

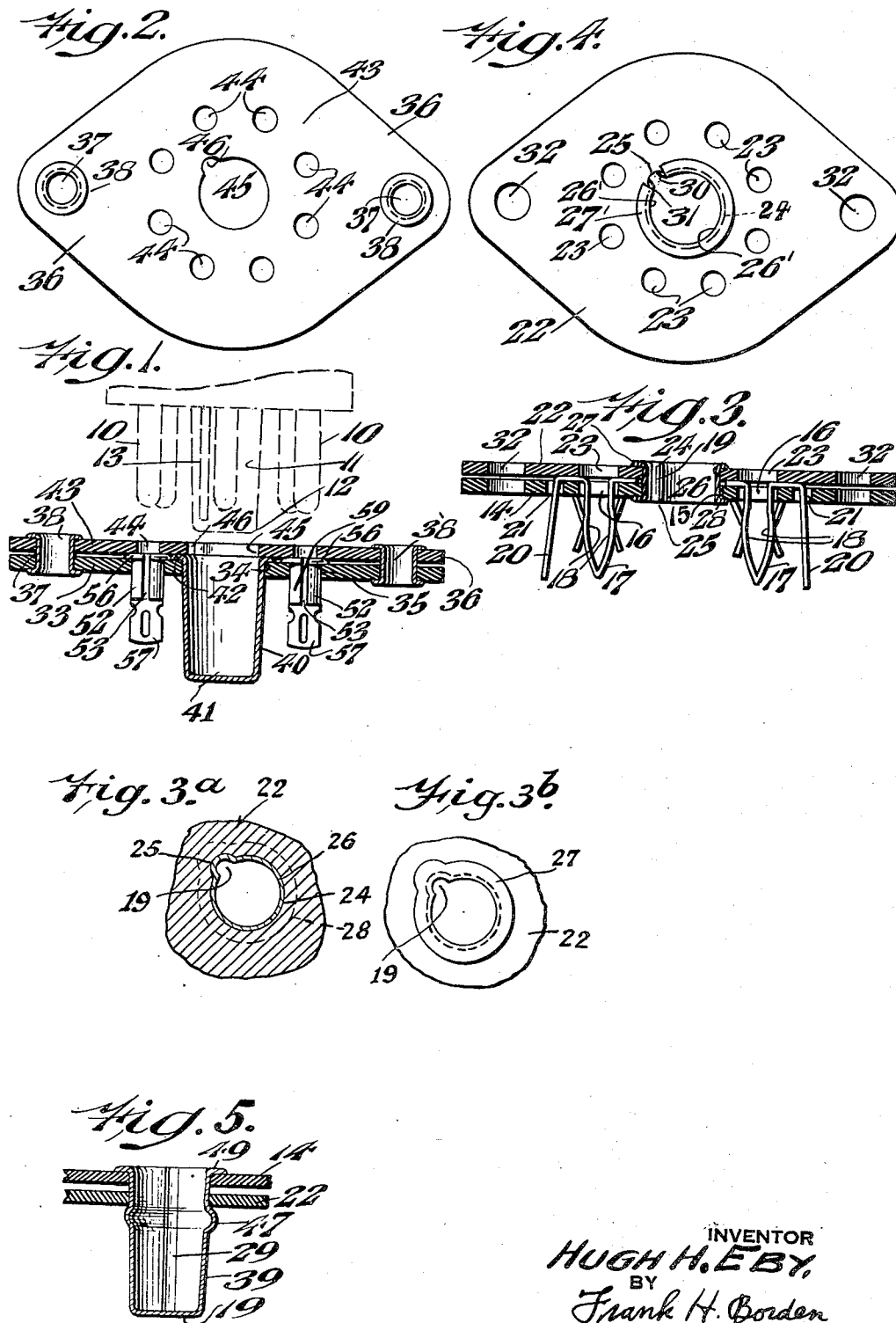
April 9, 1940.

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2,196,697

SOCKET

Filed June 5, 1935



UNITED STATES PATENT OFFICE

2,196,697

SOCKET

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Application June 5, 1935, Serial No. 25,055

5 Claims. (Cl. 173—328)

This invention relates to sockets, and particularly to sockets for vacuum tubes for radio receiving sets and like.

