

Description

It is often desirable to make electrical taps to a plurality of wires in an electrical cable.

In one known connector assembly disclosed in US-A-4,032,211 a male and female connector each having a wire connecting side and a mating side, oppositely directed to the wire connecting side, are clamped together with their wire connecting sides adjacent and wire connecting portions of corresponding terminals in alignment, the mating sides being oppositely directed.

However, a disadvantage of such prior connector assembly is that no provision is made for shielding the wires which is often desirable and to avoid signal interference. In addition, there are no means for mechanically connecting the assembly to further assemblies as may often be desired, for example, in a telephone substation.

According to the invention an electrical connector assembly for multiple wire cable, having a male and female connector pair with terminals thereof having aligned wire connecting portions and oppositely projecting mating portions adjacent mating sides of said connector pair; is characterised by first and second metal intermated shells fully enclosing said connector pair to shield them and having a first opening encircled by a first flange exposing a first mating side of one of said pair of connectors, the flange extending beyond the first mating side, and a second opening encircled by a second flange exposing a second mating side of the other of said connectors, the second flange extending beyond the second mating side, ends of said shells defining between them a cable entrance for wires of a multiple wire cable, connected to said pair of connectors and fastening means extending through said intermated shells to connect together, plural, stacked pairs of intermated shells, and wherein the first flange of said pair of mating connectors will mate with the second flange of another such pair of mating connectors and a plug mating side of said pair of connectors will interfit with a receptacle mating side of said other pair of connectors so that a pair of multiple wire cables are electrically coupled together.

There is disclosed in US-A-3,056,942, an electrical connector having a bipartite shield divided along a medial plane. In order to shield a pair of mating connectors, therefore, four shielding parts are needed, and even so, the connectors are not fully enclosed by the cover and the pair of mating connectors can be mated only with one other such pair of connectors. Also, cable entry is provided for by means of clamps secured to shielding parts.

Connector assemblies of the invention can provide a completely shielded tapped connection to two or more coaxial cables and may be readily mechanically connected together on site, and each pair of mating connectors can mate with two other such pairs of mating connectors. Each shielding shell can be cast as a unit, since the

cable entrance is defined by the shells themselves.

Conveniently, the fastener means includes a plurality of cap screws extending through aligned openings in the shells and each having a screw threaded shank end portion and a complementarily screw threaded head, the shank end portion of each cap screw projecting outwardly of the shells and engaging in the screw threaded head of a cap screw of said other pair of connectors, whereby a plurality of connector assemblies are interlocked together. These cap screws can all be identical with one another, so that both stocking and the assembly of a stack of connector assemblies are simplified.

US-A-3,056,942 discloses the use of cap screws for securing only two connectors together. A plurality of different kinds of screws of different dimensions are employed.

Preferably, a pair of wire clamping members each having a hasp at one end and at the other end a latch, are latched together about the abutting wire connecting sides of the pair of mating connectors to provide strain relief for the wires, the clamping members cooperating to hold the wires in mutually aligned channels formed in said wire connecting sides, the surface of each said member being rounded to prevent pinching damage to the wires and an undercut channel extending along each clamping member providing clearance for the corresponding wires.

Although US-A-4,095,870, US-A-3,920,306 and US-A-3,824,530 disclose wire clamping members which can be latched together about wires on opposite sides of an electrical connector, the wire clamping members do not cooperate to retain the wires in mutually aligned channels formed in a pair of mated connectors, having a common cable entrance at one end.

An example of the invention will now be described with reference to the accompanying drawings in which:

Figure 1 is an exploded perspective view of a connector assembly according to the invention;

Figure 2 is a view of the connector assembly shown in Figure 1;

Figure 3 is an end view of the connector assembly of Figure 2;

Figure 4 is a cross-sectional view taken along line 4-4 of Figure 2; and

Figure 5 is a side elevation partly in cross-section of two connector assemblies clamped together in mating engagement (with strain relieving clasps omitted for clarity).

The connector assembly 1 is for effecting shielded connection to individual wires 4 of a coaxial cable 2 which wires are surrounded by a shield 6 of metal braid which is contained within an outer jacket 8 of plastics material. The wires 4 are connected to corresponding electrical terminals in each of two connectors described in United States Patent Specification No. 3,760,335, one connector being a male or plug connector 10, and the other being a female or receptacle con-

nectors 10 and 12, clamped together in back-to-back relationship. The wires 4 are connected to the terminals of the plug connector 10 and receptacle connector 12 using the technique disclosed in United States Patent Specification No. 4,032,211.

