

Description

This invention pertains to shielded plug and receptacle connector assemblies, and in particular to shielded receptacle assemblies which are mounted in an aperture of a conductive panel.

Many electronic circuits which are used to transmit signals are enclosed in metallic shielding for protection against the effects of electromagnetic radiation, electromagnetic interference (EMI), and the special category of radio frequency interference (RFI). There is an increasing need for separable electrical connectors which preserve the shielding properties of these circuits so as to not disturb the transmitted signal. In order to provide effective shielding, a connector system must provide a means for coupling the shields to a neutral ground potential and directing the interfering signals to ground.

Frequently, separable electrical connection is required at a housing wall, such as an electrically conductive wall of an electrical chassis. The possibility therefore arises to conveniently connect a connector shield to a conductive chassis wall which is grounded.

One such arrangement is provided in U.S. Patent No. 3922056 issued to Murawski et al., on November 25, 1975. In this arrangement, a receptacle member, mounted in the chassis wall, is completely surrounded by a metallic shield. The metallic shield is electrically connected to the chassis wall by a pair of generally L-shaped spring finger members, wherein one leg of the "L" is secured to the wall, and the other leg of the "L" wipes against the receptacle shield as it is inserted through the wall.

In U.S. Patent No. 3366918 issued to F.W. Johnson, et al., on January 30, 1968, a folded metal gasket provides a shell-to-shell-to-shell RFI shield spring which is attached to a plug member mounted in the aperture of a conductive panel. The spring includes a number of outwardly directed fingers which are compressed by a metallic female socket, as that socket engages the plug member.

In yet another patent, U.S. Patent No. 4386814 issued June 7, 1983 to John Asick, a kit is provided for converting an aperture of a conductive panel, into a shielded pin receptacle. The kit includes a unitary ground plane spring having a first set of fingers which engage the conductive panel, and a second set of fingers which project into the interior opening of a dielectric housing. The ground plane spring is trapped between the panel and the housing when the two are joined together. The second set of fingers wipe across the outside surface of a shielded plug-like connector which is inserted through the conductive panel and ground plane spring, being received within the dielectric housing. This latter arrangement, although providing a ready adaptation of existing equipment, requires a certain amount of time for a skilled operator to complete the kit conversion process. Also, a reliable grounding connection to the panel should be maintained, even if the panel or the

housing should become warped. An integral, continuous ground plane spring may not provide the shape conformance required. Further, the conversion kit of U.S. Patent No. 4386814 does not lend itself to automated assembly line fabrication procedures.

The present invention provides a receptacle assembly mountable in an opening of a panel having a grounded conductive surface for receiving and electrically engaging a shielded plug connector and for grounding the plug shield to the panel, the assembly comprising a receptacle housing with an open plug receiving end surrounded by a mounting face, a plurality of terminals mounted in said housing for mating with terminals of said plug and grounding means attached to said receptacle housing to connect the plug shield with the grounded panel, said receptacle grounding means including spaced-apart metallic grounding members mounted in the receptacle housing, each grounding member having a mounting portion secured in the housing, and a plug engaging end of each member in the housing adapted to contact the plug shield and a spring portion extending out of the plug receiving opening adjacent the mounting face for resilient compression against the panel surface, characterized in that said receptacle grounding means includes separate grounding members mounted in the receptacle housing, said receptacle housing including a plurality of slots formed in the mounting face and extending into the housing to receive the mounting portion of each grounding member therein.

The invention also includes a plug and receptacle connector assembly including the receptacle described above, in combination with a plug member having an external conductive shielding surface located adjacent its mating end.

A plug and receptacle connector assembly of the present invention constitutes, in use an interference shield system which electrically couples the shield of a plug and receptacle assembly to a grounded conductive panel.

The fully fabricated receptacle assembly is ready for mounting to a conductive panel to provide a grounding connection for a shielded plug inserted within the receptacle.

The receptacle assembly has grounding members which provide electrical connection between a grounded conductive panel and a shielded plug, wherein the assembly is comprised of a minimum number of inexpensive parts and can be readily assembled using automated mass production techniques.

The discontinuous array of grounding members readily conform to a warped, or otherwise irregular surface.

The grounding members are readily adapted to selective plating techniques, and are otherwise inexpensively formed using automated manufacturing methods.

Some ways of carrying out the present invention will be described below by way of example, and not by way of limitation, with reference to

drawings which show two specific embodiments.

