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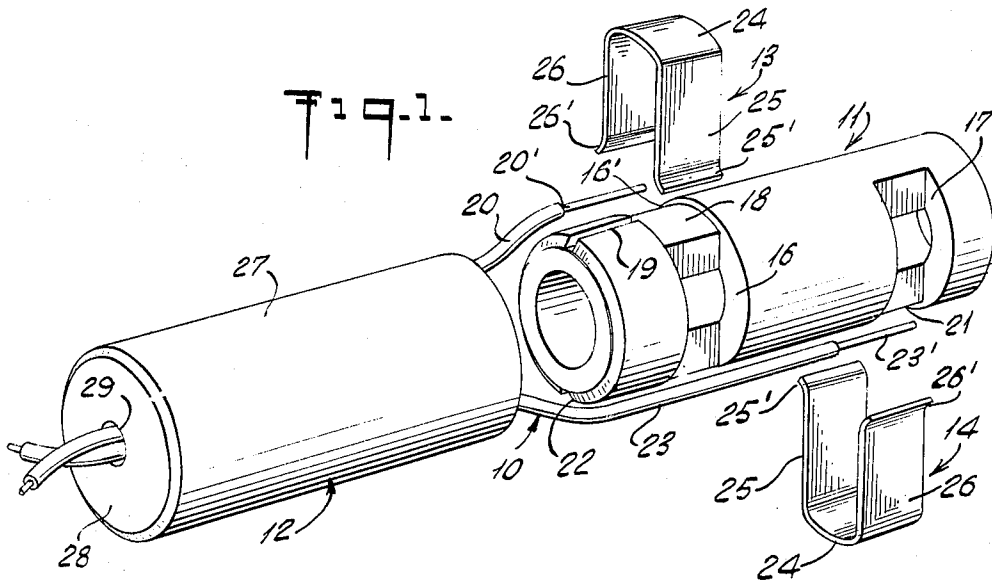
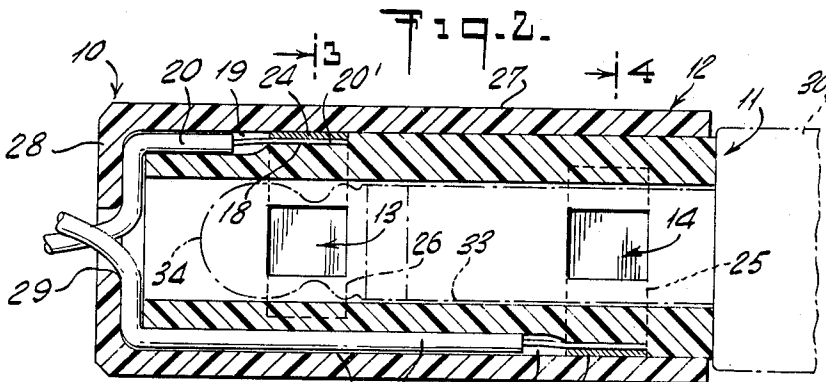
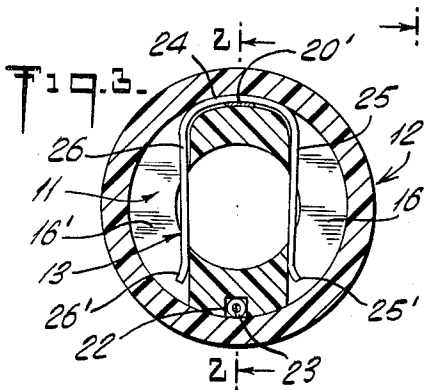
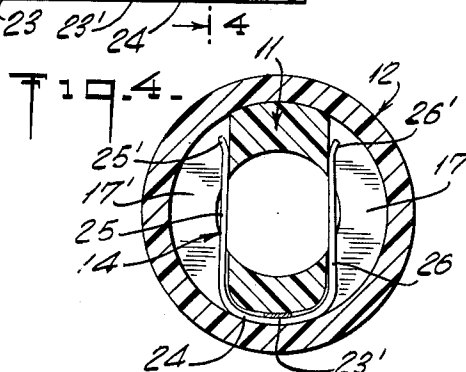
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PLUG RECEPTACLE AND CONNECTOR ASSEMBLY

