Connector for electrical connection of a plurality of signal lines
Steckverbinder zur elektrischen Verbindung einer Mehrzahl von Signalleitungen
Connecteur pour la connexion électrique d’une pluralité de lignes de signaux
Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a connector and, in particular, to a connector for electrical connection of a plurality of signal lines.

Description of Related Art

[0002] In a traditional electrical connector, the electrical connection between the signal lines and the terminals of the electrical connector or the PCB is mostly made by welding. However, in some occasions, the electrical connection is made by piercing and breaking the insulation layer covering the wire to expose the wire core therein; thus, the electrical connection can be made between the signal lines and the terminals.

[0003] However, in the traditional insulation piercing connector, the individual signal line is usually required to be inserted and pierced one by one, which is laborious and results in a higher defective rate associated with product assembly due to human error and thus needs improvements.

[0004] US 2013/3236962 A1 discloses a connector according to the preamble of claim 1, which comprises a cylindrical connector body and a rotary cable coupler sleeved around the wiring end. Inside a cavity, which is formed by the cylindrical connector body and the rotary cable coupler, a holding block is disposed, which has a plurality of retaining grooves for retaining the ends of signal lines and a plurality of insulation-displacement grooves. The holding block comprises an axial fitting post, which is accommodated in a cylindrical bore of the connector body so that it is rotationally fixed relative to the connector body. Threads are provided on the connector body and the rotary cable coupler. Upon insertion of the signal cables into the open end of the rotary cable coupler the rotary cable coupler is pushed in axial direction towards the connector body and the holding block. This axial movement of the rotary cable coupler and of the signal lines finally results in a piercing of the insulating sheath of the signal lines and a contact with terminals accommodated in bores of the holding block. A piercing of the signal lines caused by a rotary movement of the signal lines is not disclosed.

[0005] US 2009/239423 A1 discloses a termination device to facilitate interconnection of a twisted pair communications cable to insulation-displacement connectors (IDC). This document does not relate to connectors or Pin/Terminals to establish an electric connection.

[0006] DE 10 2010 041037 A1 discloses an insulation displacement connector for establishing an electrical connection, wherein the insulation displacement connector has an insulation displacement slot, which is provided between two limbs arranged on a base part, wherein a central line which runs centrally between mutually facing contact faces of the limbs is curved. The limbs are formed directly on a housing of an electric motor, but not part of a connector.

[0007] US 3,980,380 discloses an electrical connector unit comprising a molded dielectric insert having a plurality of conductive contact members mounted in longitudinal contact passages spaced around the periphery of the insert. Each contact member includes an active contact element located at one end of the contact passage and an insulation-piercing self-connection terminal element that projects into a transverse terminal guide slot at the other end of the contact passage. The connector insert comprises elongated contact passages, which accommodate conductive contact members. The conductor retainer apertures are blind-ended, but not formed as through-holes. The wiring end is simply a front end of the connector insert, but not a detachable, plate-shaped member. The shape of the fixing holes of the line fastener is different. Furthermore, the signal lines do not extend through through-holes and not from the wiring end to the connecting end. The piercing members are not disposed close to a side surface of the detachable, plate-shaped wiring end, but on the front end of the wiring end. Further, the rotary coupler is plate-shaped, i.e. a flat, planar member, but is not sleeved around the wiring end.

[0008] US 4,157,208 discloses a rotary waterproof splice connector for use with a plurality of insulated wires, having a different configuration.

SUMMARY OF THE INVENTION

[0009] It is an object of the present invention to provide a connector for electrical connection of a plurality of signal lines, configured for enabling a more reliable and more efficient mounting process of the connector.

[0010] This problem is solved by a connector as claimed by claim 1. Further advantageous embodiments are the subject-matter of the dependent claims.

[0011] A connector according to the present invention enables an easy insertion of signals lines into the insulation piercing connector via a rotary cable coupler and accomplishes the simultaneous tasks of piercing and electrical contact of all of the signal lines by means of a simple rotation of the rotary cable coupler. In this way, human error and consuming working hours can be reduced.

