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COMBINATION RECEPTACLE PLUG AND JACK MEANS

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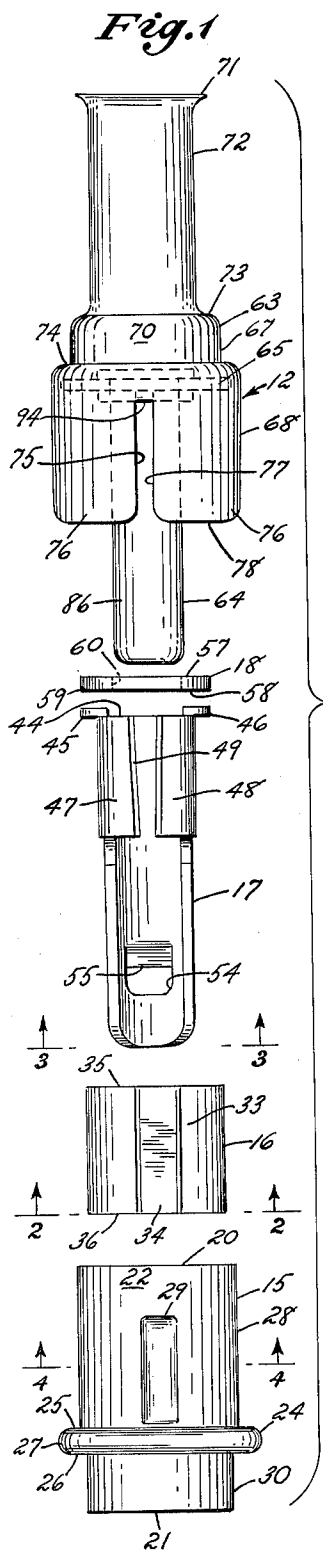
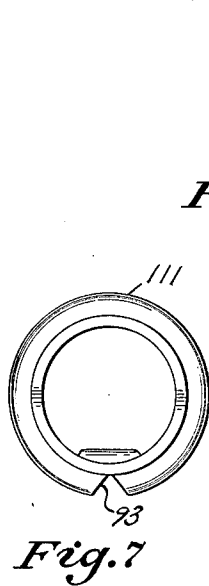
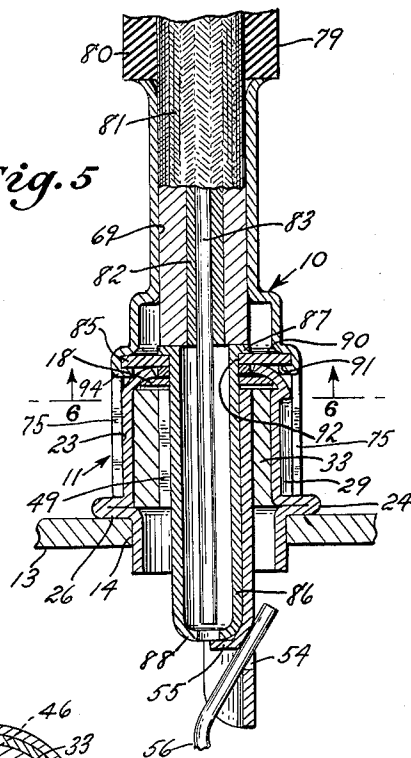
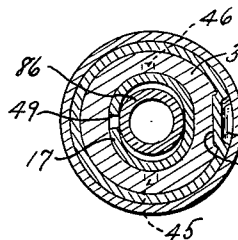


Fig. 6

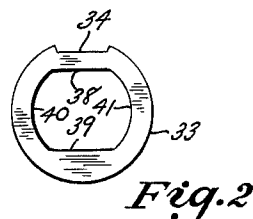


Fig. 2

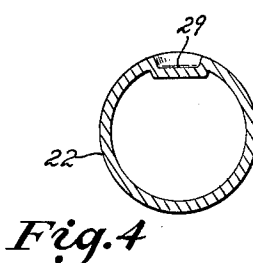


Fig. 4

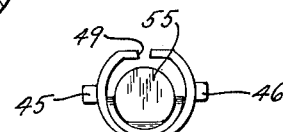


Fig. 3

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COMBINATION RECEPTACLE PLUG AND JACK MEANS

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1 Claim. (Cl. 339-177)

This invention relates generally to the field of electrical and electronic plug and jack means, and more particularly to an improved type suitable for use in conjunction with mass production assembly techniques. Devices of the above type are known in the art, and the invention lies in specific constructional details permitting improved ease and accuracy of installation.