Filed Jan. 22, 1963

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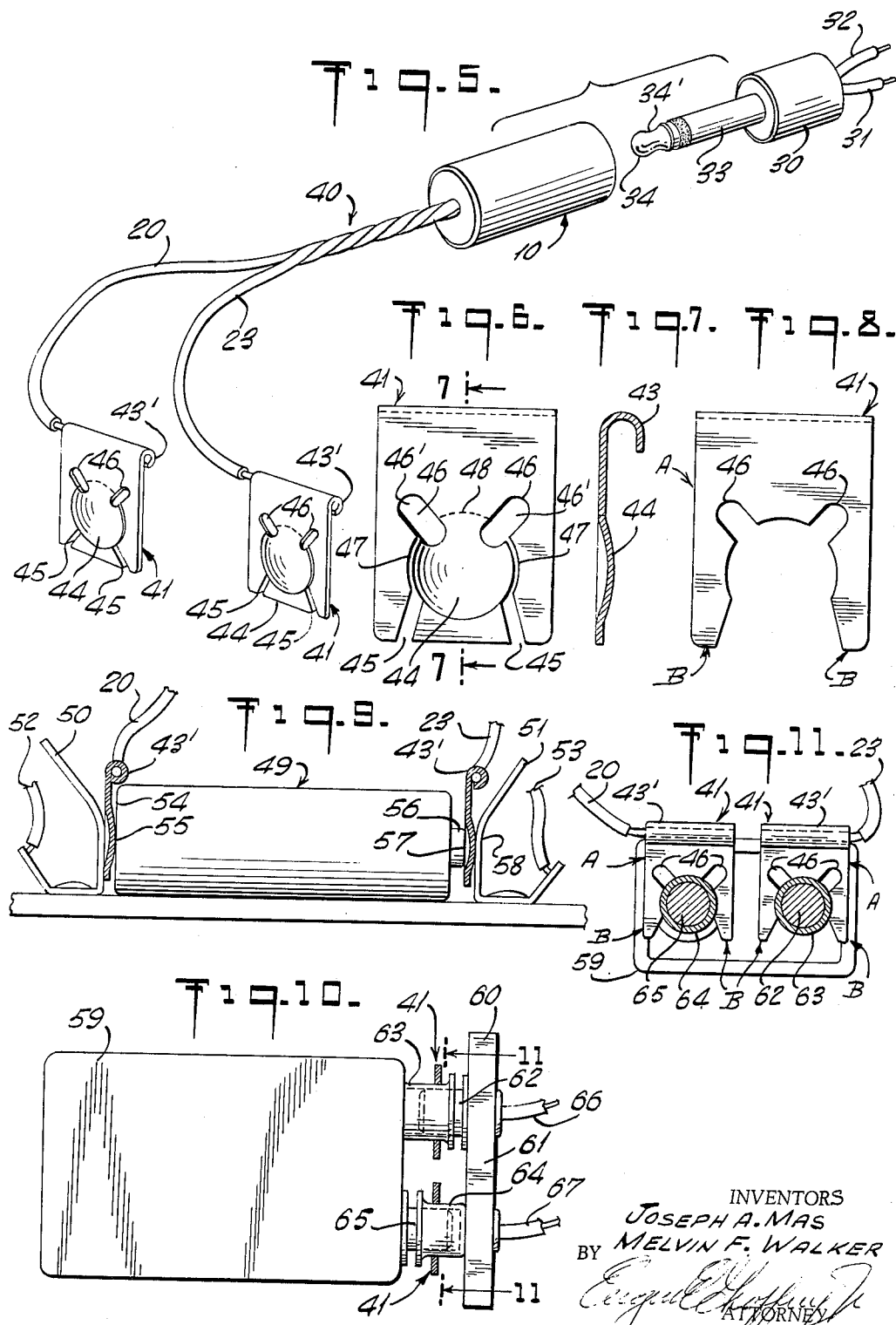
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3,246,282

PLUG RECEPTACLE AND CONNECTOR ASSEMBLY

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1 Claim. (Cl. 339-176)

This invention relates to electrical connectors and more specifically to a novel and improved plug receptacle and connector assembly that is particularly useful in a wide variety of electrical and electronic applications.