[0012] The present invention provides a connector for electrical connection of a plurality of signal lines as claimed by claim 1. The connector comprises a connector body, a plurality of terminals, and a rotary cable coupler. The connector body has a connecting end and a wiring end. The wiring end has a plurality of through-holes in correspondence to the plurality of signal lines. The terminals are disposed in the connector body; each of the terminals has a terminal body which extends from the connecting end to the wiring end and a piercing member which is formed at one end of the terminal body and dis-
posed at the wiring end. The rotary cable coupler has a plurality of plug holes corresponding to the piercing members for insertion of the signal lines and is provided with a line fastener having a plurality of fixing holes corresponding to the respective plug holes. Each of the piercing members has two spaced apart piercing blades extending perpendicular to the associated terminal body and a circumferential circular slot being formed between the two piercing blades. The connector is configured such that, when the rotary cable coupler is rotated after the signal lines are inserted into the respective holes of the wiring end, the signal lines are pushed by the plug holes towards the piercing members correspondingly by the rotation of the rotary cable coupler relative to the connector body such that the piercing members pierce the signal lines for the electrical connection. According to the present invention the wiring end is a detachable, plate-shaped member, the holes of the wiring end being formed as through-holes, wherein each of the fixing holes is formed and surrounded by two hook portions oppositely spaced on the line fastener, wherein an embedded slot is formed between the two hook portions, the signal lines are inserted into the respective through-holes of the wiring end such as to protrude at least beyond the side surface of the wiring end, each of the piercing members extends perpendicular to the associated terminal body so as to be disposed close to a side surface of the wiring end, and the rotary coupler is configured such as to be sleeved around the wiring end.

BRIEF DESCRIPTION OF DRAWING

[0013]

FIG. 1 is a perspective exploded view of the present invention;
FIG 2 is an exploded schematic view of the present invention for insertion of the signal lines;
FIG. 3 is an assembled schematic view of the present invention for insertion of the signal lines;
FIG. 4 is an actuating view of the present invention for the insertion of the signal lines;
FIG. 5 is another actuating view of the present invention for the insertion of the signal lines;
FIG 6 is a perspective exploded view according to another embodiment of the present invention;
FIG 7 is an exploded schematic view according to another embodiment of the present invention for insertion of the signal lines;
FIG 8 is an actuating view according to another embodiment of the present invention for the insertion of the signal lines;
FIG 9 is another actuating view according to another embodiment of the present invention for the insertion of the signal lines; and
FIG 10 is yet another actuating view according to another embodiment of the present invention for the insertion of the signal lines.

DETAILED DESCRIPTION OF THE INVENTION

[0014] To further disclose the features and technical details of the present invention, please refer to the following detailed description and accompanying figures associated with the present invention. However, the accompanying figures are only for reference and explanation, but not to limit the scope of the present invention.

[0015] Please refer to FIGS. 1-3, which are a perspective exploded view, an exploded schematic view, and an assembled schematic view of a connector according to the present invention for insertion of the signal lines, respectively. The present invention provides a wiring structure improvement of an insulation piercing connector for electrical connection after a plurality of signal lines 40 of a cable 4 being inserted. The connector comprises a connector body 1, a plurality of terminals 2, and a rotary cable coupler 3.

[0016] The connector body 1 may be a connector meeting one of different connector specifications. In the embodiments of the present invention, the connector body 1 which has a connecting end 10 and a wiring end 11 meets the specification of a cable connector. The connecting end 10 is used to connect with another connector (not shown); the wiring end 11 is used for electrical connection after the signal lines 40 have been inserted. In general, the connecting end 10 and the wiring end 11 are disposed at two ends of the connector body 1, respectively, but not limited to this. Further, in the current embodiment, both the connecting end 10 and the wiring end 11 are detachable. A plurality of through-holes 110 are disposed at the wiring end 11. The number of the through-holes 110 corresponds to that of the signal lines 40 for the insertion thereof.

