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(54) **Connector for at least a pair of insulated conductors.**

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Description

Background of the Invention

1. Field of the Invention

The invention refers to a connector for at least a pair of insulated conductors, particularly for the telecommunication industry.

2. Description of the Prior Art

German patent specification 31 10 144 discloses a connector for two insulated conductors having a housing of plastic material which is comprised of a base member and a cover member. Two U-shaped contact elements are mounted to the cover member as well as two projections aligned with the contact elements which upon an interconnection of base member and cover member deform and press the conductors into the smaller portion of keyhole-like passages in the base member to achieve a strain relief.

From German patent specification 26 44 936, a connector has become known which has a housing integrally formed of plastic material including strain relief means defined by a portion linked to the housing which can be brought into a locking position by tool means wherein it coacts with the conductor insulation by non-positive engagement and snaps behind a locking projection of the housing.

US Patent 4,684,195 discloses a connector wherein a cover member has wing portions into which the ends of conductors are introduced. After the introduction of the conductors, the wing portions are pivoted and interlocked with the base member, with an electrical contact being established contemporaneously by means of U-shaped contact elements. Tongues formed to the base member engage the insulation of the conductors and produce a strain relief. This document is used to form the precharacterising clause of the claim.

From US Patent 4,685,756 it is known to provide a strain relief in that at least two U-shaped contact elements are provided for each conductor which are arranged at longitudinally offset positions. The strain relief is enlarged further through angulated guiding passages for the conductors.

Normally, a strain relief is to prevent temporarily prevailing tension forces which tend to pull a conductor out of the connector. The strain relief means in the known connectors are not suited and designed to resist permanently effecting tension forces.

Above all, in the telecommunication industry, insulated conductors are frequency free suspended, for example between poles. If for such conductors, connectors are to be used in the course of the conductors. These tension forces also effect the connec-

tors. Therefore, such connectors also have to embody mechanical couplings. As mentioned, the known electrical connectors are not suited for such purposes.

5 The object of the invention is to provide a connector including a strain relief for at least a pair of insulated conductors which is suited for the transfer of a permanent tension force.

10 Summary of the Invention

According to the present invention there is provided a connector for at least one pair of insulated conductors comprising a housing of plastic material including a base member and a cover member, at least one pair of U-shaped contact members having legs forming a receiving slot, said legs penetrating the insulation of said conductors and contacting said conductors, characterized in that:-

20 said base member has two integrally formed strain relief portions inside of said base member, each including a clamping edge extending transverse to the longitudinal direction of said conductors, said clamping edges having a distance from each other transverse to the longitudinal direction of said conductors larger than twice the diameter of said conductors; and

25 said cover member has a projection inside of said cover member positioned between said contact members and said strain relief portions of the base member when said base member and said cover member are interconnected and adapted to be driven between said conductors of a said pair of conductors to press said conductors against said clamping edges, respectively, when said base member and said cover member are interconnected, whereby said strain relief portions cooperate with said projection to deform said insulation and said conductor, respectively, when said base member and said cover member are pressed against each other.

30 The connector disclosed has a base portion which includes two strain relief portions inside, each having a clamping edge extending transverse to the longitudinal direction of the conductors. Preferably, the strain relief portions are integrally formed to a base member of plastic material. The clamping edge of co-operating strain relief portions have a distance from each other transverse to the longitudinal direction of the conductors which is larger than twice the outside diameter of the conductor insulation. A projection is provided inside of the cover member located between the clamping edges and the contact elements, preferably relatively near to the clamping edges. The projection is pressed between the conductors of a pair of conductors and presses the conductors away from each other against the associated clamping edges of the strain relief portion if the base member and cover member are assembled. Prefer-

ably, the clamping edges are relatively sharp so that they may dig into the insulation upon the described operation. If a tension is exerted onto the conductors, the clamping edges penetrate deeper into the insulation and thus generate an effective positive engagement which is suited for the transfer of considerable tension forces.

