a simultaneous engagement of each of the prongs with the angularly disposed necks 39 of the contacts therefor, whereupon such necks are effective to cam or guide the pins forwardly and into engagement with the friction segments 43 and 44 of the contact legs. This arrangement not only assures a good electrical connection of the prongs with the contacts therefor, but protects the delicate prongs from damage by preventing insertion thereof between the contact and rear edge 40 of the contact opening. Such improper movement of the prongs into the openings has been a problem heretofore and has resulted in considerable damage to the tube prongs.

The ring or mounting member 23 is equipped with a laterally extending annular flange 45 that may be slightly arcuate in cross section to increase the strength thereof, and such flange is adapted to rest upon and tightly engage an upper surface of the chassis 12 when the contact assembly is inserted through an opening 46 in the chassis. The mounting member is also provided with a pair of ears 47 and 48 depending from the flange 45 at opposed points therealong, and these ears are adapted to be turned laterally (as shown in FIGURE 1) to grip the undersurface of the chassis 12. Thus, the socket assembly is anchored to the chassis 12 in the opening 46 thereof by engagement of the flange 45 with the upper surface of the chassis and engagement of the laterally turned ears 47 and 48 with the undersurface of the chassis. It will be apparent that the chassis along the opening 46 is provided with recesses 49 and 50 adapted to accommodate the ears 47 and 48.

The mounting member 23 is ring-shaped as indicated, and is adapted to have the socket body 22 inserted thereinto. The socket is constrained in position within the mounting member by engagement of the lower edge 51 thereof with the upper surface of a laterally extending annular shoulder 52 defined about the socket body, and by laterally turned ears 53 and 54 provided by the mounting member and which engage the undersurface of the shoulder 52 (see FIGURES 4 and 5). It will be evident that the ears 53 and 54 are located along opposite sides of the mounting member and that the shoulder 52 will have recesses 55 and 56 cut therein to respectively accommodate the ears. It should be noted that the dimensional relationship of the socket body 22 and mounting member 23 is such that the face 34 of the body is in substantial alignment with the edge portion of the flange 45 which engages the upper surface of the chassis 12. Therefore, the face 34 of the socket body is in substantial alignment with the upper surface of the chassis 12, and in effect forms a continuation thereof. This relationship is important in that it facilitates proper insertion of the tube prongs into the contact openings without the occurrence of damage to the prongs.

The socket body 22 has a stepped configuration adjacent the upper end portion thereof defined by an outwardly extending annular shoulder 57 and by the annular shoulder 52 which is disposed therebelow. The lower shoulder 52 is contiguous with the shoulder 57 and has a greater diameter so that it projects outwardly therebeyond. These two shoulders have diametrically opposed recesses therein adapted to pass the indexing ears 15 and 16 therethrough when the tube 10 is mounted in the socket assembly. Such recesses are best seen in FIGURES 4, 6 and 7 and are designated with the numerals 58 and 59, which respectively correspond to the ears 15 and 16. The recesses in conjunction with the mounting member 23 define channels through which the indexing ears must pass as the prongs of the tube 10 are inserted into the contact openings of the socket body. It will be seen, with particular reference to FIGURE 5, that the upper surface of the shoulder 57 is spaced slightly below the face 34 of the socket body, and therefore an arcuate groove 60 is defined between the mounting member and that portion of the socket body disposed above the shoulder 57. The recesses or channels 58 and 59 terminate at the upper ends thereof in the groove 60. The mounting member is also provided with a pair of resilient or spring-like grounding elements 61 and 62 which extend along the channels 58 and 59 in respective alignment therewith, and frictionally grip the indexing ears 15 and 16 of the tube 10 when it is mounted in the socket, as shown in FIGURE 1.

The socket body 22 and mounting member 23 are assembled in accordance with the prior description by telescoping the body 22 upwardly into the mounting member until the lower edge 51 thereof abuts the upper surface of the shoulder 52. Thereafter, the locking ears 53 and 54 are turned laterally to secure the mounting member to the socket body. The thus assembled socket structure is mounted in the chassis 12 by passing the assembly downwardly through the opening 56 in the chassis until the flange 45 of the mounting member abuts the upper surface of the chassis. Thereafter, the locking ears 47 and 48 are turned laterally to engage the undersurface of the chassis, and the socket assembly is then constrained in position.

To mount the tube 10 in the socket assembly, the indexing ears 15 and 16 are moved into adjacency with the face 34 of the socket body, are shifted into alignment with the groove 60 and are inserted thereinto. The tube 10 can now be rotated with respect to the socket assembly because the prongs 17 through 21 of the tube terminate above the lower edges of the indexing ears by an amount that spaces the prongs slightly from the face of the socket body when the indexing ears are located within the groove 60 in engagement with the upper surface of the body shoulder 57. Since the indexing ears 15 and 16 have different arcuate widths, and because the recesses or channels 58 and 59 are respectively dimensioned so as to accommodate the ears, the tube is rotated until the indexing ears 15 and 16 respectively align with the channels 58 and 59; and when such alignment occurs, the tube can be moved downwardly so as to insert the prongs thereof in the contact openings of the socket body.

Such downward movement passes the indexing ears through the channels 58 and 59 where they are resiliently engaged by the spring-like grounding elements 61 and 62 which are integral with the mounting member 23. Thus, the metal shield or envelope 13 of the tube is grounded through the indexing ears 15 and 16, resilient elements 61 and 62, and flange 45 and locking ears 47 and 48 of the mounting member which engage the chassis 12. It will be evident that the mounting member 23 is formed of metal or other conductive material, and that in the specific form shown the chassis 12 is metal. It will be apparent that the same result can be obtained in conjunction with a printed wire board or panel if either the flange 45 or ears 47 and 48 are brought into engagement with the appropriate ground conductor of the panel.