[0017] The terminals 2 are disposed in the connector body 1. Each of the terminals 2 has a terminal body 20 and a piercing member 21 formed at one end of the terminal body 20. The terminal body 20 of each of the terminals 2 extends from the connecting end 10 of the connector body 1 to the wiring end 11 such that the piercing member 21 of each of the terminals 2 is disposed at the wiring end 11 and corresponds to one side of the respective through-hole 110. In more detail, the piercing members 21 are disposed on a side surface of the wiring end 11 and arranged circularly. In the embodiments of the present invention, each of the piercing members 21 has two spaced apart piercing blades 210; thus, a slot 211 is formed between the two piercing blades 210. The slots 211 are configured for receiving the signal lines 40 by a rotary pushing movement; thus, the insulation layers covering the signal lines 40 are pierced by the two piercing blades 210 to make the two piercing blades 210 contact with the wire cores 41 of the signal lines 40 (as shown in FIGS. 4 and 5).

[0018] The rotary cable coupler 3 may have a cap-like shape and is sleeved around the wiring end 11 of the connector body 1 to rotate clockwise or counterclockwise. The rotary cable coupler 3 has a plurality of plug
holes 30 which correspond to the through-holes 110 of the wiring end 11 and are adjacent to the piercing member 21 of the terminals 2, more specifically, to one side of the slot 211 of the piercing member 21. In the current embodiment, the rotary cable coupler 3 is further provided with a line fastener 31 having a plurality of fixing holes 310 corresponding to the respective plug holes 30. Each of the fixing holes 310 is formed and surrounded by two hook portions 311 oppositely spaced on the line fastener 31; thus, an embedded slot 312 is formed due to the two hook portions 311 being spaced opposite to each other. In this way, after the signal lines 40 are inserted into the plug holes 30, the portions of the signal lines 40 corresponding to the fixing holes 310 can be embedded in the fixing holes 310 through the embedded slots 312 and be fixed by the two hook portions 311 (as shown in FIG. 3).

[0019] Please refer to FIGS. 2 and 3. When the rotary cable coupler 3 is sleeved around the wiring end 11 of the connector body 1, each of the signal lines 40 can be inserted into the respective through-hole 110 of the wiring end 11 through the respective plug hole 30 of the rotary cable coupler 3 such that the each of the signal lines 40 protrudes at least beyond the side surface of the wiring end 11. Also, the slots 211 of the piercing members 21 can be arranged in either clockwise or counterclockwise direction when the rotary cable coupler 3 is sleeved around the wiring end 11. In the embodiments of the present invention, the slots 211 of the piercing members 21 are arranged in clockwise direction, so the rotary cable coupler 3 should be rotated in counterclockwise direction. In other words, the direction of the arrangement of the slots 211 of the piercing members 21 is opposite to that of the rotation of the rotary cable coupler 3.

[0020] As shown in FIG. 4, when the rotary cable coupler 3 rotates in counterclockwise direction after the signal lines 40 are inserted into the respective through-holes 110 of the wiring end 11, the signal lines 40 can be pushed and moved by the plug holes 30 towards the slots 211 of the piercing members 21. Further, the slot 211 of the piercing member 21 has a "Y" shape to guide the signal line 40 towards between the two piercing blades 210. During the process of guiding the signal lines towards between the two piercing blades 210, the insulation layers covering the signal line 40 are pierced by the two piercing blades 210 to make the two piercing blades 210 contact with the wire cores 41 of the signal lines 40 to achieve the electrical connection, as shown in FIG 5.

[0021] Moreover, as shown in FIGS. 6 and 7, which show a perspective exploded view and an exploded schematic view according to another embodiment of the present invention for insertion of the signal lines, respectively. The wiring end 11 and the connector body 1 can be integrally molded; the line fastener 31 of the rotary cable coupler 3 in the previous embodiment is omitted here. Also, in the current embodiment, each of the plug holes 30 of the rotary cable coupler 3 may have decreasing diameters. A pressing surface 300 for the insertion of the signal line 40 is disposed on an inner edge of the each of the plug holes 30, which is located at an end with the largest diameter.