In the drawings, wherein like elements are referenced alike

Fig. 1 is a perspective view of a plug and receptacle connector assembly according to the present invention;

Fig. 2 is an elevational cross sectional view of the plug and receptacle of Fig. 1, shown in a mated position;

Fig. 3 is an elevational cross sectional view of the receptacle according to the present invention; and

Fig. 4 is an alternative embodiment of the receptacle assembly of the present invention.

Referring to Fig. 1, there is shown a plug and receptacle connector system 10 comprising a plug 12 and a receptacle assembly 14. Connector system 10 connects a shielded cable 18 to another circuit element such as a printed circuit board, not shown in the drawings.

Referring now to Fig. 2, cable 18 is of a conventional shielded type, having a plurality of signal conductors 22 surrounded by a conductive cable shielding means 24. Cable shield 24 is electrically coupled to an external plug shield 26 affixed to the outer surface of plug 12. Plug shield 26 can comprise, for example, an outer metallic shell which is adapted to slip over a conventional dielectric plug housing 30.

Signal conductors 22 are connected to plug terminals 32 to form a conventional plug arrangement which is adapted for mating with the receptacle assembly. As indicated, plug 12 has a leading end 36 which is inserted within receptacle assembly 14, so as to establish an electrical connection with receptacle terminals 40.

With reference to Figs. 1 to 3, receptacle assembly 14 is seen to generally include a dielectric housing 44 having a first plug receiving end 46 with a mounting face 48, and a second opposed end 50 in which an array of terminals 40 is mounted in a conventional manner. The receptacle housing 44 includes wall portions 52 extending between its first and second ends, to form an internal plug receiving cavity 54. The housing 44 of Fig. 1 includes a first set of mounting ears 60, for securement to the edge of a printed circuit, a chassis wall or the like horizontal mounting surface. Housing 44 also includes a second set of mounting ears 62 for mounting to a vertical panel 64 as indicated in Fig. 2. As shown in Fig. 2, the plug receiving end 46 is aligned with a plug receiving aperture 68 formed in panel 64.

To provide effective shielding of signal conductors 22, plug terminals 32, and receptacle terminals 40, a system for coupling external plug shield 26 to a ground potential must be provided. To this end, receptacle assembly 14 includes an arrangement for grounding external plug shield 26 to a conductive surface 70 of panel 64.

As shown in Fig. 1, receptacle wall portions 52 include a plurality of opposed pairs of slots or channels 72 formed in receptacle wall 52, adjacent the plug receiving end 46 thereof. Channels 72 extend from the first plug receiving end 46 toward

second closed end 50, extending in a direction parallel to the direction of insertion of plug member 12, as indicated by arrow 74 in Fig. 1.

A discontinuous array of conductive grounding members 78 is disposed about the mounting face 48, with one member being received in each opposed pair of channels 72. Members 78 comprise spring contact members stamped from a blank of spring metal material and include a first end having resiliently compressible contact fingers 82 which are pressed against conductive panel surface 70 as receptacle assembly 14 is mounted to panel 64.

Each spring grounding member 78 further includes a medial body portion 84 and a second end 86 including a resilient tongue 88 which is deflected as it engages outer plug shield 26, during mating of plug 12 with receptacle assembly 14. As can be seen from Fig. 1, medial body portion 84 includes mounting ears 90 which are inserted in channels 72 in the direction of insertion 74 of plug 12 to effect mounting of members 78 in receptacle housing 44.

As plug 12 is mated with the receptacle assembly 14, outer plug shield 26 engages tongues 88 with a wiping action, thereby deflecting tongues 88 toward the bottom of the receptacle housing wall. In the embodiment of Figs. 1 to 3, recesses 94 are provided in the bottom housing wall to receive the deflected tongues 88, thereby allowing the lower surface of external plug shields 26 to engage the bottom housing wall upon completed mating of plug 12 and receptacle assembly 14.

As indicated in Fig. 2, the contact fingers 82 of the other end of member 78 are coupled to conductive panel surface 70, with cable shield 24 and external plug shield 26 being thereby effectively coupled to conductive panel surface 70. By having a plurality of spaced-apart grounding members 78 disposed around the mounting face 48 of housing plug receiving end 46, optimum electrical connection between members 78 and conductive panel surface 70 is assured, despite warpage of either panel 64 or receptacle housing 44.