Advantageously, the strain relief portions have opposing wall portions which form a channel for a pair of conductors directed toward the contact elements. The wall portions are tapered to facilitate the introduction of the conductors into the base member. The clamping edges are formed at the ends of the wall portions facing the contact elements, and the wall portions forming the clamping edges are arranged at an acute angle.

Conveniently, the projection is approximately circular in cross section so that the insulation is not damaged upon pressing the projection between the conductors of a pair of conductors. For the same reason, the projection is tapering toward its free end according to a further embodiment of the invention. By this, the conductors are gradually separated and moved toward the clamping edges to gradually increase the non-positive engagement upon pressing the cover member against the base member.

Advantageously, the bottom of the base member can include a recess for the receipt of the free end of the projection. The projection, thus, is prevented from being deflected laterally which would reduce the engagement between the conductor insulation and a clamping edge. The recess can have a larger dimension in the longitudinal direction of the base member than the corresponding dimension of the free end of the projection whereby a deformation of the projection is allowed upon a tension force being applied to the pair of conductors so that their non-positive initial engagement with the clamping edges is enlarged.

Conveniently, a pair of contact elements is provided for each conductor which are spaced in the longitudinal direction of the conductors. The slots of the contact elements have different widths, with the legs forming the smaller slot being designed such that they suffer a permanent deformation if the thickness of the conductor exceeds a predetermined value. By this, the connector according to the invention can accommodate conductors of different diameters. In case of conductors having a smaller diameter, the electrical contact is accomplished by the contact element having the smaller slot. The legs of the contact elements forming the wider slot, partially penetrate into the insulation and effect a strain relief. In case of conductors having a larger diameter, the electrical contact is accomplished by the contact element having the wider slot. The legs of the contact elements having the smaller slot are deflected to an extent that they suffer a permanent deformation. This contact element, therefore, serves as a strain relief without

cutting into the respective conductor. Preferably, the contact elements are mounted to the cover member while the base member has guide means for the conductors which are interrupted for the accommodation of the free ends of the contact elements.

It is known to form U-shaped contact elements of sheet material. It is also known to manufacture a pair of contact elements integrally of sheet material.

Advantageously two pairs of contact elements are also integrally formed of sheet material, with the legs facing each other upon being bent out of the plane of the sheet material leaving at least one web to establish an electrical connection between the pairs of contact elements.

Brief Description of the Drawings

An embodiment example is subsequently described by the aid of accompanying drawings.

Fig. 1 is a perspective view of the base member and the cover member of a connector according to the invention, with the cover member and the base member being partially broken to afford illustration of interior member and the cover member is separated from the base member.

Fig. 2 is a perspective view of the parts shown in Fig. 1 in the assembled state, with the cover member and the base member being partially broken.

Description of the Preferred Embodiment

An elongated base member 10 has a bottom 12, side walls 14, 16 and front walls 18, 20. The interior of the base member 10 is divided by a partition wall 22 having a height approximately half of the height of the side walls 14, 16. The base member 10 is identically designed on both sides of partition wall 22.

A guide 24, 26 semi-circular in cross section extends inwardly from the front walls 18, 20. Guides 28, 30, 32, 34 or grooves arc-shaped in cross section are formed on an elevation of bottom 12 of the base member 10 adjacent partition wall 22. The guides 28 to 34 are interrupted by cuts 36, 38, 40, 42 extending transverse to the longitudinal axis of base member 10.

Strain relief portions 44, 46, 48, 50 are formed with the bottom 12 and the corresponding side walls 14, 16 between guides 24, 26 and guides 36, 38, 40, 42. They have facing wall portions 52, 54, 56, 58 which form a passage tapering toward partition wall 22, the passage being aligned to the guide 24 or 26. Together with wall portions 60, 62, 64, 66 the wall portions 52, 54, 56, 58 form clamping edges 68, 70, 72, 74 which extends approximately perpendicularly to bottom 12 transverse to the longitudinal axis of base member 10. The base member is formed with a step 76, 78 between bottom 12 and the side walls 14, 16.