[0022] Therefore, as shown in FIGS. 8 and 9, when the rotary cable coupler 3 rotates in counterclockwise direction after the signal lines 40 are inserted into the respective through-holes 110 of the wiring end 11, the pressing surfaces 300 in the plug holes 30 will push and move the signal lines 40 towards the slots 211 of the piercing members 21 such that the two piercing blades 210 will contact with the wire cores 41 of the signal lines 40 to achieve the electrical connection, as shown in FIG 10.

[0023] As a result, a connector for electrical connection of a plurality of signal lines of the present invention can be achieved by means of the configuration of the above structures.

[0024] Therefore, by means of the connector for electrical connection of a plurality of signal lines of the present invention, the insertion of the signal lines into the insulation piercing connector can be more easily carried out via the rotary cable coupler and the tasks of piercing and electrical contact of all the signal lines of the connector can be accomplished simultaneously via the rotary cable coupler, which reduce human error and consuming working hours.

Claims

1. A connector for electrical connection of a plurality of signal lines (40), comprising:

   a connector body (1) having a connecting end (10) and a wiring end (11) having a plurality of holes (110) in correspondence to said plurality of signal lines (40);

   a plurality of terminals (2) disposed in the connector body (1), wherein each of the terminals (2) has a terminal body (20) extending from the connecting end (10) to the wiring end (11) and a piercing member (21) formed at one end of the terminal body (20) and disposed at the wiring end (11); and

   a rotary cable coupler (3) having a plurality of plug holes (30) corresponding to the piercing members (21) for insertion of the signal lines (40) and being provided with a line fastener (31) having a plurality of fixing holes (310) corresponding to the respective plug holes (30), wherein each of the piercing members (21) has two spaced apart piercing blades (210) extending perpendicular to the associated terminal body, a circumferential circular slot (211) being formed between the two piercing blades (210), and said connector (1) is configured such that, when the rotary cable coupler (3) is rotated after the signal lines (40) are inserted into the respective
holes (110) of the wiring end (11), the signal lines (40) are pushed by the plug holes (30) circularly towards the piercing members (21) correspondingly such that the piercing members (21) pierce the signal lines (40) for the electrical connection, characterized in that said wiring end (11) is a detachable, plate-shaped member, the holes (110) of the wiring end (11) being formed as through-holes, wherein each of the fixing holes (310) is formed and surrounded by two hook portions (311) oppositely spaced on the line fastener (31), wherein an embedded slot (312) is formed between the two hook portions (311), the signal lines (40) are inserted into the respective through-holes (110) of the wiring end (11) such as to protrude at least beyond the side surface of the wiring end (11), each of the piercing members (21) extends perpendicular to the associated terminal body (20) so as to be disposed close to a side surface of the wiring end (11), and the rotary coupler (3) is configured such as to be sleeved around the wiring end (11).

2. The connector according to claim 1, wherein the connecting end (10) and the wiring end (11) are disposed at two ends of the connector body (1), respectively.

3. The connector according to claim 1 or 2, wherein the piercing member (21) of each of the terminals (2) is corresponding to one side of the respective through-hole (110).

4. The connector according to any of the preceding claims, wherein the rotary cable coupler (3) has a cap-like shape.

5. The connector according to any of the preceding claims, wherein each of the plug holes (30) has decreasing diameters, wherein a pressing surface (300) is disposed on an inner edge of each plug hole (30), which is located at an end with the largest diameter.

6. The connector according to any of the preceding claims, wherein the slot (211) of each piercing member (21) has a "Y" shape.

7. The connector according to any of the preceding claims, wherein the slot (211) of each piercing member (21) is arranged to have a direction opposite to that of the rotation of the rotary cable coupler (3) to pierce the signal lines (40).