More specifically, the plug connector has a wire connecting side 10A abutting a wire connecting side 12A of the receptacle connector 12. Each side 10A and 12 is provided with two rows of mutually aligned wire receiving channels 14. Electrical terminals of the type disclosed in United States Patent Specification No. 3,760,335 have wire connecting portions located in the channels 14 of each connector and these wire connecting portions will penetrate the insulation of a wire when inserted into a channel, and establish electrical contact with the conductive core of the wire. As shown in Figures 1 and 5, the wires 4 are divided into two groups, 4A and 4B distributed along perspective parallel rows of the channels 14 and connected to respective rows of electrical terminals therein. The terminated wires 4A and 4B are then covered by a pair of clasps 16 each moulded in one piece from plastics material and of sufficient length to cover the opposed wire-connecting sides 10 and 12A. Undercut channels 18 are formed along each clasp 16 to provide a clearance for corresponding wires. The surface of each clasp is rounded to prevent pinching damage to any of the wires. One end of each clasp 16 is provided with a latching projection 19, engageable in an opening 23 in a hasp 21 on the other end of each clasp to secure the clasps together thereby to hold the wires more securely in the channels preventing inadvertent disconnection from the electrical terminals.

The connectors 10 and 12 further comprise a female or receptacle mating side 12B oppositely directed to a male or plug mating side 10B. A flange 12C and 10C on the receptacle and plug respectively separate the mating sides from the wire receiving sides 12A and 10A. In practice, the peripheries of the flanges 12C and 10C are reduced for compactness, and to fit within the confines of corresponding cast metal half-shells 20 and 22, described below.

The half-shells 20 and 22 are formed with rearwardly facing cavities 24 and 48 receiving the connectors 10 and 12, respectively. Bottom walls 26, 50 of respective cavities communicating with elongate openings 28 and 52 encircled by flanges 30 and 54 which extend beyond the mating sides of respective connectors. Side walls 32 and 34 merge with thickened end walls 36, 58 and 38 provided with threaded bores 68. Hemi-cylindrical cable lead-out openings 42 and 56, respectively, of stepped diameter are provided in the ends 36 and 58 and are formed with mutually aligned spaced apart ribs 44 and 60, respectively, and semi-cylindrical grooves 46 and 62. When the half-shells 20 and 22 are clamped together as shown in Figure 5, the grooves 46 and 62 are in mutual alignment to receive an O-ring 64 which tightly grips the jacket 8 of the cable 2, and is installed prior to connecting the wires 4 to the

connectors 10 and 12. In addition, the ribs 44 and 60 are clamped against the shield 6 to establish a good mechanical and electrical connection therewith. The flanges 10C and 12C seat against the bottom walls 26 and 50 respectively, with the plug and receptacle mating sides 10B and 12B projecting into the openings 28 and 52 encircled by the flanges 30 and 54 respectively. Screws 66 passing through bores 40 engage threaded bores 68 connecting the shells 22 and 24 together. To complete the assembly, elongate cap screws 70 pass through aligned openings 72 in the shell 20, 74 in the flange 10C, 76 in the flange 12C and 78 in the shell 22. Each cap screw 70 includes an enlarged threaded shank end 80 which projects outwardly of the shell 22. The ends 80 may engage complementary screwheads of another set of cap screws 70 which are assembled to another connector, allowing a plurality of connector assemblies 1 to be stacked and interlocked together, whereby the cables 2 may have their wires 4 electrically coupled together. As shown in Figure 5, the half-shell flange 54 fits into the half-shell flange 30 in mating relation. In addition, the receptacle mating side 12A intermates with a plug mating face 10B of the other connector.

Claims

1. An electrical connector assembly for multiple wire cable, having a male and female connector pair (10, 12) with terminals thereof having aligned wire connecting portions and oppositely projecting mating portions adjacent mating sides of said connector pair (10, 12), characterised by first and second metal intermated shells (20 and 22) fully enclosing said connector pair (10, 12) to shield them and having a first opening (28) encircled by a first flange (30) exposing a first mating side (12B) of one of said pair of connectors (10), the flange (30) extending beyond the first mating side, and a second opening (52) encircled by a second flange (54) exposing a second mating side (10B) of the other (12) of said connectors, the second flange extending beyond the second mating side, ends of said shells (20 and 22) defining between them a cable entrance (42, 56) for wires of a multiple wire cable (2), connected to said pair of connectors (10, 12), and fastening means (70, 80) extending through said intermated shells (20 and 22) to connect together, plural, stacked pairs of intermated shells (20 and 22), and wherein the first flange (30) of said pair of mating connectors (10, 12) will mate with the second flange (54) of another such pair of mating connectors (10, 12), and a plug mating side (10B) of said pair of connectors (10, 12) will interfit with a receptacle mating side (12B) of said other pair of connectors (10, 12) so that a pair of multiple wire cables (2) are electrically coupled together.