In Fig. 1, a cover member 80 also can be seen which includes a top portion 82, side walls 84, 86 and front walls 88 and 90. The side walls 84, 86 have projections 92, 94 facing each other which engage the steps 76, 78 of base member 10 if cover member and base member are put together (as can be seen in Fig. 2). The end walls 88, 90 have a guide, semi-circular in cross section, one of which being indicated at 96. They each form a cylindrical guide channel together with the guides 24, 26 if base member and cover member are assembled.

Two conical projections are formed to the inner side of top portion 82, one of which being indicated at 98. In the assembled state of base member and cover member, the projections are located between the strain relief portions 44, 46 or 48, 50, respectively, and the guides 28, 30 or 32, 34, respectively. A pair of contact members 100 or 102, is mounted to the top portion 82, the design thereof is to be described in detail in connection with Fig. 2. Since the contact members 100, 102 are designed identically, only arrangement 100 will be described. It consists of two pairs 104, 106 of contact elements which, as can be seen, are formed from a blank of an electrically conductive sheet material. Two U-shaped portions 108, 114 are formed at the ends of the sheet and U-shaped portions 110 and 112 are formed from the middle. U-shaped portions 108, 110 or 112, 114, respectively, are bent downwardly parallel to each other leaving two parallel connection webs 116. The arrangements 100, 102, for example, can be fixed to the cover portion with the aid of screws. As can be seen, each pair of contact elements has a U-shape, and each contact element is also U-shaped. The U-shaped portions 108, 110, 112, 114 forming the contact elements include slots 118, 120 and 122, 124, respectively. The slots 118, 124 are broader than the slots 120, 122.

As can be seen in Fig. 2, two pairs of conductors 126, 128 or 130, 136, respectively, are electrically interconnected. The conductors 126, 128, 130, 136 are paired and laid into the base member into guides 24, 26 and extend through the tapering passage which is formed by the wall surfaces 52, 54 or 56, 58, respectively, of the strain relief portions 44, 46 or 48, 50, respectively. The conductors are located in the guiding grooves 28, 30 or 32, 34, respectively, and abut partition wall 22. As can be seen, the distance between the clamping edges 68, 70 or 72, 74, respectively, is larger than twice the outside diameter of the conductors 126, 128 or 130, 136.

As the cover member 80 is put onto the base member 10, the projection 98 drives between the conductors 126, 128 or 130, 136, respectively, and urges the conductors away from each other toward the clamping edges 68, 70 or 72, 74, respectively, which dig into the insulation. Contemporaneously, the conductors 126, 128, 130, 136 are pressed into the slots 118, 120 or 122, 124, respectively, of the

contact arrangements 100, 102 in order to provide an electrical contact. In case the conductors have a larger diameter, the electrical contact is accomplished in the slots 118 or 124, respectively, while the legs forming the slots 120 or 122, respectively, are deflected such that they are permanently deformed. The legs partially penetrate the insulation, however, they do not cut into the conductor. In case the conductors have a smaller diameter, the electrical contact is accomplished in the smaller slots 120 or 122, respectively, while the legs forming the broader slots partially penetrate into the insulation and effect a strain relief. Primarily, the strain relief takes place between the strain relief portions 44, 46, 48, 50 and projections 98. It is made such that also large and permanently effecting tension forces on conductors 126, 128, 130, 136 can be resisted.

Base member and cover member are held together by the interlocking of projections 92, 94 and the steps 76, 78. The portions 108, 110 and 112, 114 of the pairs of contact elements engage the cuts 36, 38 and 40, 42 whereby the conductors 126, 128 and 130, 136 are effectively retained in the guides 28, 30 and 32, 34.