**Patentansprüche**

1. Steckverbinder zur elektrischen Verbindung einer Mehrzahl von Signalleitungen (40), umfassend:

   einen Verbindungskörper (1) mit einem Verbindungsende (10) und einem Verdrahtungsende (11) mit einer Mehrzahl von Löchern (110) entsprechend der Mehrzahl von Signalleitungen (40);

   eine Mehrzahl von Anschlüssen (2), die in dem Verbindungskörper (1) angeordnet sind, wobei jeder der Anschlüsse (2) einen Anschlusskörper (20), der sich von dem Verbindungsende (10) zu dem Verdrahtungsende (11) erstreckt, und ein Durchstechelement (21), das an einem Ende des Anschlusskörpers (20) (20), der sich von dem Verbindungsende (10) zu dem Verdrahtungsende (11) erstreckt, und eine drehbare Kabelkupplung (3) mit einer Mehrzahl von Stecklöchern (30) entsprechend den Durchstechelementen (21) zum Einführen der Signalleitungen (40) und mit einem Leitungsbeleg (31) mit einer Mehrzahl von Befestigungsschlitz (310) entsprechend den jeweiligen Stecklöchern (30), wobei jedes der Durchstechelemente (21) zwei zueinander abstande Durchsteckklingen (210) aufweist, die sich senkrecht zu dem zugeordneten Anschlusskörper erstrecken, wobei ein umlaufender kreisförmiger Schlitz (211) zwischen den beiden Durchsteckklingen (210) ausgebildet ist, und der Steckverbinder (1) so ausgelegt ist, dass, wenn die drehbare Kabelkupplung (3) nach dem Einführen der die Signalleitungen (40) in die entsprechenden Löcher (110) des Verdrahtungsendes (11) gedreht wird, die Signalleitungen (40) durch die Stecklöcher (30) kreisförmig hin zu den Durchstechelementen (21) entsprechend so vorgeschoben werden, dass die Durchstechelemente (21) die Signalleitungen (40) für die elektrische Verbindung durchdringen bzw. anstechen, dadurch gekennzeichnet, dass das Leitungsende (11) ein abnehmbares, plattenförmiges Element ist, wobei die Löcher (110) des Verdrahtungsendes (11) als Durchgangslöcher ausgebildet sind, wobei jedes der Befestigungsschlitz (310) von zwei Hakenabschnitten (311) ausgebildet und von diesen umgeben ist, die einander gegenüberliegend und beabstandet zueinander auf dem Leitungsbeleg (31) vorgesehen sind, wobei ein eingebetteter Schlitz (312) zwischen den beiden Hakenabschnitten (311) ausgebildet ist, die Signalleitungen (40) in die jeweiligen Durchgangsschlitz (110) des Verdrahtungsendes (11) so eingeführt sind, dass diese zumindest über
die Seitenfläche des Verdrahtungsendes (11) vorstehen,
sich jedes der durchdringenden Elemente (21) senkrecht zu dem zugeordneten Anschlusskörper (20) erstreckt, um nahe einer Seitenfläche des Verdrahtungsendes (11) angeordnet zu sein, und
die Drehkupplung (3) so ausgelegt ist, dass diese um das Leitungsende (11) herum hülsenartig aufgesteckt wird.

2. Steckverbinder nach Anspruch 1, wobei das Verbindungsende (10) und das Verdrahtungsende (11) jeweils an Enden des Verbindekörpers (1) angeordnet sind.

3. Steckverbinder nach Anspruch 1 oder 2, wobei das Durchstechelement (21) von jedem der Anschlüsse (2) einer Seite der jeweiligen Durchgangslöcher (110) entspricht.

4. Steckverbinder nach einem der vorhergehenden Ansprüche, wobei die drehbare Kabelkupplung (3) eine kappenartige Form hat.

5. Steckverbinder nach einem der vorhergehenden Ansprüche, wobei jedes der Stecklöcher (30) abnehmende Durchmesser aufweist, wobei eine Druckfläche (300) an einer Innenkante jedes Stecklochs (30) angeordnet ist, die sich an einem Ende mit dem größten Durchmesser befindet.

6. Steckverbinder nach einem der vorhergehenden Ansprüche, wobei der Schlitz (211) jedes Durchstechelements (21) "Y"-förmig ist.