The prongs of the tube are further protected against damage by the orientation of the openings 29 through 33 and by the configuration of the contact elements respectively mounted therein. The contacts prevent insertion of the prongs into openings that otherwise are de-

fined occasionally between the upper ends of the contacts and rear edges of the openings therefor, and an initial and simultaneous engagement of all of the prongs with the angularly disposed necks of the contacts occurs. Consequently, the prongs are urged forwardly toward the center of the openings as the prongs are further inserted thereinto, which guides such prongs away from the edges of the openings and into firm frictional engagement with the legs of the respective contacts so that a good electrical connection is defined therewith.

An additional protection is afforded for the prongs of the tube by the planar alignment of the face **34** of the socket body with the upper surface of the chassis **12**. More particularly, if in attempting to mount the tube in the socket the tube is not in proper alignment therewith, but rather one of the indexing ears is disposed above the face of the socket body and the other indexing ear above the chassis, downward movement of the tube toward the socket and chassis will bring the prongs of the tube into adjacency with the perimetric edge portion of the socket and surrounding edge portion of the chassis. If the face of the socket were oriented either above or below the upper surface of the chassis, the tube would necessarily assume a cocked or angular position for in such event the lower edge of one of the indexing ears would be located either above or below the edge of the other. Considering the situation where the face of the tube is above the chassis, such angular disposition of the tube would bring the prongs thereof into engagement with the perimetric edge portions of the socket, and because of the delicacy of such prongs they could be damaged thereby. On the other hand, if the surface of the socket body were disposed below the chassis, the angular disposition of the tube would bring the prongs thereof into engagement with the surrounding edge portion of the chassis; and again, the tube prongs could be damaged. Such contingencies are avoided in the present case because of the planar alignment of the face **34** of the socket body with the upper surface of the chassis since this prevents cocking of the tube. It should be noted that the tube prongs are slightly shorter than the indexing ears **15** and **16**, and a clearance is thereby provided between the mounting ring **23** and prongs under the circumstances described.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making an adequate disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

I claim:

1. In combination with a chassis having top and bottom surfaces and a socket-receiving opening therethrough, a socket assembly comprising a socket body of insulating material provided with a plurality of contact-equipped openings for receiving the pins of a tube therein, and a mounting member having a generally annular ring portion circumjacent said socket body and equipped with a laterally extending flange disposed in overlying engagement with the marginal edges of said top surface surrounding said socket-receiving opening, said socket body being provided with an outwardly extending shoulder in engagement with said ring portion to positively locate the upper face of said socket body relative to said flange so as to provide a planar alignment of the upper face of said socket body with the top surface of said chassis, said mounting member being provided with bendable ears interlockingly engaging said socket body to anchor said ring portion in engagement with said shoulder, said mounting member being equipped with fastener elements in engagement with the bottom surface of said chassis whereby said flange and fastener elements fixedly relate said socket assembly with said chassis.

2. In combination with a chassis having top and bottom surfaces and a socket-receiving opening therethrough, a tube socket assembly comprising a socket body of insulating material provided with a plurality of contact-equipped openings for receiving the prongs of a tube therein, said socket body being provided intermediate the top and bottom surfaces thereof with a laterally extending shoulder, a mounting member fixedly assembled with said socket body and being provided with a laterally extending flange disposed in overlying relation with the marginal edge portion of said top surface surrounding said socket-receiving opening, and fastener elements provided by said mounting member in engagement with the bottom surface of said chassis whereby said mounting member and socket body are constrained within said socket-receiving opening by said flange and fastener elements, said mounting member being positioned in engagement with said shoulder of said socket body to positively locate said socket body with respect to said mounting member to align the upper surface of said socket body with said top surface of said chassis and with the portions of said flange in overlying engagement therewith.

3. The combination of claim 2 in which said mounting member is equipped with locking ears in engagement with said socket body and together with said shoulder effects the aforesaid fixed relation of said socket body and mounting member.

4. In combination, a conductive chassis having top and bottom surfaces and a socket-receiving opening therethrough, and a socket assembly adapted for use with a tube having a conductive shell equipped with a pair of indexing ears, said socket assembly comprising a socket body of insulating material provided with a plurality of contact-equipped openings for respectively receiving the prongs of such tube therein, said socket body having upper and lower faces, said socket body being equipped with an outwardly extending shoulder intermediate the upper and lower faces thereof, a conductive mounting member fixedly assembled with said socket body and equipped with fasteners in engagement with said chassis to secure said mounting member and socket body thereto and including a laterally extending flange in overlying engagement with the marginal edge portions of said top surface surrounding said socket-receiving opening, said socket assembly being provided with a pair of channels therein for respectively receiving such indexing ears to properly orient such tube with respect to said socket body, and a pair of resilient grounding elements provided by said mounting member in respective adjacency with said channels for frictional engagement with such indexing ears whereby such conductive shell is grounded to said chassis by said grounding elements through said mounting member, the upper face of said socket body being oriented in substantial planar alignment with the top surface of said chassis and with the portions of said flange in engagement therewith, said mounting member comprising a ring portion adjacent said socket body and in engagement with said shoulder to positively locate the upper face of said socket body with respect to said flange for effecting the aforesaid alignment of the upper face of said socket body with the top surface of said chassis.

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