COAXIAL CABLE RECEPTACLE FOR PRINTED CIRCUIT BOARDS

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References Cited

UNITED STATES PATENTS

2,774,951 12/1956 Kinkaid et al. 339/256 SP
2,958,065 10/1960 Flanagan, Jr. 339/17 R

3,179,912 4/1965 Huber et al. 339/17 R

ABSTRACT

This invention relates to a receptacle for connecting a terminated coaxial cable to circuits on a printed circuit board. More particularly, the receptacle consists of a stamped and formed shell member which contains a stamped and formed center contact and which also terminates the ground circuit to the board. The center conductor contact is embedded within a dielectric housing electrically isolating it from the shell member. Both the shell member and center contact contain formed biasing means to frictionally retain the coaxial cable.

2 Claims, 14 Drawing Figures
3,915,535

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BACKGROUND OF THE INVENTION

A "coaxial cable" means is that type of electrical cable containing two or more conductors each isolated from the others and running parallel to each other. The particular coaxial cable considered herein with respect to the instant invention is one having a center conductor embedded in a dielectric and a woven or braided metallic shield surrounding the dielectric. An outer insulating jacket surrounds the shield. The center conductor carries the RF signal while the braided shield acts to shield the RF signal from interference; i.e., crosstalk, etc. In terminating the cable the shield goes to ground.

There are a number of ways and devices for connecting a coaxial cable to a printed circuit board. Three such devices are shown in U.S. Pat. No. 3,742,425, and U.S. Application Ser. Nos. 333,589 now abandoned and 423,941, now abandoned the disclosures of which are incorporated herein by reference. The device shown in U.S. Pat. No. 3,742,425 is a vertically mounted receptacle adapted to receive a cable wherein the braided shield is terminated by being trapped between two telescoping eylets. The device shown in U.S. Application Ser. No. 333,589 is both the receptacle and the terminals which are crimped into encompassing engagement onto the cable. The cable cannot be removed from the receptacle-terminal after installation. The device shown in U.S. Application Ser. No. 423,941 is also a vertically mounted receptacle adapted to receive a cable wherein the braided shield is terminated by means of an especially-designed electrical terminal for the braided shield. This terminal is shown in U.S. Application Ser. No. 325,705, now U.S. Pat. No. 3,828,298 the disclosure of which is incorporated herein by reference.

Of the three, only the receptacle-terminal (U.S. Application Ser. No. 333,589) allows the cable to be horizontally mounted; i.e., the cable parallels the plane of the printed circuit board. However, as noted above, this device does not permit removable insertion of the cable into the receptacle.

Accordingly, the instant invention provides a receptacle comprising a stamped and formed rectangular shell member of conductive material having a pair of legs depending therefrom for receipt into a printed circuit board openings. One section of the shell member is adapted to removably receive a terminated braided shield portion of the cable and another section of the shell member contains a dielectric housing in which a stamped and formed center contact is positioned, said contact having a leg depending from the shell member for receipt into another opening in the printed circuit board, and also having a rectangular portion with one side thereof bowed inwardly to provide a spring member, said center contact adapted to removably receive the bared end of the center conductor of the cable, which when positioned therein, a continuous electrical path from the cable to the circuits on the printed circuit board may be established.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the coaxial cable receptacle, constructed in accordance with the present invention, mounted and in use on a printed circuit board;

FIG. 2 is a partially cross-sectional view of the receptacle of FIG. 1;

FIGS. 3a-3d are views showing the forming of the shell member of the receptacle of FIG. 2;

FIGS. 4a-4d are views showing the forming of the center contact of the receptacle of FIG. 2;

FIGS. 5a-5e are views of the dielectric housing of the receptacle of FIG. 2; and

FIG. 6 is an exploded view of the receptacle of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The utility of the coaxial cable receptacle is shown in FIG. 1 wherein the reference numerals 10 point out two such receptacles, one loaded with a terminated coaxial cable 12 and the other empty. The printed circuit board, generally designated by the reference numeral 14, is a conventional board having electrical circuits 16 deposited or etched thereon and, as seen in FIG. 2, a plurality of openings 18 which admit the legs of devices such as receptacle 10. The circuits 16 on the board are found on both sides as is well known.