Claims

30. 1. A connector for at least one pair of insulated conductors (126, 128, 130, 136) comprising a housing of plastic material including a base member (10) and a cover member (80), at least one pair (100, 102) of U-shaped contact members having legs (118) forming a receiving slot, said legs penetrating the insulation of said conductors and contacting said conductors, characterized in that:-
40. said base member (10) has two integrally formed strain relief portions (44, 46, 48, 50) inside of said base member (10), each including a clamping edge (68, 70, 72, 74) extending transverse to the longitudinal direction of said conductors (126, 128, 130, 136), said clamping edges having a distance from each other transverse to the longitudinal direction of said conductors larger than twice the diameter of said conductors; and
50. said cover member has a projection (98) inside of said cover member positioned between said contact members (100, 102) and said strain relief portions (44, 46, 48, 50) of the base member (10) when said base member and said cover member are interconnected and adapted to be driven between said conductors of a said pair of conductors (126, 128, 130, 136) to press said conductors against said clamping edges, respectively, when said base member and said cover member are interconnected, whereby said strain
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relief portions (44, 46, 48, 50) cooperate with said projection (98) to deform said insulation and said conductor, respectively, when said base member (10) and said cover member (80) are pressed against each other.

2. The connector according to claim 1, wherein the strain relief portions include wall portions (52, 54, 56, 58) facing each other and forming a passage for the pair of conductors, said wall portions tapering toward each other and said contact members (100, 102), said clamping edges (68, 70, 72, 74) being provided at the ends of said wall portions facing said contact elements.

3. The connector according to claim 2, wherein the wall portions defining said clamping edges are arranged at an acute angle.

4. The connector according to any preceding claim wherein said projection (98) is circular in cross section.

5. The connector according to claim 4, wherein said projection (98) tapers toward its free end.

6. The connector according to any preceding claim wherein the bottom (12) of said base member (10) has a recess (130) for receiving and accommodating the free end of said projection (98).

7. The connector according to claim 6 wherein said recess (130) has a larger dimension in the longitudinal direction of said conductors than the free end of said projection.

8. The connector according to any preceding claim wherein for each conductor (102, 104), a pair of contact elements (108, 110, 112, 114) are provided spaced in the longitudinal direction of said conductors, said pair of said contact elements having receiving slots (118, 120, 122, 124) of different widths, with the legs of said contact elements forming the smaller of said slots (120, 122) being designed such that they are deformed permanently if the diameter of a conductor exceeds a predetermined value.

9. The connector according to any preceding claim wherein said contact members (100, 102) are mounted to said cover member (80) and said base member (10) has guides (28) for said conductors interrupted by cuts (36, 38) for the receipt of the free ends of said contact elements.

10. The connector according to any preceding claim wherein two pairs of said conductors (126, 136) are interconnected and wherein two pairs of U-shaped contact elements for the interconnection of two of said conductors are integrally formed of sheet material, with the web (116) left upon a bending of the legs of said pairs of contact elements facing each other establishing the electrical connection between said pairs of contact elements.

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Patentansprüche

1. Verbinder für mindestens ein Paar isolierter Leiter (126, 128, 130, 136) mit einem Gehäuse aus Kunststoff, umfassend ein Basiselement (10) und ein Abdeckungselement (80), mindestens ein Paar (100, 102) U-förmiger Kontaktelemente mit Schenkeln (118), welche eine Aufnahmenut bilden, wobei die Schenkel die Isolierung der Leiter durchdringen und in Kontakt mit den Leitern gelangen, dadurch gekennzeichnet, daß:

das Basiselement (10) zwei integral ausgebildete Zugentlastungsteilstücke (44, 46, 48, 50) innerhalb des Basiselements (10) aufweist, von denen jedes eine Klemmkante (68, 70, 72, 74) umfaßt, die sich transversal zu der Längsrichtung der Leiter (126, 128, 130, 136) erstrecken, wobei die Klemmkanten zueinander transversal zu der Längsrichtung der Leiter einen Abstand aufweisen, der mehr als das Zweifache des Durchmessers der Leiter beträgt; und daß