In the installation of small jack means within an opening in a sheet metal chassis, a widely used technique is the positioning of the outer shell of the jack within the opening so that it rests upon a tapered portion thereof, which tapered portion is surrounded by a solder ring of low melting solder metal. Usually, a large number of such plugs are assembled on a single chassis, following which the chassis is placed within a heated enclosure having a temperature sufficient to melt the solder, so that upon cooling and removing the chassis from the heated enclosure, the plugs are soldered in position.

In the prior art constructions, the outer shell comprising the plug is formed to include a necked portion of slightly smaller diameter, the necked portion forming means for preventing the shell from passing completely through the opening in the chassis. As the necked portion is of tapered configuration, rather than planar configuration, only line contact occurs between the shell and the chassis prior to soldering, so that with normal commercial tolerances between the diameter of the hole in which the shell is positioned, and the outer diameter of the necked portion, the possibility of tilting away from a vertical axis prior to the melting of the solder is always present. Where the shell is soldered to the chassis, such that its principal axis is other than normal to the surface of the chassis, the completed chassis cannot be assembled with other components without difficulty, owing to the fact that the principal axis of the opening in the plug is not aligned with the corresponding jack.

Another difficulty which has been encountered in the use of conventional-type plugs has been the inability of the same to withstand torsional effects when disengaging a jack from a plug. Plugs of this type normally include the outer shell, a ceramic insulator, and an inner prong receiving member supported by the ceramic insulator. The outer shell is normally used as a ground, and the inner prong-engaging member is provided with an inner terminal to which a conductor is soldered. When the jack is inserted within the plug, or removed therefrom, owing to resilient frictional forces which must be overcome, the jack is twisted, that is to say rotated about its own principal axis to assist in this operation. As the prong-receiving construction is not positively anchored with respect to relative rotational movement within the shell, where a conductor has been soldered, the soldered connection is subjected to considerable stress, often sufficient to cause breakage of the electrical joint insofar as conductivity is concerned, even if not sufficient to mechanically break the solder of the joint.

To protect the above-mentioned solder joint from contact with the central prong of the jack, a small tongue is bent outwardly from the plane of the solder lug, which will contact the prong when the same is fully seated.

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However, a severe engaging force is often sufficient to bend the same on contact, again disturbing the solder connection. This action occurs using conventional-type jacks by virtue of the fact that the outer shield on the plug is not limited with respect to its movement upon engagement, except by direct contact with the outer surface of the chassis in which the jack is installed.

It is therefore among the principal objects of the present invention to provide improved jack and plug construction of the class described, in which the above-mentioned disadvantages have been substantially eliminated.

Another object of the invention lies in the provision of an improved plug construction having flange means on the outer shell thereof for making surface contact with the outer surface of the chassis when installed therein, so as to substantially negate the possibility of tilting of the same prior to the soldering operation.

Another object of the invention lies in the provision of improved jack means having a radially extending flange, an upper surface of which positively limits the ingress of a corresponding plug upon engagement therewith.

Yet another object of the invention lies in the provision of an improved combination plug and jack means of the class described in which the manufacturing cost may be directly comparable with existing prior art devices, thereby permitting consequent wide sale, distribution and use.

A feature of the invention lies in the direct mechanical keying of all of the components of the jack element, whereby relative rotation between any of the components is effectively prevented.

Another feature of the invention lies in the provision for direct mechanical keying of the jack element with respect to the opening within which it is installed.

These objects and features, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claim.