In addition to showing the openings 18 in board 14, FIG. 2 shows a partially cross-sectional view of an assembled receptacle 10 so that the three discrete, interlocking members can be seen in their assembled relation. The three members are the shell member 20, center contact 22 and dielectric housing 24. FIG. 2 also shows, on the right hand side of receptacle 10, cable 12 in its prepared form for insertion into the receptacle. The bored center conductor 26 protrudes out from dielectric 28. A bared shield terminal 30 (disclosed in the aforementioned U.S. Application Ser. No. 325,705) surrounds and is crimped onto an exposed portion of the cable's braided shield 32. The walls 34 of the insulation support portion of the terminal 30 are wrapped around the outer insulating jacket 36 of the cable.

The forming of shell member 20 is disclosed in FIGS. 3a-3d and will now be described.

The flat shell member 20 in FIG. 3a has been stamped to provide a pair of pointed legs 38-40, a floor 42 and a floor opening 44. Each leg has shoulders 46 thereon. A reduction in the width of the opening provides two rearward facing shoulders 46, one on each side. The dashed lines at the juncture of the legs and the floor show where the legs will be bent downwardly. Two front sidewalls 48 at the front end 50 of the member have circular outside ends 52. The dashed lines indicate fold lines. These two sidewalls provide, when formed up, a front section which receives the bared shield terminal.

The two rear sidewalls 54 join with the back panel 56 to form a box-like rear section on the receptacle which holds the dielectric housing 24.

FIG. 3b is a view looking down into the receptacle with sidewalls 48-54 and panel 56 formed upwardly and legs 38-40 bent downwardly. This view was included primarily to show the floor opening 44, particularly that portion between depending leg 40 and shoulders 46. As noted elsewhere, this portion of the open-
ing, the confining sidewalls 54 and panel 56 define the rear section of the shell member. This rear section begins with the slot 58 at the sidewalls 48-54.

FIG. 3c is a side view of the shell member shown in FIG. 3b and FIG. 3d is a view looking into the front end 50 of each shell member 20 except that the top portion of each sidewall 48 has been formed into an inverted triangle, designated generally by the reference numeral 60. The triangles 60 are resilient and provide spring members 61 which bias the trialed shield terminal 30 on cable 12 when such is inserted therein.

The stamping and forming of center contact 22 is disclosed in FIGS. 4a-4d and will now be described.

The flat contact 22 in FIG. 4a has been stamped to provide a leg, a short right sidewall 64, a longer left sidewall 66 and a floor 68 which is defined by elongated slots 70 on either side thereof. The axial dashed lines indicate where the walls are to be bent and the dashed line adjacent the beveled portion on leg 62 indicates where the leg will be severed from carrier strip 72.

FIG. 4b is a top plan view showing the contact after the sidewalls have been bent along the dashed lines. This drawing and that in FIG. 4d shows that sidewall 66 forms the top wall of the contact as well as the left sidewall. FIG. 4d also shows passageway 74 provided by the floor and sidewalls of the contact.

With reference to FIG. 4c which is a side view of center contact 22, one can see that during the forming operation floor 68 has been arched upwardly to form an arcuate spring member 76. The arching also reduces the cross-sectional area of passageway 74 to less than the cross-sectional area of center conductor 26 of cable 12. This spring member has some resiliency to frictionally retain the center conductor and to provide good electrical contact between it and the center contact. Further, the forming operation provides a rectangular conductor-receiving portion 77 of center contact 22.

The dielectric housing 24 is disclosed in FIGS. 5a-5d and will now be described.

Dielectric housing 24 is molded from insulating material such as polypropylene. Its four sidewalls define a passageway 78 in which the center contact 22 is positioned. The top and two sidewalls at front end 80 of the dielectric housing projects out into the passageway slightly and is beveled as shown by reference numeral 82 to facilitate insertion of center conductor 26. Further, the projection provides rearwardly facing shoulders 84 which prevents forward longitudinal movement of the center contact.

The floor 86 is recessed inwardly from front end 80 to define a vertical groove 88.

The sidewalls, herein designated by reference numeral 90 has a reduced thickness near the base of the housing to define downwardly facing shoulders 92 and two parallel rails 94. These rails are as long as the length of opening 44 between leg 40 and shoulders 46 in the rear section of the shell member and the width between outside surfaces on the rails equal the width of the portion of openings 44 positioned in the rear section of the shell member.

The assembly of receptacle 10 is disclosed in FIGS. 6 and 2 and will now be described with references to those two drawings.

FIG. 6 is a perspective view of the shell member 20, center contact 22 and dielectric housing 24.