Referring now to Fig. 4, an alternative embodiment of the present invention is shown comprising the receptacle assembly 114 which is similar to assembly 14 shown above, but with channels 72 extending deeper into housing cavity 54, closer toward second closed end 50. In the alternative conductive grounding member 120 incorporated in this embodiment, the resilient tongue member 122 is struck from a terminal body portion 124 located adjacent the spring contact fingers 126. The channel engaging portion 130 extends along substantially the entire edge of body portion 124, such that the terminal body portion adjacent the tongue 122 is secured within channels 72. Terminal securement barbs 134 are provided on either channel engaging portion 130 to provide retention of members 120 within receptacle housing 44. Recess 94 allows tongue 122 to be deflected outside of receptacle cavity 54, thereby allowing engagement between tongue 122 and plug shield 26.

Member 120 of Fig. 4 is substantially identical to member 78 of Figs. 1 to 3, except that a U-shaped frame member is disposed adjacent the edges of tongue member 122, the U-shaped frame comprising the remaining portion of the blank from which tongue 122 is struck. The embodiment of Fig. 4 would be employed, for example, when greater retention force is required for mounting of the grounding members 120 within receptacle housing 44.

There has been described with reference to the drawings completed receptacle assemblies having a discontinuous array of conductive grounding members mounted in a receptacle housing wall adjacent a plug receiving end thereof, such that the contact fingers at the leading end of the grounding members project outwardly beyond the housing mounting face. It will be readily appreciated by those skilled in the art that the assemblies described allow for a reduction in the number of parts that must be carried in inventory, since a single receptacle housing can be used in both shielded and non-shielded applications. When a housing for use in a shielded system is required, the connector manufacturer, using inexpensive automated techniques, can load a plurality of discrete clip members in the receptacle housing prior to shipment to the end user. The end user benefits since mounting of both non-shielded and shielded receptacle housings is identical, requiring no modification or special consideration.

Claims

1. A receptacle assembly (14; 114) mountable in an opening (68) of a panel (64) having a grounded conductive surface (70) for receiving and electrically engaging a shielded plug connector (12) and for grounding the plug shield (26) to the panel, the assembly comprising a receptacle housing (44) with an open plug receiving end surrounded by a mounting face (48), a plurality of terminals (40) mounted in said housing for mating with terminals of said plug and grounding means (78 or 120) attached to said receptacle housing to connect the plug shield (26) with the grounded panel, said receptacle grounding means including spaced-apart metallic grounding members (78; 120) mounted in the receptacle housing, each grounding member having a mounting portion secured in the housing, and a plug engaging end of each member in the housing adapted to contact the plug shield (26) and a spring portion extending out of the plug receiving opening adjacent the mounting face for resilient compression against the panel surface, characterised in that said receptacle grounding means includes separate grounding members (78 or 120) mounted in the receptacle housing, said receptacle housing including a plurality of slots or channels (72) formed in the mounting face and extending into the housing to receive the mounting portion of each grounding member therein.

2. The assembly of claim 1 wherein the receptacle housing slots include pairs of opposed slots or channels (72) located adjacent said plug receiving end of said receptacle housing, and said grounding members (78 or 120) mounting portion includes transversely extending mounting ears (74 or 134) which are slidably received in said slots or channels in a direction of insertion of said plug connector.

3. The assembly of claim 2 wherein said receptacle housing further includes an indent (94) inward of the mounting face for receiving said plug engaging end of the grounding members (78 or 120) when electrical connection is made therewith to said plug shield.

4. The assembly of claim 2 wherein said plug engaging end of the grounding member (120) includes a resilient tongue (122) struck from said clip.

5. The assembly of any preceding claim wherein said receptacle terminals (40) comprise pin-like members mounted in a second housing end opposing said plug receiving end.

Patentansprüche

1. In einer Öffnung (68) einer Platte (64) mit einer geerdeten Leiterfläche (70) einsetzbare Buchsenanordnung (14; 114) zur Aufnahme eines abgeschirmten Anschlußsteckers (12) mit elektrischem Eingriff und zum Erden der Steckerabschirmung (26) an der Platte, bestehend aus einem Buchsengehäuse (44) mit einem offenen, von einer Montagefläche (48) umgebenen Steckeraufnahmeende, einer Mehrzahl von im Gehäuse angebrachten Anschlüssen (40) zur Verbindung mit Anschlüssen der Stecker- und Erdungseinrichtung, die am Buchsengehäuse zur Verbindung der Steckerabschirmung (26) mit der geerdeten Platte angebracht sind, wobei die Buchsenerdungseinrichtung im Buchsengehäuse mit Abstand voneinander angebrachte metallische Erdungsglieder (78; 120) aufweist, jedes Erdungsglied einen im Gehäuse befestigten Montagebereich aufweist, ein Steckereingriffsende jedes Glieds im Gehäuse mit der Steckerabschirmung (26) in Kontakt bringbar ist und sich ein Federbereich aus der Steckeraufnahmeöffnung an der Montagefläche für eine elastische Zusammenpressung an der Plattenfläche herauserstreckt, dadurch gekennzeichnet, daß die Buchsenerdungseinrichtung gesonderte im Buchsengehäuse angebrachte Erdungsglieder (78; 120) aufweist und das Buchsengehäuse eine Mehrzahl von Schlitzten oder Kanälen (72) besitzt, die in der Montagefläche gebildet sind und sich in das Gehäuse zur Aufnahme des Montagebereichs eines jeden Erdungsglieds erstrecken.