It is among the objects of this invention; to provide a simplified and inexpensive socket, especially arranged and adapted for ready and facile assembly; to provide improved contact devices for the prong contacts of tubes and the like; to provide a socket for tubes possessed of centering axial extensions with means to protect the ends of such extensions; to provide in operative association with a laminated base foundation structure improved contact elements arranged for quick and easy association with the foundation; to provide in connection with a prong contact element an extension to a rivet for joining the parts as a ground connection; to provide in a socket means to receive a slightly tapered or conical axial guide of a tube with a housing to cover the end of such means; to provide a contact element arranged for operative association with supporting structures of diversified thicknesses; to improve the devices shown in earlier patents to MacFadden, Nos. 1,771,094, 1,780,778, and 1,904,670, and in Benjamin No. 1,904,662, without sacrificing any of the advantages of those patents or any of them; to adapt features of the foregoing patents to use in sockets for tubes of non-conventional type; to improve and simplify contacts for tube sockets; to provide a single laminated plate for supporting contacts, with the contact ends disposed below the plane of the plate to preclude "shorting" same through inadvertence; to improve anchoring structures for laminated sockets to simultaneously anchor the plates and serve as a guide for a ribbed guiding extension of a tube; and many other objects and advantages as will become more apparent as the description proceeds.

In the accompanying drawing:

Fig. 1 represents a transverse section through a laminated socket according to a preferred form thereof including one form of guard housing concentric with the enlarged axial opening, with a fragment of the tube to be operatively associated therewith shown in dotted lines in detached relation,

Fig. 2 represents a plan of the socket assembly of Fig. 1,

Fig. 3 represents a transverse section through a modified form of laminated socket utilizing contacts as set forth in some of the earlier recited patents, and with a modified axial rivet serving as a guide and also as an attaching element,

Fig. 3a represents a fragmentary horizontal section through the upper plate and the guiding grooved eyelet of Fig. 3,

Fig. 3b represents a fragmentary plan of the grooved eyelet of Fig. 3,

Fig. 4 represents a plan of a modified form of socket, and

Fig. 5 represents a fragmentary section through a modified axial guard housing in which the housing replaces the axial rivet.

It is a feature of the several prior patents noted to provide in various forms U shaped contacts or contacts of multiple engaging surfaces, so arranged as to exert frictional pressure on substantially opposite sides of tube contact prongs, and it is preferred that the advantages of this construction be carried forward in the present application, in certain manifestations of the invention.

The socket of this invention have many features which are applicable to the general art of sockets, and particularly to elements interchangeable in whole or in part with some of those in the recited patents to MacFadden and Benjamin, or with other conventional socket formations. However, in the main, without departing from the spirit and intention of amplifying, augmenting and reinforcing the desirable features of those said patented devices, the invention herein contemplates use to excellent advantage in connection with certain types of axially guided tubes. As contrasted with the tubes of the prior art, which have contact prongs in an arbitrary pattern so arranged as to fit only a given predetermined type of socket having apertures in a similar or registering pattern the instant tube, aside from its greater number of contacts, and disposition of the contacts in evenly spaced relation in a ring concentric with the axis of the tube, comprises a modification of the guiding principle for the prongs of the tube, pointed out and claimed in MacFadden 1,771,094, above noted, in which cooperating guiding devices are carried by the tube and socket to complementarily guide the prongs into engagement with appropriate contacts. The axially guided tube of utility in connection with the instant invention utilizes similar, though specifically different, structures to serve the same guiding functions to secure the desired aligned and angularly positioned result. The difference lies in providing a separate concentric guiding extension on the tube with which the prongs have predetermined relation, arranged for operative association with a preformed guide ring on socket instead of hav-

ing the concentric guiding extension or guide ring on the socket itself, and with which the prongs themselves have guiding engagement.