In the drawing, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts throughout the several views.

FIGURE 1 is an exploded view in elevation of an embodiment of the invention.

FIGURE 2 is an end elevational view, as might be seen from the plane 2-2 in FIGURE 1.

FIGURE 3 is an end elevational view, as seen from the plane 3-3 in FIGURE 1.

FIGURE 4 is a transverse sectional view, as seen from the plane 4-4 in FIGURE 1.

FIGURE 5 is a longitudinal central sectional view of the embodiment in fully assembled condition.

FIGURE 6 is a transverse sectional view as seen from the plane 6-6 in FIGURE 5.

FIGURE 7 is a view in elevation of an alternate form of jack element.

In accordance with the invention, the device, generally indicated by reference character 10, comprises broadly: a jack element 11, and a plug element 12. As seen in FIGURE 5, the device 10 is shown in installed condition upon a metallic plate 13 forming part of an electronic chassis, the same being disposed within a circular opening 14 therein.

The jack element 11 includes an outer shell member 15, a ceramic insulating member 16, an inner resilient prong-engaging member 17, and an insulative washer member 18.

The outer shell member 15 is preferably formed from tubular metallic stock as a progressive die stamping operation, and is bounded by a first circular edge 20, a second circular edge 21, an outer surface 22, and an inner surface 23. Extending radially from the outer surface 22 is an annular flange 24, having a first or exposed surface 25, a second or concealed surface 26, the surfaces 25 and 26 being interconnected by a periphery 27 of narrow radius. Extending upwardly from the flange 24 is a first tubular segment 28 having a longitudinally-arranged depression 29 forming a key, and extending downwardly from the flange 24 is a second tubular segment 30 of somewhat narrower diameter. From a consideration of FIGURE 5, it will be seen that the diameter of the segment 30 is sufficient to permit the same to pass within the opening 14, wherein the surface 26 may rest upon the outer surface of the plate 13 in surface-to-surface contact.

The ceramic insulating member 16 is adapted to be keyed to the shell member 15, and is initially slidably engaged therewith. As best seen in FIGURES 1 and 2, the member 16 is bounded by an outer cylindrical surface 33 having a quasi rectangular keyway 34. The first and second end surfaces 35 and 36, respectively, are of planar configuration. Extending axially through the body of the member 16 is a central opening 37 of generally symmetrical non-circular configuration, the opening being bounded by first and second planar surfaces 38 and 39, respectively, and first and second oppositely disposed curvilinear surfaces 40 and 41, respectively.

The inner prong-engaging member 17 is preferably formed as a metallic stamping from sheet material, and includes a first end edge 44 of arcuate configuration, from which extend first and second lateral tabs 45 and 46, respectively. Extending inwardly from the edge 44 are first and second resilient portions 47 and 48, respectively, the longitudinal edges of which define a tapered slot 49. As best seen in FIGURE 3, the portions 47 and 48 define an opening of progressively narrower cross section in a direction away from the edge 44, so that, upon engagement with the plug element 12, the same are cammed mutually away from each other to resiliently grip the same in mechanical and electrical communication. Disposed adjacent a second end edge 52 is a rectangular opening 54, formed by bending out of the plane of the metal comprising the member 17 a tab 55 (see FIGURES 3 and 5). The opening 54 forms means for engaging a conductor 56 disposed within the chassis, the same being maintained in position by soldering.

The insulative washer member 18 is of conventional type, and preferably formed from suitable phenolic resins. It is bounded by first and second planar surfaces 57 and 58, a peripheral edge surface 59, and a central bore 60, as is well-known in the art. If desired, the member 18 may also be formed of fiber, XP, XXP, XXXP, linen and canvas base phenolics, glass epoxy, Teflon, and the like.

Assembly of the plug element is accomplished by inserting the insulating member 16 within the shell member 15 in splined interconnection, following which the member 17 is inserted within the longitudinal opening in the ceramic member. Owing to the presence of the tabs 45 and 46, the member 17 is accurately located, and engagement of the end surface 36 with a portion of the flange 24 similarly locates the ceramic member with respect to the shell member. Following this, the washer member 18 is positioned immediately below the edge 20, and the edge 20 headed over to retain the members of the jack element in fixed relation.