2. Anordnung nach Anspruch 1, bei der die Buchsengehäuseschlitze Paare einander gegenüberliegender, am Steckeraufnahmeende des Buchsengehäuses angeordneter Schlitze oder Kanäle (72) aufweisen und der Montagebereich der Erdungsglieder (78; 120) sich in Querrichtung der Erstreckende Befestigungsnasen (74; 134) besitzt,



Member 120 of Fig. 4 is substantially identical to member 78 of Figs. 1 to 3, except that a U-shaped frame member is disposed adjacent the edges of tongue member 122, the U-shaped frame comprising the remaining portion of the blank from which tongue 122 is struck. The embodiment of Fig. 4 would be employed, for example, when greater retention force is required for mounting of the grounding members 120 within receptacle housing 44.

There has been described with reference to the drawings completed receptacle assemblies having a discontinuous array of conductive grounding members mounted in a receptacle housing wall adjacent a plug receiving end thereof, such that the contact fingers at the leading end of the grounding members project outwardly beyond the housing mounting face. It will be readily appreciated by those skilled in the art that the assemblies described allow for a reduction in the number of parts that must be carried in inventory, since a single receptacle housing can be used in both shielded and non-shielded applications. When a housing for use in a shielded system is required, the connector manufacturer, using inexpensive automated techniques, can load a plurality of discrete clip members in the receptacle housing prior to shipment to the end user. The end user benefits since mounting of both non-shielded and shielded receptacle housings is identical, requiring no modification or special consideration.

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2. The assembly of claim 1 wherein the receptacle housing slots include pairs of opposed slots or channels (72) located adjacent said plug receiving end of said receptacle housing, and said grounding members (78 or 120) mounting portion includes transversely extending mounting ears (74 or 134) which are slidably received in said slots or channels in a direction of insertion of said plug connector.

3. The assembly of claim 2 wherein said receptacle housing further includes an indent (94) inward of the mounting face for receiving said plug engaging end of the grounding members (78 or 120) when electrical connection is made therewith to said plug shield.

4. The assembly of claim 2 wherein said plug engaging end of the grounding member (120) includes a resilient tongue (122) struck from said clip.

5. The assembly of any preceding claim wherein said receptacle terminals (40) comprise pin-like members mounted in a second housing end opposing said plug receiving end.

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1. In einer Öffnung (68) einer Platte (64) mit einer geerdeten Leiterfläche (70) einsetzbare Buchsenanordnung (14; 114) zur Aufnahme eines abgeschirmten Anschlußsteckers (12) mit elektrischem Eingriff und zum Erden der Steckerabschirmung (26) an der Platte, bestehend aus einem Buchsengehäuse (44) mit einem offenen, von einer Montagefläche (48) umgebenen Steckeraufnahmeende, einer Mehrzahl von im Gehäuse angebrachten Anschlüssen (40) zur Verbindung mit Anschlüssen der Stecker- und Erdungseinrichtung, die am Buchsengehäuse zur Verbindung der Steckerabschirmung (26) mit der geerdeten Platte angebracht sind, wobei die Buchsenerdungseinrichtung im Buchsengehäuse mit Abstand voneinander angebrachte metallische Erdungsglieder (78; 120) aufweist, jedes Erdungsglied einen im Gehäuse befestigten Montagebereich aufweist, ein Steckereingriffsende jedes Glieds im Gehäuse mit der Steckerabschirmung (26) in Kontakt bringbar ist und sich ein Federbereich aus der Steckeraufnahmeöffnung an der Montagefläche für eine elastische Zusammenpressung an der Plattenfläche herauserstreckt, dadurch gekennzeichnet, daß die Buchsenerdungseinrichtung gesonderte im Buchsengehäuse angebrachte Erdungsglieder (78; 120) aufweist und das Buchsengehäuse eine Mehrzahl von Schlitten oder Kanälen (72) besitzt, die in der Montagefläche gebildet sind und sich in das Gehäuse zur Aufnahme des Montagebereichs eines jeden Erdungsglieds erstrecken.

