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AT-B- 312 726
DE-A- 2 631 094
DE-A- 3 009 675

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Description

Insulation-displacement connector.

The invention relates to an insulation-displacement connector adapted to be connected to a cable having a conductor with an insulation layer covering thereon, which connector displaces the insulation layer and pinches the conductor in a slot of a connection terminal in order to asure an electrical connection between the conductor and the connection terminal such as is further indicated in the heading of the main claim.

An example of a conventional insulation-displacement connector is shown in Fig. 1, and includes housing 100 with connection terminal 200 therewithin. At one end of connection terminal 200, insulation-displacement contact section 210 is formed, and is brought into contact with a conductor in a cable (not shown). At the other end of connection terminal 200, receptacle section 220 is formed, and is connected to a plug pin (not shown. At insulation-displacement contact section 210 of connection terminal 200, opening 211 and slot 212 communicating with opening are formed, as is shown in Fig. 2. Push member 300 made of an insulation material is snap-fitted into housing 100 such that projections 311, 312, formed on the side surfaces of push member 300, engage first grooves 110, shown in Fig. 3A, which are formed on the inner surfaces of the housing.

Cable 400 is inserted, with cable insulation 410, through insertion hole 500 located between recess 320 of push member 300 and opening 211 of terminal 200, as is shown in Fig. 3A. By using a suitable tool, such as a pair of pliers, to forcefully insert push member 300 into housing 100, in the direction indicated by an arrow P in Fig. 3A, the cable insulation is displaced, so that conductor 420 of the cable is exposed and pinched in slot 212 of contact section 210, as is shown in Fig. 3B. In this state, projections 311, 312 of push member 300 abut against second grooves 120, as is shown in Fig. 3B. In this way, cable 400 is fixedly connected to connection terminal 200, via the exposed conductor 420.

In the aforementioned insulation-displacement connector, however, the push member presses strongly against the outer surface of the cable, upon member 300 being forcefully inserted into housing 100 and, for this reason, there is a risk that the cable will inadvertently slip off or be shifted relative to the insertion hole, as a result of the impact exerted by member 300. This problem arises, in particular when the cable is thin.

Another example of a conventional insulation-displacement connector, as reflected in the heading of the main claim, is indicated in DE-A-3009675. This conventional insulation-displacement connector comprises a housing in which three connection terminals are arranged in parallel relationship in order to receive a set of three parallel conductors each having an insulation layer. Each connection terminal has a downwardly-directed slot. The space within the housing is divided into three channels with the aid of two inner walls parallel to the opposite side walls. In said channels between said opposite side walls of the housing and the two inner walls respectively said three connection terminals are positioned on the bottom of the housing. The push member made of insulation material has a closed top and two opposite sides insertable into the housing. Within the space formed by the closed top and opposite sides a push element is located having three recesses evenly divided opposite the slots of the connection terminals of the three channels to receive the conductors. The three recesses each substantially have a shallow half circular form.

The opposite inner surfaces of the side walls of the housing are each provided with a first rib, and a second rib, while the separate sides of the push member are each provided with first and second projections. These ribs cooperate with said projections on the separate sides of the push member when this push member is inserted into the housing.

One object of the present invention is to provide an insulation-displacement connector which is markedly improved in relation to a conventional insulation-displacement connector.

Another object of the present invention is to provide an insulation-displacement connector which, even if the cable is thin, assures a positive connection to a cable conductor, without the risk of the cable inadvertently slipping or dropping off the insertion hole.

The invention aims to obviate the above mentioned problems with an insulation-displacement connector of the above mentioned type according to the invention such that the second engaging means are grooves provided on the opposite inner surfaces of the side walls of the housing near the bottom thereof, that the guide means are guiding grooves formed between the first and second engaging means, being first and second engaging grooves, on the opposite inner surfaces of the side walls of the housing that the guiding grooves are formed as wider guide grooves between first and second engaging grooves, that the recess in the push member opening toward the opening of the connection terminal is formed by two legs, which form said two opposite sides of the push member, and that the opening of the connection terminal is tapered, so that it aligns with the center of the recess, which has an inverted elongated U-shape, thus defining an insertion hole between said recess and said downwardly-directed opening, and that said projections are placed at the bottom of the sides of the push member.