The plug element 12 includes an outer shell member 63, an inner prong member 64, and an insulative washer 65, which members are assembled in fixed relation.

The outer shell member 63 may also be formed by progressive die techniques, and includes a base portion

67, a castellated flange portion 68, and a shank portion 66. The portions 66-68 are integrally formed, and are bounded by an inner surface 69 and an outer surface 70.

The shank portion 66 includes an outer flanged end 71, a cylindrical portion 72, and an inner end flange 73 by means of which it connects with the base portion 67.

The flange portion 68 includes a connecting flange 74, and a plurality of slots, one of which is shown at 75, which define a plurality of arcuate castellated portions 76, each of which includes a pair of side edges 77 and an end edge 78. A portion of the material which is cut to form the slots 75 is bent inwardly, as will more fully appear, to retain the insulative washer 65.

The plug element 12 is normally employed in conjunction with a well-known type of shielded conductor 79, the conductor including an outer insulative covering 80, a braided ground conductor 81, an inner insulative layer 82, and a centrally disposed conductor 83. The inner diameter of the cylindrical portion 72 is preferably equal to the outer diameter of the braided conductor 81, so that upon removal of a portion of the covering 80, a substantial area of the conductor 83 is placed in contact with the cylindrical portion 72. This not only facilitates the soldering of the connection, but, where extremely rapid production is required, it is possible to crimp mechanically the cylindrical portion 72 to obtain adequate mechanical and electrical interconnection.

The inner prong member 64 may be of a conventional type, including an elongated hollow shank 86 having an inner flanged end 87, and an outer rounded end 88, the conductor 83 being bared a length sufficient to permit a soldered interconnection within the hollow shank 86.

The insulative washer 65 may also be of a conventional fiber or phenolic type, bounded by first and second planar surfaces 90 and 91, respectively, and defining a central opening 92 through which the shank 86 may pass. The outer edge thereof is dimensioned to lie upon the flange 74, being held in position by the tabs 94 formed from the material cut to define the slots 75, as mentioned hereinabove.

Assembly of the plug element requires only the mechanical positioning of the shank 86 within the opening 92 in the washer 65, and the above-mentioned positioning followed by the engagement of the tabs 94.

Referring to FIG. 5, it will be observed that when the jack element 11 is engaged by the plug element 12, the ingress of the centrally disposed prong member 64 is limited not only by the engagement of the same with the tab 55, but by the contact of the end edges 78 with the surface 25. But for the presence of the flange 24, the sole method of limiting the ingress is the above-mentioned contact of the central prong. With normal commercial tolerances, this means alone is often not adequate, whereas the engagement of the outer shell of the plug element constitutes a positive stop upon contact with the flange, a location which is always predetermined irrespective of the orientation of the jack element with respect to the chassis.

Referring to FIGURE 7, if desired an additional keyway 93 may be formed, as indicated, in the alternate form 111 of jack element, to enable the same to be keyed with respect to the chassis in which the jack element is installed.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

In a combination grounding jack and selectively engageable plug therefor, the improvement comprising: said jack including a unitary outer shield having a first segment of first outer diameter and a second segment of second outer diameter, and a planar flange extending radially outwardly of said shield at the interconnection of

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said first and second segments; said plug including an outer shell having a castellated flange portion having a free edge selectively contacting said flange on the said jack when engaged upon one of said segments; said jack having an inner contact insulated from said outer shield 5 including a resilient prong-engaging member of elongated configuration having first and second resilient portions defining prong-engaging means, and a tab struck out from said prong-engaging member lying in the path of movement of a mating inserted prong; said plug having a corresponding inner contact insulated from said outer shell 10 including a centrally disposed prong selectively engaged within said prong-engaging member to contact said tab,

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said tab thereby serving to limit further relative axial movement, and provide means for connection of a wire.

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