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Applicant: DU PONT JAPAN LTD.
Kowa Building No. 2, 11-39, Akasaka
1-Chome
Minato-ku Tokyo 107(JP)
Applicant: NEC CORPORATION
33-1, Shiba 5-chome, Minato-ku
Tokyo 108(JP)

Inventor: Sakamoto, Haruo
3-9-7, Tamagawagakuen
Machida-shi Tokyo(JP)
Inventor: Takai, Nobuei
1-7-5, Nishifu-machi
Fuchu-shi Tokyo(JP)
Inventor: Uekido, Kouzou c/o NEC
Corporation
33-1, Shiba 5-chome
Minato-ku Tokyo(JP)
Inventor: Nishiyama, Michiaki c/o NEC
Corporation
33-1, Shiba 5-chome
Minato-ku Tokyo(JP)

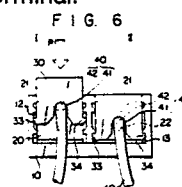
Representative: van der Beek, George Frans
et al
Nederlandsch Octrooibureau Johan de
Wittlaan 15 P.O. Box 29720
NL-2502 LS 's-Gravenhage(NL)

Insulation-displacement connector.

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An insulation-displacement connector is disclosed which includes an insulation-displacement connection terminal(20)-equipped housing (10) having first engaging grooves (11) for holding a cable pushing member (30) an initial state, second engaging grooves (13) for fixedly holding a conductor(42)-exposed cable (40) in a slot (22) of the connection terminal (20) for connection to the connection terminal, and guide grooves (12) provided between the first and second engaging grooves to allow the pushing member (30) to be held. After a cable (40) having insulation layer (41) has been placed over a

tapered opening (21) of the connection terminal, the pushing member (30) is forced down along the guide grooves (12) with the cable (40) compressed over the tapered opening (21) and held there temporarily. Then the pushing member (30) is further pushed to allow the cable (40) to be pinched in the slot (22) of the connection terminal.



Insulation-displacement connector

This invention relates to an electrical connector and, particularly, to an electrical connector including an insulation-displacement connector which displaces an insulating sheath covering on the associated conductor and pinches the conductor in the slot of the contact, to assure an electrical connection between the contact and the conductor.

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 tapered 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 tapered 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.

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.

According to the present invention, an insulation-displacement connector is provided which is adapted to be connected to a cable having a conductor with an insulation layer covering the conductor, comprising:

(A) a housing made of an insulation material having two opposite side walls, an open top, and an open front;

(B) a connection terminal arranged within the housing and having a downwardly-directed tapered opening with a slot communicating therewith; and

(C) a push member made of an insulation material, having a pair of legs with a recess formed therebetween and located opposite the tapered opening of the connection terminal and projections formed on the respective legs and facing the inner surfaces of the side wall of the housing.

The push member is inserted into the housing from the open top of the housing. The member can push the cable, which is placed over the tapered opening of the connection terminal, so that the cable is pushed into the slot of the connection terminal to expose the conductor for connection thereto.

The housing includes:

(a) first engaging means provided on the opposite inner surfaces of the side walls of the housing and adapted to engage the projections of the push member, with the cable set over the tapered opening of the connection terminal, so as to hold the push member relative to the housing;

(b) second engaging means provided on the opposite inner surfaces of the side walls of the housing and adapted to be snap-fitted to the projections of the push member, with the conductor of the cable fixedly held in the slot of the connection terminal; and

(c) guide means formed between the first and second engaging means and adapted to guide the push member up to a position where the cable is held between the tapered opening of the connection terminal and the recess of the push member before the exposed conductor is connected to the connection terminal.

In the connector of the present invention, the cable is placed over the tapered opening of the connection 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 tapered opening (21) with a slot (22) communicating therewith; and

(C) a push member (30) made of an insulation material, having a pair of legs (35, 36) with a recess (32) formed therebetween and located opposite said tapered opening of said connection terminal and projections (33, 34) formed on the respective legs 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 being capable to push the cable (40) placed over the tapered 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 tapered opening (21) of the connection terminal, so as to hold the push member relative to the housing;

(b) second engaging means (13) provided on the opposite inner surfaces of the side walls (101) of the housing and adapted to be snap-fitted in the projections (33, 34) of the push member, with the conductor (42) of the cable (40) fixedly held in the slot (22) of the connection terminal (20); and

(c) guide means (12) formed between said first and second engaging means (11, 13) and adapted to guide said push member (30) up to a position where the cable (40) is held between the tapered opening (21) of the connection terminal and the recess (32) of the push member before the exposed conductor (42) is connected to the connection terminal.

2. A connector according to claim 1, characterized in that said first engaging means, second engaging means and guide means comprise steps (11, 12, 13) provided on said opposite inner surfaces of the side walls of the housing.

3. A connector according to claim 2, characterized in that said steps comprises grooves (11, 12, 13) formed in a direction perpendicular to that in which said push means is pushed into said housing.