2. An electrical connector assembly according to claim 1, characterised in that the fastener means includes a plurality of cap screws (70, 80) extending through aligned openings (72) in the shells (20 and 22) and each having a screw

(12)

nectors 10 and 12, clamped together in back-to-back relationship. The wires 4 are connected to the terminals of the plug connector 10 and receptacle connector 12 using the technique disclosed in United States Patent Specification No. 4,032,211.

More specifically, the plug connector has a wire connecting side 10A abutting a wire connecting side 12A of the receptacle connector 12. Each side 10A and 12 is provided with two rows of mutually aligned wire receiving channels 14. Electrical terminals of the type disclosed in United States Patent Specification No. 3,760,335 have wire connecting portions located in the channels 14 of each connector and these wire connecting portions will penetrate the insulation of a wire when inserted into a channel, and establish electrical contact with the conductive core of the wire. As shown in Figures 1 and 5, the wires 4 are divided into two groups, 4A and 4B distributed along perspective parallel rows of the channels 14 and connected to respective rows of electrical terminals therein. The terminated wires 4A and 4B are then covered by a pair of clasps 16 each moulded in one piece from plastics material and of sufficient length to cover the opposed wire-connecting sides 10 and 12A. Undercut channels 18 are formed along each clasp 16 to provide a clearance for corresponding wires. The surface of each clasp is rounded to prevent pinching damage to any of the wires. One end of each clasp 16 is provided with a latching projection 19, engageable in an opening 23 in a hasp 21 on the other end of each clasp to secure the clasps together thereby to hold the wires more securely in the channels preventing inadvertent disconnection from the electrical terminals.

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connectors 10 and 12. In addition, the ribs 44 and 60 are clamped against the shield 6 to establish a good mechanical and electrical connection therewith. The flanges 10C and 12C seat against the bottom walls 26 and 50 respectively, with the plug and receptacle mating sides 10B and 12B projecting into the openings 28 and 52 encircled by the flanges 30 and 54 respectively. Screws 66 passing through bores 40 engage threaded bores 68 connecting the shells 22 and 24 together. To complete the assembly, elongate cap screws 70 pass through aligned openings 72 in the shell 20, 74 in the flange 10C, 76 in the flange 12C and 78 in the shell 22. Each cap screw 70 includes an enlarged threaded shank end 80 which projects outwardly of the shell 22. The ends 80 may engage complementary screwheads of another set of cap screws 70 which are assembled to another connector, allowing a plurality of connector assemblies to be stacked and interlocked together, whereby the cables 2 may have their wires 4 electrically coupled together. As shown in Figure 5, the half-shell flange 54 fits into the half-shell flange 30 in mating relation. In addition, the receptacle mating side 12A intermates with a plug mating face 10B of the other connector.

Claims

1. An electrical connector assembly for multiple wire cable, having a male and female connector pair (10, 12) with terminals thereof having aligned wire connecting portions and oppositely projecting mating portions adjacent mating sides of said connector pair (10, 12), characterised by first and second metal intermated shells (20 and 22) fully enclosing said connector pair (10, 12) to shield them and having a first opening (28) encircled by a first flange (30) exposing a first mating side (12B) of one of said pair of connectors (10), the flange (30) extending beyond the first mating side, and a second opening (52) encircled by a second flange (54) exposing a second mating side (10B) of the other (12) of said connectors, the second flange extending beyond the second mating side, ends of said shells (20 and 22) defining between them a cable entrance (42, 56) for wires of a multiple wire cable (2), connected to said pair of connectors (10, 12), and fastening means (70, 80) extending through said intermated shells (20 and 22) to connect together, plural, stacked pairs of intermated shells (20 and 22), and wherein the first flange (30) of said pair of mating connectors (10, 12) will mate with the second flange (54) of another such pair of mating connectors (10, 12), and a plug mating side (10B) of said pair of connectors (10, 12) will interfit with a receptacle mating side (12B) of said other pair of connectors (10, 12) so that a pair of multiple wire cables (2) are electrically coupled together.