das Abdeckungselement innerhalb einen Vorsprung (98) aufweist, der zwischen den Kontaktelementen (100, 102) und den Zugentlastungsteilstücken (44, 46, 48, 50) des Basiselements positioniert ist, wenn das Basiselement und das Abdeckungselement miteinander verbunden werden und der Vorsprung kann zwischen die Leiter eines Leiterpaars (126, 128, 130, 136) getrieben werden, um die Leiter entsprechend gegen die Klemmkanten zu drücken, wenn das Basiselement und das Abdeckungselement miteinander verbunden werden, wodurch die Zugentlastungsteilstücke (44, 46, 48, 50) mit dem Vorsprung (98) zusammenwirken, um die Isolierung bzw. den Leiter zu verformen, wenn das Basiselement (10) und das Abdeckungselement (80) gegeneinander gedrückt werden.

2. Verbinder nach Anspruch 1, dadurch gekennzeichnet, daß die Zugentlastungsteilstücke Wandteilstücke (52, 54, 56, 58) aufweisen, die zueinander zeigen und die einen Durchgang für das Leiterpaar bilden, wobei die Wandteilstücke zueinander und zu den Kontaktelementen (100, 102) zulaufen und wobei die Klemmkanten (68, 70, 72, 74) an den Enden der Wandteilstücke vorgesehen sind, welche zu den Kontaktelementen zeigen.

3. Verbinder nach Anspruch 2, dadurch gekennzeichnet, daß die Wandteilstücke, welche die Klemmkanten definieren, in einem spitzen Winkel angeordnet sind.
4. Verbinder nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Vorsprung (98) einen kreisförmigen Querschnitt aufweist.
5. Verbinder nach Anspruch 4, dadurch gekennzeichnet, daß der Vorsprung (98) zu seinem freien Ende konisch zuläuft.
6. Verbinder nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß der Boden (12) des Basiselements (10) eine Aussparung (130) aufweist, und zwar zur Aufnahme und Unterbringung des freien Endes des Vorsprungs (98).
7. Verbinder nach Anspruch 6, dadurch gekennzeichnet, daß die Aussparung (130) in der Längsrichtung der Leiter ein größeres Ausmaß aufweist als das freie Ende des Vorsprungs.
8. Verbinder nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß für jeden Leiter (102, 104) ein Paar Kontaktlemente (108, 110, 112, 114) vorgesehen ist, das in der Längsrichtung mit Zwischenabstand versehen ist, wobei das Paar von Kontaktlementen Aufnahmen (118, 120, 122, 124) mit verschiedenen Breiten aufweist, wobei die Schenkel der Kontaktlemente die kleineren Nuten (120, 122) bilden, welche so gestaltet sind, daß sie dauerhaft verformt werden, wenn der Durchmesser eines Leiters einen vorbestimmten Wert übersteigt.
9. Verbinder nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Kontaktlemente (100, 102) an dem Abdeckungselement (80) befestigt sind und daß das Basiselement (10) Führungen (28) für die Leiter aufweist, die durch Ausschnitte (36, 38) unterbrochen sind, um die freien Enden der Kontaktlemente aufzunehmen.
10. Verbinder nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die beiden Paare von Leitern (126, 128) miteinander verbunden sind und wobei zwei Paare U-förmiger Kontaktlemente für die Verbindung der beiden Leiter integral aus Blattmaterial gestaltet sind, wobei die Bahn (116) auf einer Biegung der Schenkel der zueinanderzeigenden Kontaktlementepaare hinterlassen wird, wodurch die elektrische Verbindung zwischen den Kontaktlementpaaren

gestaltet wird.