7. Steckverbinder nach einem der vorhergehenden Ansprüche, wobei der Schlitz (211) jedes Durchstechelements (21) so angeordnet ist, dass er entgegengesetzt zur Drehrichtung der Drehkabelkupplung (3) ausgerichtet ist, um die Signalleitungen (40) zu durchstechen.

Revendications

1. Un connecteur pour la connexion électrique d’une pluralité de lignes de signal (40), comprenant:
   un corps de connecteur (1) ayant une extrémité de connexion (10) et une extrémité de câblage (11) ayant une pluralité de trous (110) en correspondance avec ladite pluralité de lignes de signal (40);
   une pluralité de bornes (2) disposées dans le corps de connecteur (1), chacune des bornes (2) ayant un corps de borne (20) s’étendant depuis l’extrémité de connexion (10) jusqu’à l’ex-
   trémité de câblage (11) et un élément de perçage (21) formé à une extrémité du corps de borne (20) et disposé à l’extrémité de câblage (11); et
   un coupleur de câble rotatif (3) ayant une pluralité de trous de fiche (30) correspondant aux éléments de perforation (21) pour l’insertion des lignes de signal (40) et fourni avec un fixateur de ligne (31) ayant une pluralité de trous de fixation (310) correspondant aux trous de fiche respectifs (30), dans lequel chaque élément de perçage (21) a deux lames perforatrices (210) espacées de part et d’autre (210) perpendiculaires au corps de borne associé, une fente circulaire circonférentielle (211) étant formée entre les deux lames perforatrices (210), et
   ledit connecteur (1) est configuré de sorte que, lorsque le coupleur de câble rotatif (3) est tourné après que les lignes de signaux (40) sont insérées dans les trous traversants (110) respectifs de l’extrémité de câblage (11), les lignes de signaux (40) sont poussées par les trous de fiche (30) vers les éléments de perçage (21) de manière correspondante, de sorte que les éléments de perçage (21) percent les lignes de signaux (40) pour la connexion électrique,
caractérisé en ce que ladite extrémité de connexion (11) est un élément en forme de plaque, détachable, les trous (110) de l’extrémité de connexion (11) étant formés comme des trous traversants, dans lequel chaque trou de fixation (310) est formé et entouré par deux parties de crochet (311) espacées l’une opposée à l’autre sur le fixateur de ligne (31), dans lequel une fente (312) intégrée est formée entre les deux parties de crochet (311), les lignes de signal (40) sont insérées dans les trous traversants respectifs (110) de l’extrémité de câblage (11) de façon à venir en saillie au moins au-delà de la surface latérale de l’extrémité de câblage (11), chaque élément de perçage (21) s’étend perpendiculairement par rapport au corps de borne associé (20) de façon à être disposé proche d’une surface latérale de l’extrémité de câblage (11), et
   le coupleur rotatif (3) est configuré de façon être manchonné autour de l’extrémité de câblage (11).

2. Le connecteur selon la revendication 1, dans lequel l’extrémité de connexion (10) et l’extrémité de câblage (11) sont disposées aux deux extrémités du corps de connecteur (1), respectivement.

3. Le connecteur selon la revendication 1 ou 2, dans lequel l’élément de perçage (21) de chacune des
borne (2) correspond à un côté du trou traversant respectif (110).

4. Le connecteur selon l'une quelconque des revendications précédentes, dans lequel le coupler de câble rotatif (3) a la forme d'un capuchon.

5. Le connecteur selon l'une quelconque des revendications précédentes, dans lequel chacun des trous de fiche (30) a des diamètres décroissants, dans lequel une surface de pression (300) est disposée sur un bord intérieur de chaque trou de fiche (30), qui est situé à une extrémité ayant le plus grand diamètre.

6. Le connecteur selon l'une quelconque des revendications précédentes, dans lequel la fente (211) de chaque élément de perçage (21) a une forme en "Y".

7. Le connecteur selon l'une quelconque des revendications précédentes, dans lequel la fente (211) de chaque élément de perforation (21) est agencée pour avoir une direction opposée à celle de la rotation du coupler de câble rotatif (3) pour percer les lignes de signal (40).
REFERENCES CITED IN THE DESCRIPTION

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