2. An electrical connector assembly according to claim 1, characterised in that the fastener means includes a plurality of cap screws (70, 80) extending through aligned openings (72) in the shells (20 and 22) and each having a screw



threaded shank end portion (80) and a complementarily screw threaded head, the shank end portion (80) of each cap screw (70, 80) projecting outwardly of the intermated shells (20 and 22) and engaging in the screw threaded head of a cap screw (78, 80) of said other pair of connectors (10, 12), whereby a plurality of connector assemblies (1) are interlocked together.

3. An electrical connector assembly according to claim 1 or 2, characterised in that a pair of wire clamping members (16) each having a hasp (21) at one end and at the other end a latch (19) are latched together about the abutting wire connecting sides (10A and 12A) of the pair of mating connectors (10 and 12) to provide strain relief for the wires, the clamping member (16) cooperating to hold the wires in mutually aligned channels (14) formed in said wire connecting sides (10A and 12A), the surface of each said member (16) being rounded to prevent pinching damage to the wires and an undercut channel (18) extending along each clamping member (16) providing clearance for the corresponding wires.

Revendications

1. Assemblage de connecteurs électriques pour câble à fils multiples comportant une paire de connecteurs mâle et femelle (10, 12) dont des bornes comportent des parties alignées de connexion de fils et des parties d'accouplement, faisant saillie dans des directions opposées, adjacentes aux côtés d'accouplement de ladite paire de connecteurs (10, 12), caractérisé par des première et seconde coques métalliques (20 et 22), accouplées entre elles, renfermant totalement ladite paire de connecteurs (10, 12) pour les blinder et présentant une première ouverture (28) entourée d'un premier rebord (30), mettant à découvert un premier côté d'accouplement (12B) de l'un des connecteurs (10) de ladite paire, le rebord (30) s'étendant au-delà du premier côté d'accouplement, et une seconde ouverture (52) entourée d'un second rebord (54), mettant à découvert un second côté d'accouplement (10B) de l'autre (12) desdits connecteurs, le second rebord s'étendant au-delà du second côté d'accouplement, des extrémités desdites coques (20 et 22) définissant entre elles une entrée de câble (42, 56) pour les fils d'un câble (2) à fils multiples, connecté à ladite paire de connecteurs (10, 12), et des moyens de fixation (70, 80) passant à travers lesdites coques accouplées entre elles (20 et 22) pour relier ensemble plusieurs paires empilées de coques (20 et 22) accouplées entre elles, et dans lequel le premier rebord (30) de ladite paire de connecteurs complémentaires (10, 12) s'accouple avec le second rebord (54) d'une autre paire identique de connecteurs complémentaires (10, 12), et un côté d'accouplement mâle (10B) de ladite paire de connecteurs (10, 12) s'enclenche étroitement avec un côté d'accouplement femelle (12B) de ladite autre paire de connecteurs (10, 12) afin que deux câbles (2) à fils

multiples soient accouplés électriquement ensemble.

2. Assemblage de connecteurs électriques selon la revendication 1, caractérisé en ce que les moyens de fixation comprennent plusieurs vis à tête (70, 80) passant dans des ouvertures alignées (72) des coques (20 et 22) et comportant chacune un tronçon extrême de tige filetée (80) et une tête taraudée complémentaire, le tronçon extrême de tige (80) de chaque vis à tête (70, 80) faisant saillie vers l'extérieur des coques (20 et 22) accouplées entre elles et étant vissé dans la tête taraudée d'une vis à tête (78, 80) de ladite autre paire de connecteurs (10, 12), afin que plusieurs assemblages (1) de connecteurs soient verrouillés entre eux.

3. Assemblage de connecteurs électriques selon la revendication 1 ou 2, caractérisé en ce que deux éléments (16) de bridage de fils, comportant chacun un morillon (21) à une extrémité et un verrou (19) à l'autre extrémité, sont verrouillés entre eux autour des côtés (10A et 12A) de connexion des fils, en butée, de la paire de connecteurs complémentaires (10 et 12), afin d'assurer le soulagement des contraintes des fils, l'élément de bridage (16) coopérant de façon à maintenir les fils dans des rainures (14) alignées mutuellement, formées dans lesdits côtés de connexion de fils (10A et 12A), la surface de chaque élément (16) étant arrondie afin d'empêcher und détérioration par pincement des fils, et une rainure rentrante (18), qui s'étend le long de chaque élément de bridage (16), établissant un espace pour les fils correspondants.