While it will become apparent that the novel and improved plug receptacle and connector assembly have a wide variety of applications, it has been found particularly useful in connection with portable battery operated radios for the attachment of an external source of energy to the batteries when in place in the equipment to provide additional power for operation of the device as well as for charging the battery.

Accordingly, it is one object of the invention to provide a novel and improved connector assembly that may be readily installed in a wide variety of battery operated devices for supplying an external source of energy thereto.

Another object of the invention resides in a novel and improved plug receptacle that is characterized by its simplicity, ruggedness and relatively low cost.

Another object of the invention resides in a novel and improved plug receptacle that may be readily fabricated in a wide variety of sizes and which is further characterized by its relatively light weight and durability.

A further object of the invention resides in the provision of a novel and improved battery connector for making firm and dependable contact with batteries while the latter are connected with a device to be operated thereby, such connectors facilitating the connection of an auxiliary device such as a battery charger, a battery voltage indicator, an auxiliary load and the like.

The above and other objects will become more apparent from the following description and accompanying drawings forming part of this application.

In the drawings:

FIGURE 1 is a greatly enlarged exploded perspective view of a plug type receptacle in accordance with the invention.

FIGURE 2 is a cross-sectional view of the assembled connector shown in FIG. 1 and taken along the line 2-2 of FIG. 3.

FIGURE 3 is a cross-sectional view of FIG. 2 taken along the line 3-3 thereof.

FIGURE 4 is a cross-sectional view of FIG. 2 taken along the line 4-4 thereof.

FIGURE 5 is a perspective view of a connector assembly utilizing the plug type receptacle as illustrated in FIGS. 1 to 4.

FIGURE 6 is a front elevational view of a novel and improved battery connector in accordance with the invention.

FIGURE 7 is a cross-sectional view of FIG. 6 taken along the line 7-7 thereof.

FIGURE 8 is a front elevational view of a connector identical to that illustrated in FIG. 6 but with a portion removed to facilitate attachment of a connector to a modified battery.

FIGURE 9 is a side elevational view of a conventional

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so-called dry cell retained between spring clips and with the battery connectors in accordance with the invention in position between the battery and the spring clips.

FIGURE 10 shows the application of a battery clip in accordance with the invention to a modified form of battery and associated connector.

FIGURE 11 is a cross-sectional view of the battery and connector assembly of FIG. 10 taken along the line 11-11 thereof.

Referring now to the drawings, a plug receptacle 10 in accordance with the invention is illustrated in FIGS. 1 to 4 and comprises four separate elements, namely, a tubular member 11, a surrounding sleeve 12 and resilient electrical connectors 13 and 14. The tubular member 11 in the instant embodiment of the invention is cylindrical and has a cylindrical opening 15 extending therethrough. The tube is further provided with two pairs of diametrically opposing slots 16, 16' and 17, 17' which intersect the central opening 15 as illustrated in FIGS. 1, 3 and 4.

The top side of the body as shown in FIG. 1 is recessed at 18 to accommodate the connector 13 and has a longitudinal groove 19 to receive the lead wire 20. The bottom side of the body is similarly recessed at 21 to join the slots 17 and 17' and accommodate the connector 14. A second longitudinal groove 22 is formed in the underside of the body and accommodates the second lead wire 23. The clips or connectors 13 and 14 are identical and are preferably fabricated out of a spring material such as phosphor bronze or the like. Each clip is in the form of a U having a transverse wall 24 which in this embodiment of the invention has a curvature corresponding to the curvature of the base of the recess 18 or 21 as the case may be. The legs 25 and 26 of each clip are essentially straight, and the distance between these legs corresponds to the thickness of the tubular body 11 remaining between the slots 16, 16' and 17, 17'. The bottom ends 25' and 26' of the legs 25 and 26 are curved outwardly to facilitate engagement of the clips with their respective slots.

The depth of the recesses 18 and 21 is adjusted so that it is slightly less than the combined thicknesses of the transverse wall 24 of the clip and the wire 20', 23' forming part of the conductors 20, 23.