Referring to Fig. 1, an illustrative form of the bottom end of a tube with which this invention is primarily concerned is indicated in dotted lines in spaced relation to the socket to be described. The several contact prongs 10, reduced in number for simplification of the illustrative disclosure, are radially spaced about the tube axis with the same clearance annularly or arcuately between the prongs, except possibly for the end prongs in the row, if less than the maximum number of contacts is used, as is contemplated. A conical or tapered guide 11, the taper of which is perhaps somewhat exaggerated for illustrative purposes, is provided and extends beyond the end of the tube and has the reduced smaller end 12 extending below the ends of prongs 10, and has also an external longitudinally extending rib 13, the lowermost end of which is spaced from reduced end 12, but extends beyond the ends of prongs 10. It will be understood that in positioning the tube, it is necessary merely to first locate the reduced end 12 of the axial guiding cone 11 in a socket guide opening, to be described, then insert it slightly and rotate the tube until the end of the guide rib 13 enters a complementary guide groove or recess to be described, at which juncture, if everything is properly coordinated, the several prong contacts will have been axially aligned with suitable cooperative contact devices, and the tube may then be moved axially to proper seated position with the prongs in appropriate angular position relative to the complementary contacts of the socket.

The invention will first be described in detail in connection with the showing of Figs. 3 and 4, but in order to understand certain factors of the invention further, passing reference may first be made to Fig. 1, in which a top plate 43 is provided with an unguarded axial guiding aperture 45 having a guide groove or recess 46, as the centering and aligning element of the socket, as will subsequently be described in detail. In Fig. 1, it is contemplated that the axial projection of the associated plug-in or tube device will physically contact the material of the top plate 43. As will be pointed out, the construction of Fig. 1 has many advantages, but so far as described it will be clear that the top plate 43 should be relatively heavy and stiff and therefor relatively expensive, to preclude any possibility that the end of the guide rib 13 on the guiding projection 11 can cut its own, undesired, path into the sheet to form its own guide groove communicating with the axial aperture in spaced relation to the true guide recess 46. This mischance might easily happen if axial pressure was applied to the projection with the rib and guide groove in misalignment, such as might accidentally occur to the unskilled, if the top plate were too thin or too soft. A construction which obviates this potential disadvantage is shown in Figs. 3 and 4.

In these figures, which differ only in the particular type of axial reinforcement used, as will be explained, a laminated sheet of material of usably high insulating qualities, such as those having binders of a phenolic condensation product, or the like, 14, is provided with a relatively large axial opening 15, and a plurality of contact apertures or openings 16. In each hole 16, or in a selected number less than all of them if desired, a contact 17, having cooperating frictional surfaces 18, as shown and described in

MacFadden 1,780,778 and 1,904,670, is threaded, as by axial insertion, and has preferably a terminal or soldering lug 20 extending threadably through a secondary smaller aperture 21 in the plate 14. The several contacts 17 are held in place by the secondary or cover plate 22, which, if desired, may be much thinner or softer, or both, than the corresponding plate 43 of Fig. 1, as explained. Cover plate 22 has a plurality of prong contact openings 23 in registration with, although not necessarily of the same diameter as, the respective apertures 16, and has also the enlarged axial opening 24 registering with the axial aperture 15 in the sheet 14. In predetermined angular relation to the respective registering contact holes 23 and 16, a groove or depression 25 is formed at least in the top plate and preferably in both the top and bottom plates, according to the degree of taper on the guiding cone of the plug-in device, and the particular benefits to be derived from the axial guard device, among other factors.

The top and bottom plates having the registering axial apertures 24 and 15 respectively, and the registering grooves 25, as shown in Fig. 3, are engaged by the substantially cylindrical tubular eyelet 26. Eyelet 26 has a top flange 27 arranged to engage the upper surface of the top plate surrounding the axial aperture, which, being of metal or other hard material thereby strengthens and reinforces same to prevent the pointed end of a guide rib of a pronged connector from being forced into the relatively softer material of plate 22 surrounding the apertures at points arcuately spaced from the recess 25. The eyelet has its lower end swaged and upset to form a bottom flange 28, to firmly anchor the plates together, and also to strengthen the center of the assembly where the strains are the greatest. This also enables use of thinner and weaker material in the bottom plate. The cylindrical eyelet, which obviously may be of unitary tubular form, as well as of the split type as will be described, may have a channel portion or guide groove 19 preformed therein to extend laterally of the guide ring comprised of the eyelet, so as to engage in the recesses 25, or it may be inserted as a substantial cylinder, and the desired wall portion subsequently treated to cause the formation of a channel portion or guide groove in the guide ring in registry with the guide recesses in the plates, as may be desired. A unitary continuous guide ring having no split portions is indicated in Fig. 3, as noted.