Patentansprüche

1. Elektrische Verbinderanordnung für Mehrleiterkabel, mit einem Paar (10, 12) bestehend aus Stecker-Verbinder und Aufnahme-Verbinder, wobei Anschlüsse derselben miteinander ausgerichtete Drahtanschlußbereiche sowie in entgegengesetzten Richtungen wegstehende Verbindungsbereiche aufweisen, die an Verbindungsseiten des Verbinderpaars (10, 12) angrenzen, dadurch gekennzeichnet, daß ein erstes und ein zweites Gehäuseteil (20 und 22) aus Metall vorgesehen sind, die zusammengefügt sind und das Verbinderpaar (10, 12) zur Abschirmung desselben vollständig umschließen und die eine erste Öffnung (28), die von einem ersten Flansch (30) umgeben ist und eine erste Verbindungsseite (12B) des einen Verbinders (10) des Verbinderpaars freilegt, wobei sich der Flansch (30) über die erste Verbindungsseite hinauserstreckt, sowie eine zweite Öffnung (52) aufweisen, die von einem zweiten Flansch (54) umgeben ist und eine zweite Verbindungsseite (10B) des anderen Verbinders (12) des Verbinderpaars freilegt, wobei sich dieser Flansch (54) über die zweite Verbindungsseite hinauserstreckt.

daß Enden der Gehäuseteile (20 und 22) zwischen sich einen Kabeleingang (42, 56) für Drähte eines Mehrleiterkabels (2) definieren, die mit dem Verbinderpaar (10, 12) verbunden sind,



daß sich eine Befestigungseinrichtung (70, 80) durch die zusammengefügteten Gehäuseteile (20 und 22) hindurcherstreckt, um mehrere aneinandergestapelte Paare zusammengefügteten Gehäuseteile (20 und 22) miteinander zu verbinden, und

daß der erste Flansch (30) des Paares aus zusammengefügteten Verbindern (10, 12) mit dem zweiten Flansch (54) eines weiteren derartigen Paares aus zusammengefügteten Verbindern (10, 12) in Eingriff bringbar ist und eine Stecker-Verbindungsseite (10B) des Verbinderpaars (10, 12) mit einer Aufnahme-Verbindungsseite (12B) des genannten weiteren Verbinderpaars (10, 12) zusammenpaßt, so daß ein Paar von Mehrleiterkabeln (2) elektrisch zusammengeschaltet ist.

2. Elektrische Verbinderanordnung nach Anspruch 1, dadurch gekennzeichnet, daß die Befestigungseinrichtung eine Mehrzahl von Kopfschrauben (70, 80) umfaßt, die sich durch miteinander ausgerichtete Öffnungen (72) in den Gehäuseteilen (20 und 22) hindurcherstrecken und jeweils einen mit einem Schraubengewinde versehenen Schaftendbereich (80) und einen mit einem komplementären Schraubengewinde versehenen Kopf aufweisen, wobei der Schaftendbereich (80) jeder Kopfschraube (70, 80) von den

zusammengefügteten Gehäuseteilen (20 und 22) nach außen hervorsticht und in den mit einem Schraubengewinde versehenen Kopf einer Kopfschraube (78, 80) des anderen Verbinderpaars (10, 12) eingreift, wodurch eine Mehrzahl von Verbinderanordnungen (1) miteinander verriegelt ist.

3. Elektrische Verbinderanordnung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß ein Paar Drahtklammerelemente (16), deren jedes einen Schließsteg (21) an dem einen Ende und eine Verriegelungseinrichtung (19) an dem anderen Ende besitzt, zur Schaffung einer Zugentlastung für die Drähte um die aneinander angrenzenden Drahtanschlußbereiche (10A und 12A) des Paares zusammengefügteten Verbinders (10 und 12) herum miteinander verriegelt sind, wobei die Klammerelemente (16) zusammenarbeiten, um die Drähte in miteinander ausgerichteten Kanälen (14) zu halten, die in den Drahtanschlußseiten (10A und 12A) ausgebildet sind, und wobei die Oberfläche eines jeden Klammerelements (16) zur Verhinderung einer Quetschbeschädigung der Drähte abgerundet ist und ein sich längs jedes Klammerelements (16) erstreckender unterschrittener Kanal (18) einen Freiraum für die entsprechenden Drähte schafft.

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