In the connector of the present invention, the cable is placed over the tapered opening of the con-

nection terminal. The push member is pushed down over the cable so that the projections of the push member may be moved along the guide grooves. In this state, the cable is forced into the tapered opening of the connection terminal and is held there by the push member. Then the push member is further pushed with extra force, so that the cable is pushed into the slot of the connection terminal and the insulation layer of the cable is displaced to permit the exposed conductor to be connected to the connection terminal.

The cable is temporarily held at the tapered opening of the connection terminal before it can be further pushed into the slot. This prevents the cable from inadvertently slipping or dropping off a connection terminal due to an impact.

The push member is preferably made of an elastic insulation material, such as a plastic type, so that the pair of legs of the push member can be elastically deformed toward and away from each other.

The projections of the legs may effectively be sharp-tipped in order to properly engage with the minute grooves which are formed as a knurled portion on the inner surfaces of the side wall of the housing.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a cross-sectional view showing a conventional insulation-displacement connector;

Fig. 2 is a perspective view showing a connector terminal in the connector of Fig. 1;

Figs. 3A and 3B are front views showing the connector as seen in the direction indicated by an arrow III in Fig. 1;

Fig. 4 is a front view showing an insulation-displacement connector according to one embodiment of this invention;

Fig. 5 is a perspective view of the connector of Fig. 4;

Fig. 6 is a front view of the connector of Fig. 4, explaining the manner in which the connection is used; and

Fig. 7 is a view showing an insulation-displacement connector according to another embodiment of the present invention.

Figs. 4 and 5 show an insulation-displacement connector according to one embodiment of the present invention. The connector includes housing 10, connection terminals 20 located within the housing and push member 30 to be inserted into the housing through the open top of the housing. Inverted U-shaped recess 32 is formed on front surface 31 of push member 30. U-shaped recess 32 is so formed that its center aligns with tapered opening 21 of connection terminal 20. Projections 33, 34 are formed on either side of push member 30 such that they can engage with first engaging grooves 11 formed on the inner surface of the side walls 101 of housing 10, with insertion hole 50 defined between tapered opening 21 of connection terminal 20 and U-shaped recess 32 of push member 30. The size of insertion hole 50 is selected to allow the ready insertion of not only a thin cable but also a thick one.

Formed below first grooves 11 of the housing are guide grooves 12 which guide projections 33, 34. Guide grooves 12 allow the push member to be moved within a range of the width of the guide groove, when it is forced downward and its projections move beyond first engaging grooves 11.

Push member 30 has a pair of legs 35, 36 with U-shaped recess 32 defined therebetween. The push member is preferably formed of plastic material so that the pair of legs can elastically deform inwardly or outwardly. The resultant push member allows its projections 33, 34 to be effectively snap-fitted into first grooves 11 and then into guide grooves 12 beyond the first grooves. With projections 33, 34 located in guide grooves 12, they are pushed firmly against the inner surface of guide grooves 12, by the elastic force of leg sections 35, 36, to allow push member 30 to be held in any desired position.

Second engaging grooves 13 are formed adjacent to guide grooves 12, and are used to hold the cable in place, as is set forth below. The first grooves, second grooves and guide grooves extend in direction perpendicular to that in which push member is pushed into the housing.

Firstly, push member 30 is so set that its projections 33, 34 fit into first grooves 11, as is shown in Fig. 4. Then, cable 40 is inserted into insertion hole 50 and placed on tapered opening 21. Push member 30 is pushed, for example, by hand, into guide grooves 12, as indicated by I in Fig. 6, with its projections clear of the first engaging groove, so that cable 40 is compressed over tapered opening 21 of connection terminal 20 and stopped at that position. Since projections 33, 34 abut against the inner surface of guide grooves 12, with a greater frictional force, there is no risk, even if the pushing force (such as hand grip force) is released from push member 30, that the push member will slip upwardly due to the elastic recovery force exerted by insulation layer 41. It should be noted that various cables of respective different diameters may be used, due to guide grooves 12 being formed as wider guide grooves between first engaging grooves 11 and second engaging grooves 13. As a result, cable 40, even if smaller in diameter, can be positively held over tapered opening 21.