2. Anordnung nach Anspruch 1, bei der die Buchsengehäuseschlitten Paare einander gegenüberliegender, am Steckeraufnahmeende des Buchsengehäuses angeordneter Schlitten oder Kanäle (72) aufweisen und der Montagebereich der Erdungsglieder (78; 120) sich in Querrichtung erstreckende Befestigungsnasen (74; 134) besitzt.



die in den Schlitzten oder Kanälen in Einsteckrichtung des Anschlußsteckers gleitend aufgenommen sind.

3. Anordnung nach Anspruch 2, bei der das Buchsengehäuse ferner einen Einschnitt (94) von der Montagefläche nach innen zur Aufnahme des Steckereingriffsendes der Erdungsglieder (78; 120) bei Herstellung deren elektrischer Verbindung mit der Steckerabschirmung aufweist.

4. Anordnung nach Anspruch 2, bei der das Steckereingriffsende des Erdungsglieds (120) eine aus dem Glied ausgedrückte federnde Zunge (122) aufweist.

5. Anordnung nach einem der vorhergehenden Ansprüche, bei der die Buchsenanschlüsse (40) stiftförmige Glieder umfassen, die in einem zweiten Gehäuseende gegenüber dem Steckeraufnehmende angebracht sind.

Revendications

1. Connecteur femelle (14; 114) qui peut être monté dans une ouverture (68) d'un panneau (64) offrant une surface conductrice à la masse (70) et qui est destiné à loger un connecteur mâle blindé (12) et à coopérer électriquement avec celui-ci et est destiné à mettre le blindage (26) de ce connecteur mâle à la masse sur le panneau, ce connecteur femelle comprenant un boîtier de connecteur femelle (44) possédant une extrémité ouverte de réception de connecteur mâle entourée par une face de montage (48), plusieurs bornes (40) montées dans ce boîtier en vue de s'emboîter sur des bornes du connecteur mâle, et des moyens de mise à la terre (78; 120) fixés sur le boîtier de connecteur femelle dans le but de relier le blindage (26) du connecteur mâle au panneau mis à la masse, ces moyens de mise à la terre du connecteur femelle comprenant des éléments métalliques espacés de mise à la masse (78; 120) montés dans le boîtier du connecteur femelle, chaque élément de mise à la masse possédant une partie de montage immobilisée dans le boîtier, et une extrémité, de coopération avec le connecteur mâle, de chaque élément situé dans le boîtier qui est agencée de façon à venir au contact du blindage (26) du connecteur mâle et une partie faisant ressort qui s'étend hors de l'ouverture de réception de connecteur mâle en position adjacente à la face de montage en vue d'une compression élastique contre la surface du panneau, caractérisé en ce que les moyens de mise à la masse du connecteur femelle comprennent des éléments séparés de mise à la masse (78; 120) montés dans le boîtier du connecteur femelle, ce boîtier de connecteur femelle comportant plusieurs fentes ou couloirs (72) ménagés dans la face de montage et s'étendant dans le boîtier de façon que s'y loge la partie de montage de chaque élément de mise à la masse.

2. Connecteur femelle suivant la revendication 1, dans lequel les fentes du boîtier de connecteur femelle comprennent des paires de fentes ou couloirs (72) disposés en position adjacente à l'extrémité de réception de connecteur mâle du boîtier de connecteur femelle et la partie de montage des éléments de mise à la masse (78; 120) comprend des pattes de montage s'étendant transversalement (74; 134) qui se logent de façon coulissante dans les fentes ou couloirs dans le sens d'introduction du connecteur mâle.

3. Connecteur femelle suivant la revendication 2, dans lequel le boîtier de ce connecteur femelle comporte en outre un évidement (94) situé du côté intérieur par rapport à la face de montage et destiné à loger l'extrémité, de coopération avec le connecteur mâle, des éléments de mise à la masse (78; 120) lorsqu'une connexion électrique est réalisée sur le blindage à l'aide de ceux-ci.

4. Connecteur femelle suivant la revendication 2, dans lequel l'extrémité, de coopération avec le connecteur mâle, de l'élément de mise à la masse (120) comporte une languette élastique (122) constituée par un crevé réalisé à partir de ladite pièce.

5. Connecteur femelle suivant l'une quelconque des revendications précédentes, dans lequel les bornes (40) de ce connecteur femelle sont constituées par des éléments en forme de broche montés dans une seconde extrémité de boîtier située à l'opposé de l'extrémité de réception du connecteur mâle.