5 Revendications

1. Connecteur pour au moins une paire de conducteurs isolés (126,128,130,136), comprenant un boîtier en matière plastique comportant une base (10) et un couvercle (80), au moins une paire (100,102) de dispositifs de contact en forme de U ayant des branches (118) qui définissent une encoche de réception, lesdites branches traversant l'isolation desdits conducteurs et venant en contact avec lesdits conducteurs, caractérisé en ce que :

ladite base (10) comprend deux parties de relaxation des contraintes (44,46,48,50) formées solidairement à l'intérieur de ladite base (10), présentant chacune un bord de serrage (68,70,72,74) transversal à la direction longitudinale desdits conducteurs (126,128,130,136), lesdits bords de serrage étant espacés l'un de l'autre, transversalement à la direction longitudinale desdits conducteurs, d'une distance supérieure au double du diamètre desdits conducteurs ; et

ledit couvercle comporte une saillie (98) située à l'intérieur dudit couvercle entre lesdits dispositifs de contact (100,102) et lesdites parties de relaxation des contraintes (44,46,48,50) de la base (10) lorsque ladite base et ledit couvercle sont interconnectés, ladite saillie pouvant s'enfoncer entre les dits conducteurs d'une dite paire de conducteurs (126,128,130,136) pour presser lesdits conducteurs contre lesdits bords de serrage, respectivement, lorsque ladite base et ledit couvercle sont interconnectés, de sorte que lesdites parties de relaxation des contraintes (44,46,48,50) coopèrent avec ladite saillie (98) pour déformer ladite isolation et ledit conducteur, respectivement, lorsque ladite base (10) et ledit couvercle (80) sont pressés l'un contre l'autre.
2. Connecteur suivant la revendication 1, dans lequel les parties de relaxation des contraintes comprennent des parties de paroi (52,45,56,58) mutuellement en regard et formant un passage pour la paire de conducteurs, lesdites parties de paroi étant inclinées les unes vers les autres et vers lesdits dispositifs de contact (100,102), lesdits bords de serrage (68,70,72,74) étant prévus aux extrémités desdites parties de paroi en regard desdits éléments de contact.
3. Connecteur suivant la revendication 2, dans lequel les parties de paroi définissant lesdits bords de serrage sont disposées suivant un angle aigu.

4. Connecteur suivant une quelconque des revendications précédentes, dans lequel ladite saillie (98) est de section transversale circulaire. 5

5. Connecteur suivant la revendication 4, dans laquelle ladite saillie (98) diminue de section vers son extrémité libre. 10

6. Connecteur suivant une quelconque des revendications précédentes, dans lequel le fond (12) de la dite base (10) comporte un logement (130) pour recevoir et loger l'extrémité libre de ladite saillie (98). 15

7. Connecteur suivant la revendication 6, dans lequel ledit logement (130) a une dimension plus grande, dans la direction longitudinale desdits conducteurs, que l'extrémité libre de ladite saillie. 20

8. Connecteur suivant l'une quelconque des revendications précédentes, dans lequel, pour chaque conducteur (102, 104), il est prévu deux éléments de contact (108, 110, 112, 114) espacés dans la direction longitudinale desdits conducteurs, lesdits deux éléments de contact ayant des encoches de réception (118, 120, 122, 124) de différentes largeurs, les branches desdits éléments de contact qui forment la plus petite desdites encoches (120, 122) étant conçues de sorte qu'elles subissent une déformation permanente si le diamètre d'un conducteur dépasse une valeur pré-déterminée. 25

9. Connecteur suivant une quelconque des revendications précédentes, dans lequel lesdits dispositifs de contact (100, 102) sont fixés audit couvercle (80) et ladite base (10) comporte des guides (28) pour lesdits conducteurs, interrompus par des coupures (36, 38) pour la réception des extrémités libres desdits éléments de contact. 30

10. Connecteur suivant une quelconque des revendications précédentes, dans lequel deux paires de dits conducteurs (126, 136) sont interconnectées et dans lequel deux paires d'éléments de contact en forme de U pour l'interconnexion de deux desdits conducteurs sont solidairement formées en une matière en feuille, la bande (116) qui reste après pliage des branches desdites paires d'éléments de contact mutuellement en regard établissant la connexion électrique entre lesdites paires d'éléments de contact. 45

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