With cable 40 so held, push member 30 is forcibly pushed by, for example, a pair of pliers, in the direction indicated by arrow P so that, as indicated by II in Fig. 6, projections 33, 34 snap-fit into second engaging grooves 13, to allow conductor 42 to be pinched in contact with slot 22 of connection terminal 20, with insulation layer 41 displaced. Before this step, the cable is already in contact with push member 30 and, for this reason, the cable will assuredly be guided into

the slot of connection terminal 20, by the push member.

Fig. 7 shows an insulation-displacement connector according another embodiment of this invention. A number of minute grooves 14a, 14b, ... are formed, as a knurled portion, over a range of the width of guide grooves 12. Sharp-tipped projections 33, 34 may effectively be formed on push member 30 so as to allow them to be hooked onto the respective minute grooves.

Claims

1. An insulation-displacement connector adapted to be connected to a cable (40) having a conductor (42) with an insulation layer (41) covering thereon, comprising:
   (A) a housing (10) made of an insulation material, having two opposite side walls (101), an open top, and an open front;
   (B) a connection terminal (20) arranged within the housing (10) and having a downwardly-directed opening (21) with a slot (22) communicating therewith; and
   (C) a push member (30) made of an insulation material, having a closed top and two opposite sides insertable into the housing, and having a recess (32) located opposite said opening (21) of said connection terminal and projections (33, 34) formed on the respective sides and facing the inner surfaces of said side walls (101) of said housing, and inserted into said housing from said open top of said housing, said push member with its recess (32) being capable to push the cable (40) placed over the opening (21) of the connection terminal (20), so that the cable is pushed into the slot (22) of the connection terminal in order to expose the conductor (42) for connection to the connection terminal, said housing (10) including
      (a) first engaging means (11) provided on the opposite inner surfaces of the side walls (101) of the housing and adapted to engage with the projections (33, 34) of the push member (30), with the cable (40) set over the opening (21) of the connection terminal so as to hold the push member relative to the housing;
      (b) second engaging means (13); and
      (c) guide means (12) adapted to guide the push member (30) to a position where the cable is held between the opening of the connection terminal (21,22) and the recess (32) of the push member (30) before the exposed conductor is connected to the connection terminal (20),

      characterized in that the second engaging means (13) are grooves provided on the opposite inner surfaces of the side walls of the housing (10) near the bottom thereof,
      that the guide means are guiding grooves (12) formed between the first and second engaging means, being first (11) and second (12) engaging grooves, on the opposite inner surfaces of the side walls (101) of the housing, the guiding grooves being formed as wider guide grooves (12) between first (11) and second (13) engaging grooves, and
      that the recess (32) in the push member opening toward the opening (21) of the connection terminal is formed by two legs (35, 36), which form said two opposite sides of the push member (30), and that the opening (21) of the connection terminal is tapered, so that it aligns with the center of the recess (32), which has an inverted elongated U-shape (see fig. 4), thus defining an insertion hole (50) between said recess (32) and said downwardly-directed opening (21), said projections (33, 34) being placed at the bottom of the sides of the push member.

Patentansprüche

1. Isolierung verdrängender Verbinder, der sich zum Anbringen eignet an ein Kabel (40) das einen Leiter (42) mit einer darauf angeordneten Isolierschichtüberdeckung (41) aufweist, umfassend:
   (A) ein Gehäuse (10) aus isolierendem Material mit zwei gegenüberliegenden Seitenwandungen (101), einer offenen Oberseite und einer offenen Vorderseite;
   (B) eine Verbindungsklemme (20), die innerhalb des Gehäuses (10) angeordnet ist und eine nach unten gerichtete Öffnung (21) mit einem damit kommunizierenden Schlitz (22) aufweist; und
   (C) ein Druckelement (30) aus isolierendem Material mit einer geschlossenen Oberseite und zwei gegenüberliegenden Seiten, das in das Gehäuse einsetzbar ist und eine gegenüber der Öffnung (21) der Verbindungsklemme angeordnete Ausnehmung (32) sowie an den jeweiligen Seiten angeformte und den Innenflächen der Wandungen (101) des Gehäuses gegenüberliegende Vorsprünge (33,34) aufweist, und welches in das Gehäuse von der offenen Oberseite dieses Gehäuses her eingesetzt ist, wobei dieses Druckelement mit seiner Ausnehmung (32) fähig ist, das über die Öffnung (21) der Verbindungsklemme (20)

gelegte Kabel (40) so zu drücken, dass das Kabel in den Schlitz (22) der Verbindungsklemme gedrückt wird, um den Leiter (42) zwecks Verbindung mit der Verbindungsklemme blosszulegen,

wobei das Gehäuse (10) umfasst:

(a) erste Eingriffmittel (11), die an den gegenüberliegenden Innenflächen der Seitenwandungen (101) des Gehäuses vorgesehen sind und sich zum Eingriff mit den Vorsprüngen (33,34) des Druckelements (30) eignen, wobei das Kabel (40) so über die Öffnung (21) der Verbindungsklemme gelegt ist, dass es das Druckelement in bezug auf das Gehäuse hält;

(b) zweite Eingriffmittel (13); und

(c) Führungsmittel (12), die sich eignen, das Druckelement (30) zu einer Lage zu führen, bei der das Kabel zwischen der Öffnung der Verbindungsklemme (21,20) und der Ausnehmung (32) des Druckelements (30) gehalten wird, bevor der blossgelegte Leiter mit der Verbindungsklemme (20) verbunden ist;

dadurch gekennzeichnet, dass

die zweiten Eingriffmittel (13) Nuten sind, die an den gegenüberliegenden Innenflächen der Seitenwandungen des Gehäuses (10) in Nähe seines Bodens vorgesehen sind,

die Führungsmittel Führungsnuten (12) sind, die an den gegenüberliegenden Innenflächen der Seitenwandungen (101) des Gehäuses zwischen den ersten und den zweiten Eingriffmitteln gebildet sind, welche ihrerseits erste (11) und zweite (13) Eingriffnuten sind, wobei die Führungsnuten zwischen den ersten (11) und den zweiten (13) Eingriffnuten als breitere Führungsnuten (12) ausgebildet sind, und die sich zur Öffnung (21) der Verbindungsklemme hin öffnende Ausnehmung (32) im Druckelement aus zwei Schenkeln (36,36) gebildet ist, welche die beiden gegenüberliegenden Seiten des Druckelements (30) bilden, und sich die Öffnung (21) der Verbindungsklemme verjüngt, so dass sie mit dem Zentrum der Ausnehmung (32) fluchtet, welche ihrerseits eine umgekehrte längliche U-Form aufweist (vgl. Fig. 4), wodurch ein Einsteckloch (50) zwischen dieser Ausnehmung (32) und der nach unten gerichteten Öffnung (21) definiert wird, und wobei die Vorsprünge (33,34) am unteren Teil der Seiten des Druckelements angeordnet sind.

Revendications

1. Connecteur à déplacement d'isolant apte à être connecté à un câble (40) comportant un conducteur (42) sur lequel se trouve une couche isolante de couverture (41), comprenant:

(A) un boîtier (10) en matériau isolant présentant deux parois latérales opposées (101), une partie supérieure ouverte et une partie avant ouverte;

(B) une borne de connexion (20) disposée à l'intérieur du boîtier (10) et présentant une ouverture (21) dirigée vers le bas avec une fente (22) qui communique avec elle;

(C) un élément poussoir (30) en matériau isolant présentant une partie supérieure fermée et deux parois opposées, insérable dans le boîtier, et présentant une cavité (32) disposée vis-à-vis de l'ouverture (21) de la borne de connexion et des saillies (33,34) formées sur les côtés respectifs vis-à-vis des surfaces intérieures des parois latérales (101) du boîtier, et qui est inséré dans le boîtier à partir de la partie supérieure ouverte du boîtier, l'élément poussoir étant capable avec sa cavité (32) de pousser le câble (40) placé sur l'ouverture (21) de la borne de connexion (20) de telle manière que le câble soit poussé dans la fente (22) afin de mettre à nu le conducteur (42) en vue de sa connexion à la borne de connexion;

le boîtier comportant:

(a) des premiers moyens de prise (11) prévus sur les surfaces intérieures opposées des parois latérales (101) du boîtier et aptes se mettre en prise avec les saillies (33,34) de l'élément poussoir (30), le câble (40) étant placé sur l'ouverture (21) de la borne de connexion de manière à tenir l'élément poussoir par rapport au boîtier;

des deuxièmes moyens de prise (13); et

des moyens de guidage (12) aptes à guider l'élément poussoir (30) vers une position où le câble est tenu entre l'ouverture de la borne de connexion (21,20) et la cavité (32) de l'élément poussoir (30) avant que le conducteur dénudé ne soit connecté à la borne de connexion (20);

caractérisé en ce que

les deuxièmes moyens de prise (13) sont des gorges prévues sur les surfaces intérieures opposées des parois latérales du boîtier (10) près du fond de celui-ci,

les moyens de guidage sont des gorges de guidage (12) formées sur les surfaces intérieures opposées des parois latérales (101) du boîtier entre les premiers et deuxièmes moyens de prise, lesquels sont des premières (11) et deuxièmes (13) gor-

ges de prise, les gorges de guidage étant formées entre les premières (11) et deuxièmes (13) gorges de prise comme des gorges de guidage (12) plus larges, et la cavité (32) pratiquée dans l'élément poussoir et qui s'ouvre vers l'ouverture (21) de la borne de connexion est formée de deux jambages (35,36) qui forment les deux côtés opposés de l'élément poussoir (30), et l'ouverture (21) de la borne de connexion se rétrécit de façon à s'aligner avec le centre de la cavité (32), laquelle a une forme allongée en U inversé (voir fig. 4), ce qui définit entre cette cavité (32) et l'ouverture (21) dirigée vers le bas un trou d'insertion (50), les saillies (33,34) étant disposées au bas des côtés de l'élément poussoir.