The sleeve 12 which is preferably formed of insulating material has a relatively thin cylindrical wall 27 and a single closed end wall 28, the latter having an opening 29 centrally disposed therein. The total internal depth of the sleeve 12 is slightly greater than the length of the tubular member 11 which is formed of insulating material and the thickness of the wires 20 and 23. The internal diameter of the sleeve 12 is substantially equal to the external diameter of the tube 11 so that a firm engagement will be effected between the sleeve and tube when the tube is forced into the sleeve as illustrated in FIG. 2.

In assembly of this receptacle 10, the lead wires 20 and 23, which may be twisted, are inserted through the opening 29 in the sleeve 12, and the stripped end portions of the lead wires 20' and 23' are positioned in the base of the recesses 18 and 21. The insulated portions of the lead wires 20 and 23 lie within the grooves 19 and 22. The clips 13 and 14 are then placed in position as shown in FIGS. 3 and 4, and the resilience of the clips will secure them in place. The sleeve 12 is then moved into engagement with the tube and in so doing will form a tight

pressure connection between each clip and its associated lead wire and will prevent the lead wires from being pulled from engagement with their respective clips. Furthermore, the lead wires 20 and 23 curve sharply about the inner end of the tube 11 as shown in FIG. 2, and the pressure of the tube 11 against the lead wires firmly secures them in position in the connector.

If desired, a suitable cement may be utilized to cement the tube 11 within the sleeve 12, and furthermore, in certain applications, it may be desirable to solder the stripped portions 20' and 23' of the lead wires to their respective connectors.

The cooperation of the improved receptacle described above with the conventional "phone plug" is shown in FIGS. 2 and 5. The "phone plug" includes a body portion 30 to which lead wires 31 and 32 are attached. A relatively thin cylindrical sleeve 33 of conductive material extends from the body 30, and a tip 34 is carried in insulating relationship to the sleeve 33. The lead wires 31 and 32 are connected respectively to the sleeve and tip connections 33 and 34. When this plug is inserted in the connector 10, the sleeve engages the spring clip 14 while the tip 34 engages the spring clip 13. It will be observed that the tip 34 is provided with a narrow neck portion 34' and the forward portion of the tip is generally rounded. By properly positioning the slots 16 and 16' relative to the outer end of the tube 11, the tip 34 of the plug 30 will move slightly beyond the inner edge of the clip 13 so that the inner edge of that clip will engage the rearwardly curved portion of the tip 34 which forms part of the narrow neck 34'. In this way, the plug 30 will be retained in position in the receptacle 10 with the clip 13 engaging the tip 34 and the clip 14 engaging the sleeve 33.

The receptacle 10 as described above may be used to considerable advantage in connection with an improved connector assembly for making connection to a battery contained within a battery operated device such as a portable radio and the like, for supplying an external source of power to operate the device and also to maintain the charge on the battery. This improved cable assembly is shown in FIG. 5 and is generally denoted by the numeral 40. This cable assembly includes the plug receptacle 10, the leads 20 and 23 and a pair of novel and improved battery connectors 41.

The improved connector 41 in accordance with the invention is shown in FIG. 6 and comprises a flat body part 42 of a suitable conductive material such as brass, Phosphor bronze and the like, it being preferable to use a material which will afford some degree of resiliency. The top edge 43 is curved over and upon itself to receive one end of a lead wire and is then rolled tightly as indicated at 43' in FIGS. 5 and 9 to firmly hold the wire therein. If desired, the top edge 43 may be rolled as shown at 43' and then the connecting lead soldered in place. The central portion of the plate 42 has a circular dished portion 44 which is partially severed from the plate 42. This partial severance is accomplished by the formation of inclined slots 45 extending from the bottom edge of the body 42 as shown in FIG. 6 and inclined upwardly and inwardly to the periphery of the dished portion 44. These slots may be exceedingly narrow and may consist merely of slits through the material. A pair of oblong openings 46 are formed in the body and extend from the upper quadrants of the dished portion 44 and slope upwardly and outwardly as shown in FIG. 6. The outer edges 46' are in closely spaced relationship to the side edges of the body 42 and the periphery of the dished portion 44 between the inner edge of each slit 45 and the intersection of the openings 46 are partially or completely cut as indicated at 47. The peripheral portion 48 of the dished part 44 which extends between the openings 46 is scored to facilitate removal of the dished portion 44 together with the body part 42' which is formed integrally with the dished portion 44.