Center contact 22 with its leg 62 still parallel to the rectangular conductor receiving portion 77 is pushed into passageway 78 in dielectric housing 24 until the contact abuts against rearwardly facing shoulders 84 (FIG. 2 and 5a). Leg 62 is then bent downwardly, passing through groove 88, depending from dielectric housing 24 as seen in FIG. 2. The leg is bent about 90 degrees relative to conductor receiving portion 77.

The loaded dielectric housing is now dropped into the rear section of shell member 20 so that rails 94 and leg 62 pass through opening 44 (FIG. 3b) and downwardly facing shoulders 92 are abutting floor 42 (FIG. 3b). As is apparent, dielectric housing 24 is automatically centered in the rear section of the shell member by virtue of the dimensions of rails 94 and shoulders 46 in opening 44.

Once the loaded dielectric housing is in place, rear sidewalls 54 are bent down over the top of the housing to retain such in the rear section of the shell member and the assembly is complete as shown in FIG. 2.

Receptacle 10 is now placed on printed circuit board 14 with legs 38-40 being inserted into openings 18 on the board going to a ground circuit and leg 62 being inserted into an opening 18 going to a signal circuit. The downwardly facing shoulders 45 on legs 38-40 assure a correct depth of insertion. As is conventional, the legs may be soldered to the board.

A cable 12 prepared and terminated as shown in FIG. 2 is inserted into receptacle 10 so that center conductor 26 is received in conductor receiving portion 77 and frictionally retained therein by the biasing action of arcuate spring member 76. Concurrently, braided shield terminal 30 is being received into the front portion of shell member 20. Spring members 61 bias the terminal to frictionally retain such in the front section of the receptacle and to provide electrical contact therewith.

As is apparent, the RF signal circuit is established between center conductor 26 and the printed circuit board 14 via leg 62 which is electrically isolated from the rest of receptacle 10 by the dielectric housing.

The foregoing detailed description has been given for clearness of understanding only, an no unnecessary limitations should be understood therefrom, as some modifications will be obvious to those skilled in the art.

What is claimed:

1. A receptacle for mounting on a printed circuit board to removably receive a coaxial cable of the type having a center conductor, a terminated braided shield and a dielectric between, which comprises:
   a. an electrically conductive, coaxial cable receiving shell member having a floor from which a pair of legs depend, said legs being adapted to be inserted into openings in a printed circuit board, said floor further having an opening positioned between the legs, said shell member further having a front section defined by said floor and a pair of sidewalls with the top of each sidewall being bent inwardly and downwardly to provide spring members which biasingly engages the terminated braided shield portion of the coaxial cable which may be inserted therein, and a rear section;
   b. a dielectric housing positioned in the rear section of the shell member, said housing having a depending rail extending along either side of the base thereof, said rails adapted to be positioned in the opening of the floor of the shell member; and
c. a contact positioned in the dielectric housing and having a rectangular portion adapted to removably receive an end of the center conductor of the coaxial cable and further having a leg depending downwardly from one end of the dielectric housing and through the opening in the floor of the shell member for insertion into a printed circuit board.

2. A receptacle for mounting on a printed circuit board to removably receive a coaxial cable of the type having a center conductor, a terminated braided shield and a dielectric inbetween, which comprises:

a. a stamped and formed elongated shell member into which the coaxial cable may be inserted, said member having a floor and a pair of legs depending therefrom and adapted to be inserted into openings in a printed circuit board, an opening in the floor between the legs, a front section defined by a pair of sidewalls with the top portion of each sidewall bent inwardly and downwardly to provide inverted triangular-shaped spring members which biasingly engage the terminated braided shield portion of the coaxial cable which may be inserted therein, and a rear section defined by a pair of sidewalls and an upright rear panel wall with the top portion of each sidewall bent laterally inwardly to enclose the rear section;

b. a dielectric housing made from insulating material and having a passageway, a vertical groove extending downwardly from one end of the passageway, and along each longitudinal side of the base a depending rail, said housing positioned in the rear section of the shell member with the rails positioned in the floor opening; and

c. a stamped and formed center contact having a rectangular portion in which one side thereof is arched inwardly to provide a spring member and further having a leg, said rectangular portion positioned in the passageway in the dielectric housing with the leg depending downwardly along the vertical groove and passing through the floor opening in the shell member, said leg adapted to be inserted in a printed circuit board, said rectangular portion adapted to removably receive an end of the center conductor of the coaxial cable with the spring member frictionally retaining such therein, said leg connecting the circuit on the printed circuit board with an inserted center conductor.

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