By reference to Fig. 4, it may be noted that the guide ring, comprises a substantial cylinder or eyelet 26', having an upper flange or swaged portion 27', a lower abutment or flange (not shown), and the channel portion comprised of two longitudinal edge portions 30 and 31, respectively. The eyelet, which may be formed in any desired manner, including cutting and bending from a strip of metal tape or the like, may be inserted axially, or formed axially in the registering guiding apertures of the plates, and the marginal portions or edges 30 and 31 may be bent out of the peripheral extent of the cylinder to engagement in the registering grooves 25 of the plates of the socket. Anchoring openings 32 may be left in the pairs of plates, or these may be reinforced as by the eyelets as shown in Fig. 1. It will be clear that the hollow eyelet 26' and the split therein registering with the depressions or recesses 25 or with its integral struck out rib or groove or the like, will provide a structure, a

complement of the tube shown in Fig. 1, so that the rib 13 thereof will be guided and received by the recesses 25 to center the tube and properly position its contact prongs, which latter will establish contact in the conventional manner with the contact devices 17 of the form of invention just described.

It will be apparent that either of the guide rings of Figs. 3 and 4 may be used, according to manufacturing and other conditions, and that each has certain well defined advantages, which include the following, in summary: The guide ring has a flange which protects the area surrounding the aperture to strengthen same, and thus enables the use of weaker, and hence, from the standpoint of economy the thinner top plate. Each guide-ring has some channel portion extending laterally of its periphery, some element disposed eccentrically, to engage in or with portions of both the top and bottom plate, and therefore serves as an anchoring means to prevent relative angular movement of one plate or sheet to another. This insures perfect and continued alignment of the contact apertures with but a single fastening device, as shown in Fig. 3, in contrast for instance, with the multiple fastening of the prior art, as shown, so far as the multiple eyeletting is concerned, in Fig. 1. With the flanging over of the ends of the guide ring into engagement with oppositely presenting faces of the plates a reinforced central portion of the socket is achieved. Strengthening the center enables the use of weaker and thinner sheets, as already explained. Some further advantages of the construction will be pointed out in connection with the following discussion relative to the contact and contact guides for the assembly.

In the forms of socket already described, it will be clear that it is contemplated that a certain number of contacts for the plug-in device may be used. Thus the tube may have contacts arranged in an annular series, or there may be several series, or there may be other patterns, but in general a maximum number of contacts is provided for, but the number actually used may depend upon other factors, such as the complexities of the tube itself. Thus, if the annular series provides spaces for eight or more contacts, it might well be that any given smaller number of contacts might be used in a given or other plug-in device. Although in quantity production it might not be desirable to fill less than the maximum number of contact apertures with contacts, yet this is contemplated, so that there might be one or more "blind" holes in the bottom plate, if the situation so required. If the upper plate, which insulatingly holds the contacts in position were provided with the maximum number of contact holes for every socket, it would be very difficult for the user to properly dispose the parts in the set with appropriate contacts properly wired so that a predetermined set were alive while others were dead. It is a part of this invention therefore, that the top plate 22 be provided with certain distinguishing characteristics by which the initiated can tell practically at a glance, what the situation is as to live contacts, as well as the particular plug-in device which is to be associated with the socket. In the illustrative situation where the maximum number of contact holes is eight or more, but in which illustratively only six contacts are to be wired, or by one means or another are to have no contact prongs in physical engagement with them, then the plate 22 may have

only six contact apertures provided, so that there is a solid sheet of top plate over the two (illustratively two) unused contact holes in the lower plate. The initiated can tell by a glance at the upper surface of the top plate, and by the irregular aperture arrangement, incident to blinding out certain of the regular series, can determine the proper wiring and the proper plug-in device to be used. This may obviously be amplified in any desired manner as by indicia, or by suitable coloring effects or combinations thereof, which may broadly be designated as to create a predetermined visual sensation. Here again, the central guide ring as explained may be of value, as it may be suitably colored or otherwise marked as to give a predetermined visual effect coordinated with the contact situation of the socket with which it is associated. It will be observed that from numerous angles the guiding central eyelet of this invention is of great importance.