When the clip 41 is utilized for connection to a cylindrical battery having terminals at opposing ends as shown in FIG. 9, the dished portion 44 remains in position as shown in FIG. 6. Such a cylindrical battery, which is denoted by the numeral 49 in FIG. 9, would normally be held between spring clips 50 and 51, these clips having leads 52 and 53 secured thereto for connection to a device for operation by the battery. The base 54 of such a conventional battery 49 has an indented portion for cooperation with a shallow boss 55 on the contact 50 which secures the base of the battery 49 in engagement with the contact 50. The positive terminal 56 of the battery 49 has a boss 57 on the outer surface thereof which engages a corresponding indent on the cooperating contact 51 to effect engagement of the battery with the contact 51. When utilizing the clips 41 with the battery as shown in FIG. 9, the dished portion 44 of the clip engages both the indent on the base 54 of the battery and the boss 55 on the contact 50. The second clip similarly engages the boss 57 on the positive terminal of the battery and the indent 58 on the clip 51. In this way, the clips 41 are held in engagement with the battery and with the contacts 50 and 51.

In the case of batteries, such as the battery 59 shown in FIGS. 10 and 11, a dual terminal spring clip 60 is provided for attaching leads to the battery. The spring clip includes an elongated insulating member 61 and a pair of terminals 62 and 64. Terminal 62 cooperates with a female spring terminal 63 on the battery 59 while terminal 64, which is identical to the terminal 63 on the battery, cooperates with a cylindrical terminal 65 of the battery. In this way, the clip 60 can be placed in engagement with the battery in only one polarity and leads 66 and 67 are used to connect the battery to the device being powered. When utilizing the cable assembly 40 shown in FIG. 5 with a battery as shown in FIGS. 10 and 11, the dished portion 44 of each clip is removed as shown, for instance, in FIG. 8, and the narrowed portions A and A' of the clip permit the legs B to spring outwardly. With this arrangement, each clip 41 can be moved into engagement with the spring clips 63 and 64 to connect the receptacle 10 with the battery.

From the foregoing, it is evident that the clip 41 can be used with a wide variety of batteries including all sizes of cylindrical batteries and with many different sizes of spring clips as described in connection with FIGS. 10 and 11. If desired, the legs B as shown in FIG. 8 can be sprung outwardly to accommodate slightly larger clips or in the alternative, can be bent inwardly to accommodate smaller clips.

While only certain embodiments of this invention have been illustrated and described, it is evident that alterations, changes and modifications may be made without departing from the true scope and spirit thereof as defined in the appended claim.

What is claimed is:

An electrical receptacle comprising an elongated tube of insulating material having an opening extending there-through, said tube including at least two spaced sets of slots with each set having two diametrically opposed and aligned slots intersecting said opening with the bottoms of said slots being in substantially spaced parallel planes, the surface portion of said tube between said planes being slightly recessed, a resilient U-shaped electrical connector engaging each set of slots with a portion of each connector lying in said recessed portion, a pair of grooves in the surface of said tube with one groove extending from one recessed portion to one end of said tube and the other groove extending from the other recessed portion to said one end of said tube, lead wires connected to said electrical connectors and disposed in said grooves, a single open-ended sleeve surrounding said tube, the closed end of said sleeve overlying said one end of said tube and having an opening through which said lead wires extend, said sleeve locking said electrical

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connectors in position on said tube and securing the lead wires thereto.

References Cited by the Examiner

UNITED STATES PATENTS

1,551,876 9/1925 Hartmann 339—209 X
 1,767,808 6/1930 Nietman 339—31
 1,950,215 3/1934 Baum 339—183 X
 1,973,410 9/1934 Greibach 339—262

5

6

2,200,321 5/1940 Angell 339—183
 2,205,316 6/1940 Stratton 339—150
 2,657,369 10/1953 Ziemianin 339—183
 2,703,393 3/1955 Bird 339—183
 2,846,658 8/1958 Bender 39—108
 3,023,391 2/1962 Pahl 339—31
 3,077,523 2/1963 Clewes 339—183 X

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