FIG. 1

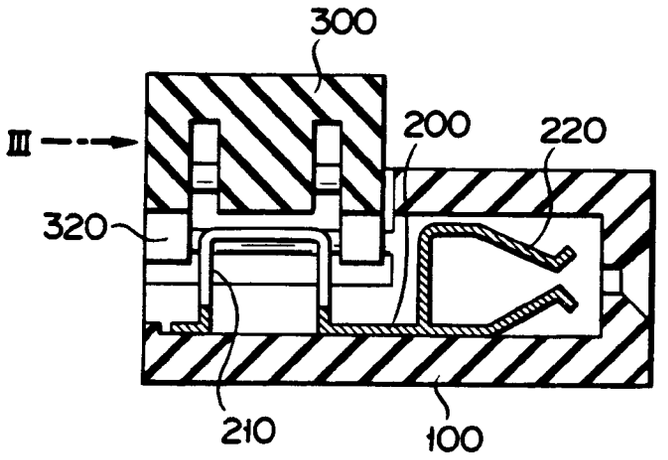

FIG. 2

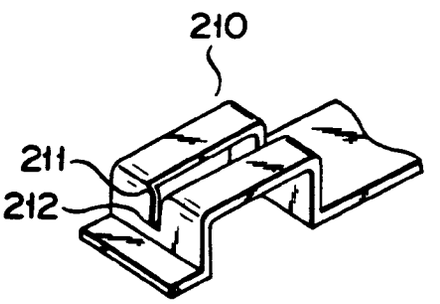

FIG. 3A

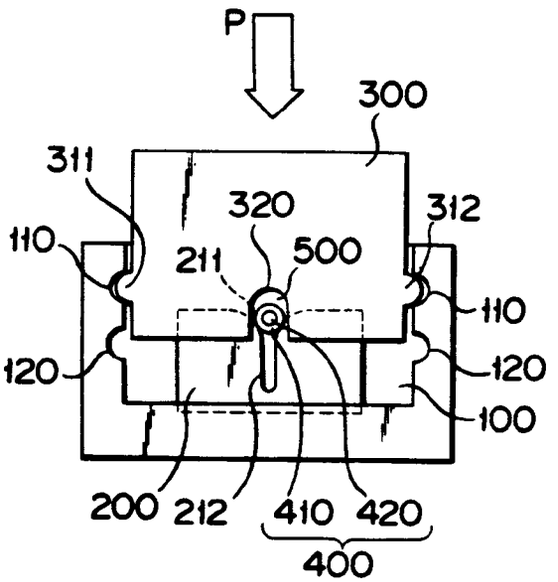

FIG. 3B

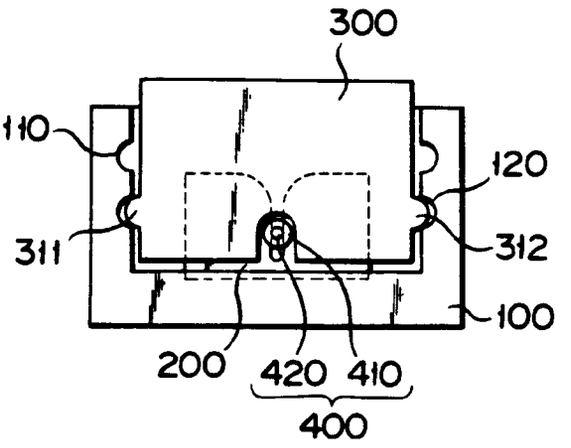

FIG. 4

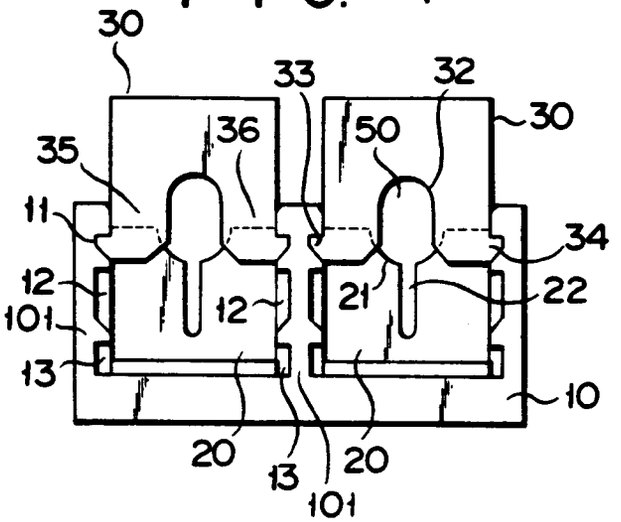

FIG. 5

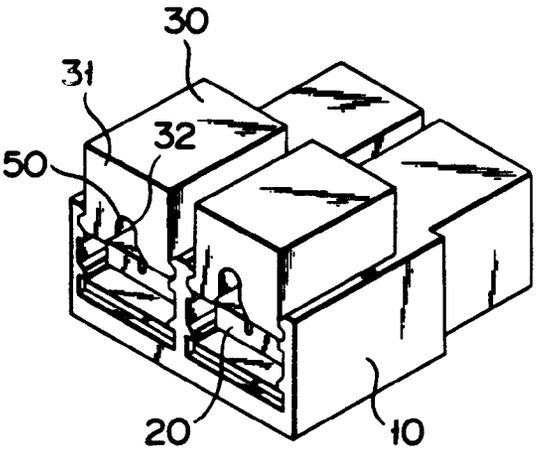

FIG. 6

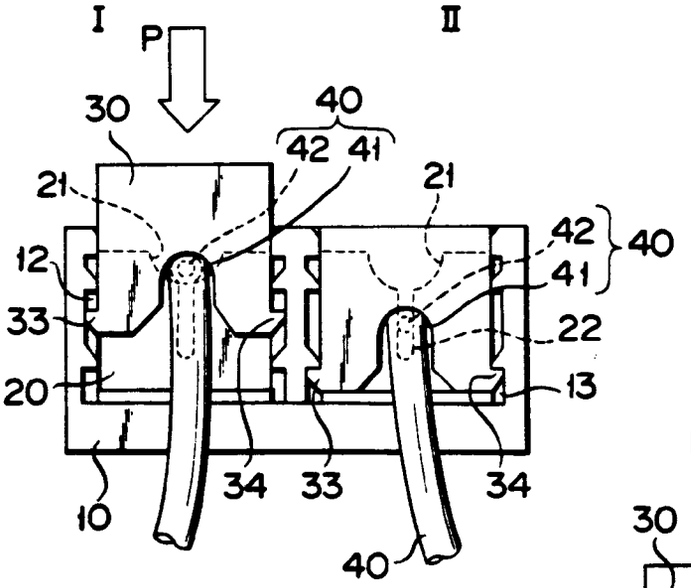

FIG. 7