It will be evident that with several sockets having the large guide rings of Fig. 3 on a panel, there are provided a number of openings into the set, beyond the panel, of such diameter as to form a potential or actual disadvantageous entrance for various metallic devices such for instance as eyelets, screws and even screw drivers and other tools, and the like, that would be undesirable in the set. With the conical guide element disposed in the aperture and extending beyond it, there is a further possibility of trouble from such unguarded entry of a tube part beyond the radio panel or instrument board, even though the guide cone 11 is insulated.

Reference to Figs. 1 and 2 disclose a form of the invention in which the problems raised by the unusually large central apertures of the sockets incident to the provision for admission of the conical axial guide of the tubes, is satisfactorily solved. In these figures the main relatively heavy body of laminated sheet material 33 has the large central or axial opening 34, and the series of radially disposed contact openings 35, and the ears 36 may have aperture 37 to receive the coupling or anchoring hollow rivets 38 shown. An elongated tapered or slightly conical member 40 having the closed lower end as at 41 and the upper flange 42 is provided and dropped downwardly to seat in the hole 34 with the flange resting upon the upper surface of the supporting sheet 33. The upper closure of complementary laminated sheet 43 has the registering radially disposed tube prong apertures 44, the enlarged axial opening 45 having the recess or guide groove 46 in a predetermined angular position and has cooperating ears and apertures to be engaged by the anchoring rivets 38 as will be clear. The housing 40 will be more or less loosely held in the lower plate by the anchored upper plate as will be understood. As shown in Figs. 1 and 2, the guide recess 46 may be formed in the upper closure plate 43 alone, so that the inner surface of guard 40 may be an uninterrupted cone, if it is of slightly larger diameter than that of axial opening 45. The contacts of the assembly will be later discussed, after exploring some phases of the use of the "hat" housing 40 and its equivalents.

A modified form of guard housing is shown in Fig. 5 at 39, to include a peripheral rib 47 arranged whereby the guard 39 may replace the anchoring hollow rivet of Fig. 3, and serve the dual purpose of anchoring and securing the pair of laminated sheets as 14 and 22 together, 7L

between the upper flange 49, which may be swaged after insertion of the guard from below, and the bead or annular rib 47. The modified guard 39 of Fig. 5 has a guide groove 29 extending longitudinally at least part way of the guard to receive the guide rib 13 of the tube.

Each such guard or housing 39 or 40 obviously may be variously formed in order to secure given desired results. It will suffice to indicate some of the high points of the construction, when those skilled in the art will become aware of the further ramifications possible. The housing 40, as a separate threadably inserted attached element may be easily stamped or formed out of metal, as probably the simplest form, whether the metal when finished is rigid or capable of movement as by having high ductility so as to conform to the shape of the inserted axial guide will depend upon necessities. Obviously, if made of metal, the "hat" or guard may be formed of a metal mesh, as screening bent or otherwise shaped for the purpose. Alternatively the separate and independently formed "hat" may be formed of molded material preformed to the desired shape, as by being formed of pressed or molded insulating compound, or of cast material, such as cast metal, papier mâché, or the like. Alternatively the guard may be formed of metal in any desired form of stamping or rolling to secure the desired shape, which is then coated upon either or both sides with suitable insulating medium, whether by being dipped in varnish and baked, or by lining the guard with a thin cup of pressed paper or the like (not shown). The guard may be pressed out of "fish paper", or may be formed of a cone of fiber or the like. It may be a woven mesh material, such as a textile, and may be suitably impregnated with fireproofing or water-proofing compounds as to prevent any moisture absorption by the material. Obviously each guard may be formed of material having an open slit running longitudinally to receive the guiding rib on the axial guide of the tube, or the guide slot may be pushed into the material without the formation of a slot in accordance with requirements. It may frequently occur, however, that the guiding slot 46 in the upper plate may be the only slot guide required, and the housing proper need not be of such close fit as to be physically contacted by the axial guide of the tube. In the form of invention shown in Fig. 10, however, as noted, it will generally be preferred that some sort of longitudinal slot be provided at least part way of the guard, so as to fulfill the guiding functions of the assembly.

Referring again to Fig. 1, a form of contact is disclosed which has numerous advantages as contrasted to the prior art, not the least of which is its low cost and adaptability to narrow foundation structures. The contact 59 comprises a relatively short substantially cylindrical portion 52 formed preferably of one piece and rolled or bent into the substantial cylinder shown, but possibly possessing the longitudinal slit or slot 53 by which the resilience of the contact may be utilized to form a yielding contact element to maintain frictional engagement with a tube contact prong which may later be inserted. The outer end of the frictional contact includes the swaged or spun flange 56, arranged to overlie the foundation structure to hold the contact against appreciable inward axial movement relative to the foundation. The cover plate 43 holds it against appreciable outward axial movement. Preferably an integral prolongation 51 of the

material of the cylinder is carried beyond the end of the bent cylindrical portion to form a terminal connector of conventional use. Normally the tail piece or terminal will be bent laterally out of the axial line of the contact proper, so as to be out of the way of the tube contact prongs when they enter the socket contacts and to prevent soldering flux on the terminals from entering the contact or touching the prongs.

The contact 59 is provided with the bendable lugs 54 and 55 in the peripheral extent of the substantial cylinder of the contact, and may be inserted axially through the top of the plate through aperture 35, until the flange 56 abuts the upper surface of the plate, or else until it engages within the slight depression or recess 57 communicating with the aperture 35, with which it is concentric, as shown in Fig. 5, in case such depression is provided, as will be later discussed, after which the lugs 54 and 55, or one of them, is bent outwardly to engage the bottom surface of the plate 33, or approximately so, so that the contact is thereby capable of slight axial floating by the slight clearance between the lug and flange and the foundation, as well as slight lateral floating through lateral clearance between the outside of the substantially cylindrical contact and the internal bore of the aperture to receive it. This latter may be effected in another manner by bending the contact into something less than a substantial cylinder, so that, perhaps as a slight oval, it may have actual contact with opposite sides of the contact aperture or hole, and which may yield in any desired direction due to the resilience of the contact in the assembly. The speed and economy of such installation will be clear. The relations of the parts will also be made more clear by inspection and by the explanation of Fig. 1.

It will be clear that substantially regardless of the thickness of the base or socket shown, depending upon the length of the substantially cylindrical part of the contacts 59 of Fig. 1, the tongues or lugs 54 or 55, or both, or such additional ones as may be struck up will be bent up into engagement with the lower surface of the base to hold the contacts in axially restrained relation to the base.

It should be observed that the preformation of actual lugs 54 and 55 is not necessary, as the contact material may be made relatively weak so that a suitable die or punch device can force portions of the contact into proper anchoring disposition. In many cases it is not necessary that actual lugs be formed, as a suitable die or punch operating in the slot of the substantially cylindrical portions thereof, can force the lower edges of the marginal portions outward in a flared disposition to secure desired anchoring of the contacts.

Reference has been made to the floating of the contacts in the apertures to permit them to make slight adjustments to accord with slight variations in setting of the tube contact prongs. It should be understood that in the usual and ordinary case such slight adjustment does not include the ability of the contact to rotate in its supporting base. It will usually be essential that the contact be prevented from any such rotative feature, as the strains upon the wires and other connectors soldered or otherwise secured to the terminals of the contacts is undesirable and disadvantageous. The diametrical slots or recesses with which the contact of Fig. 3 engage, as illustrated in the cited MacFadden patents, furnish

an excellent medium to prevent rotative movement of the U contacts shown. Similar precautions will effect similar results with the contacts of Fig. 1.

It will be understood that in the prior patents listed above, the ideas set forth included that of threading the contacts into a perforated or apertured plate, and then cover the exposed portions of the contacts with a cover plate having cooperating apertures and which secondary plate served to anchor the parts in place. It is a part of this invention to provide a laminated socket, that is, one having a supporting plate of laminated sheet material, suitably punched or otherwise formed as to have recesses communicating with contact apertures in such a manner that the flared end of the contacts may be received in the recesses in such manner that any conducting element accidentally caused to overlie the sheet so formed cannot simultaneously contact any two of such submerged contact ends.

The advantages of the invention and the obvious multiplicity of more or less slight modifications thereof that will occur to those skilled in the art, will be apparent, and all such are to be construed as within the scope of the invention unless otherwise limited in the appended claims.

I claim:

1. A socket receptacle for the reception of a plug-in device having contact prongs and a guide prong non-circular in cross section, comprising two sheets of insulating material having a registering series of contact apertures and registering non-circular guide apertures, contacts mounted in substantial alignment with certain of the contact apertures, a guiding eyelet externally non-circular in transverse section complementarily of the registering guide apertures so as to have but one angular positioning in which to be disposed in said guide apertures and disposed in the said guide apertures and preventing relative angular motion of the sheets, flanges formed on the eyelet and abutting the exposed surfaces of the respective sheets to reinforce and protect same adjacent to the guide apertures therein, said eyelet being internally non-circular in transverse section as a guiding complement of the non-circular guide prong of the plug-in device so as to guide said plug-in device to a single predetermined angular relative positioning with the socket receptacle.

2. A socket receptacle for the reception of a plug-in device having contact prongs and a guide prong having an external rib, comprising two sheets of insulating material having registering contact apertures and registering guide apertures, each guide aperture including a lateral recess, contacts in certain of the contact apertures, a metallic guiding eyelet having a channel portion and disposed in the guide apertures with the channel portion in the lateral recesses and assisting in preventing relative rotation of the sheets, said eyelet having flanges abutting the outer surfaces of the sheets adjacent to the guide apertures and reinforcing the surface to prevent undesired entry of the rib on the guide prong of such device into the sheet spaced from the recess, said eyelet having internally a guide surface and guiding groove in the channel portion with which such guide prong has guided entry in one single predetermined angular relation of the parts.

3. A socket receptacle for the reception of a plug-in device having contact prongs and a guide prong having an external rib, comprising two sheets of insulating material having registering contact apertures and contacts and registering guide apertures each of which latter is shaped complementarily of such guide prong with a lateral recess such as to receive the rib thereof, an eyelet mounted in the guide apertures and having an external channel portion the outer surface of which is closed and continuous and engages in the lateral recess of the guide apertures to hold the sheets against relative angular motion, said eyelet having flanges abutting the outer surfaces of the sheets adjacent to the guide apertures, said eyelet forming a guiding sleeve for such guide prong, and the inner surface of the external channel portion forming a groove to guidingly receive the rib on such guide prong to insure that the seating of the guide prong is in one predetermined angular relation of the device and receptacle.

4. A socket receptacle for the reception of a plug-in device having contact prongs and a guide prong having an external rib, comprising two sheets of insulating material having registering contact apertures and contacts and registering guide apertures each of which latter is shaped complementarily of such guide prong with a lateral recess such as to receive the rib thereof, a guiding eyelet mounted in the guide apertures and having an external channel portion which is discontinuous in peripheral extent and engages in the lateral recesses of the guide apertures to hold the sheets against relative angular motion, said eyelet having flanges abutting the outer surfaces of the sheets adjacent to the guide apertures, said eyelet forming a guiding sleeve for such guide prong, and the inner surface of the discontinuous channel portion forming a groove to guidingly receive the rib on such guide prong to insure that the seating of the guide prong is in one predetermined angular relation of the device and receptacle.

5. In combination, a radio tube having a plurality of contact prongs and a guide prong non-circular in cross section, and a socket receptacle for the removable support of the tube comprising two sheets of insulating material having a registering series of contact apertures and registering non-circular guide apertures, contacts mounted in substantial alignment with certain of the contact apertures, a guiding eyelet externally non-circular in transverse section complementarily of the registering guide apertures so as to have but one angular positioning in which to be disposed in said guide apertures and disposed in the said guide apertures and preventing relative angular motion of the sheets, flanges formed on the eyelet and abutting the exposed surfaces of the respective sheets to reinforce and protect same adjacent to the guide apertures therein, said eyelet being internally non-circular in transverse section as a guiding complement of the non-circular guide prong of the radio tube so as to guide said radio tube to a single predetermined angular relative positioning with the socket receptacle with contact prongs in the contact apertures.

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