4. A connector according to claim 1, characterized in that said legs (35, 36) of said push member (30) are of a type that said pair of legs can be elastically deformed toward or away from each other.

5. A connector according to claim 1, characterized in that said projections (33, 34) have sharp tips provided thereon, said first and second engaging means comprise steps (11, 13), and said guide means comprises a plurality of grooves (14a, 14b, 14c) as a knurled portion so as to allow the tips to be held in the grooves, said grooves extending in a direction perpendicular to that in which said push member is pushed into the housing.

6. A connector according to claim 5, characterized in that said pair of legs (35, 36) can be elastically deformed toward or away from each other.

7. A connector according to claim 4 or 6, characterized in that said push member (30) is made of an elastic insulation material.

8. A connector according to claim 1, characterized in that said recess (32) is inverted U-shaped which is open toward said tapered opening (21) of said connection terminal.

9. A connector according to claim 8, characterized in that said recess (32) is so formed that its center aligns with said tapered opening of said connection terminal.

FIG. 1

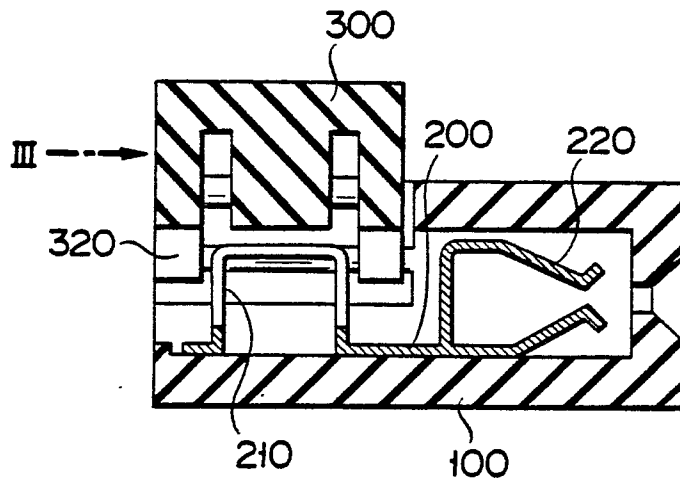


FIG. 2

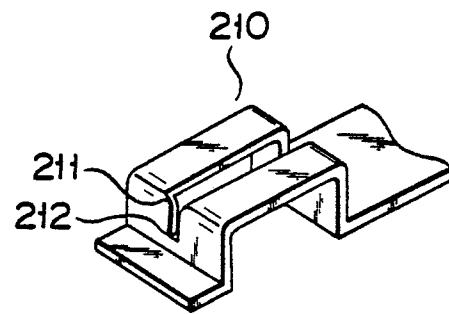


FIG. 3A

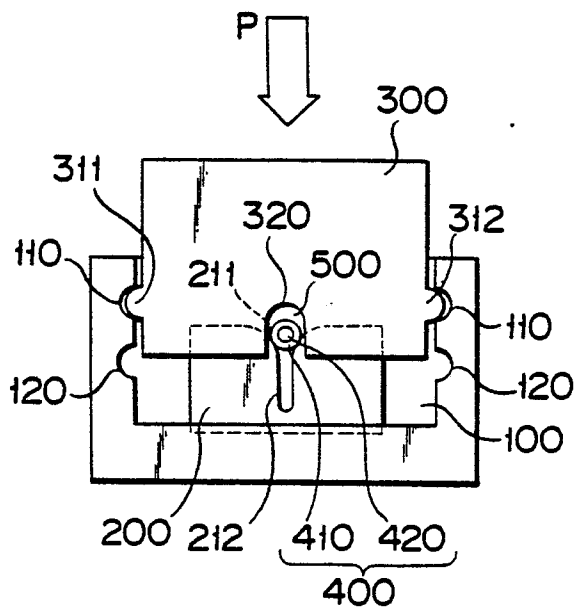


FIG. 3B

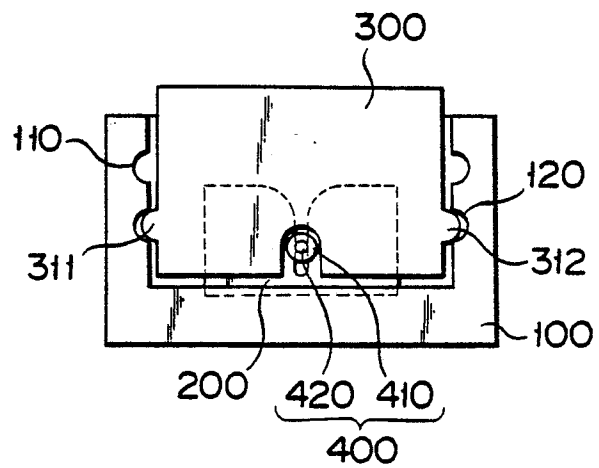


FIG. 4

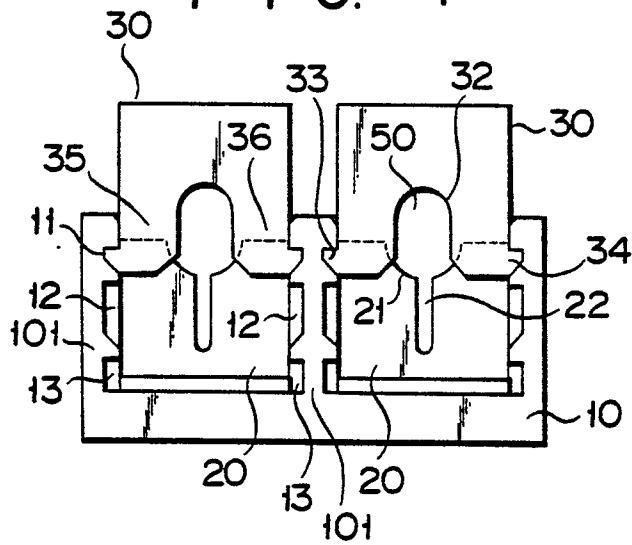


FIG. 5

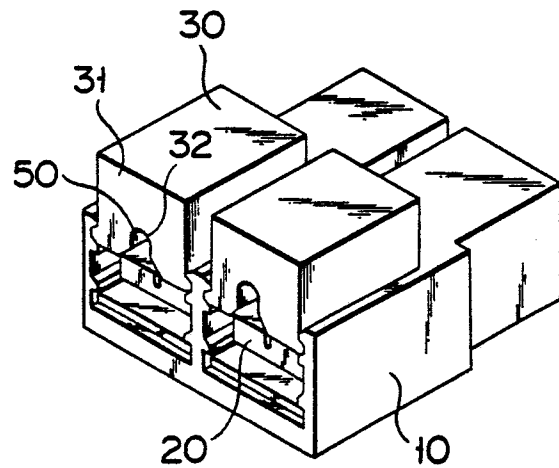


FIG. 6

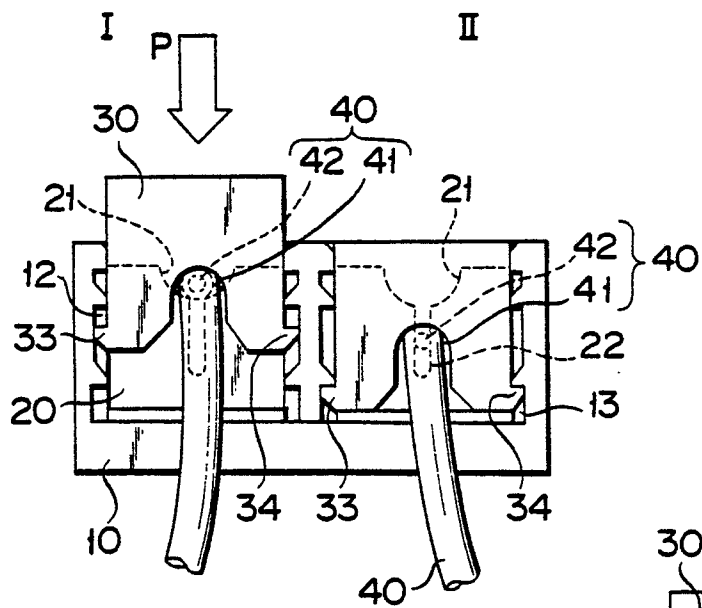
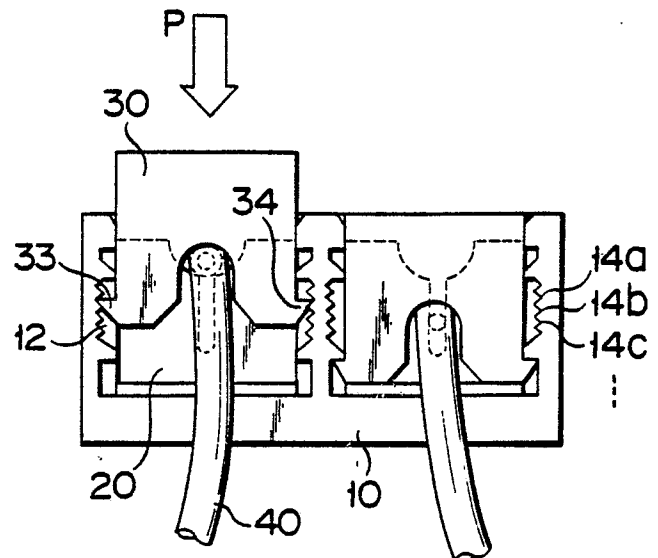


FIG. 7





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-A-3 009 675 (MINNESOTA MINING AND MANUFACTURING CO.) * page 13, line 7 - page 14, line 3; figures 1-7 *	1, 4, 8, 9	H 01 R 4/24
A	DE-A-2 631 094 (BICC LTD.) * page 3, lines 14-19; figure 1 *	1, 5	
A	AT-B- 312 726 (BRÜDER ASSMANN) * figure 3 *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 01 R 4/00 H 01 R 13/00
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 15-05-1987	Examiner LEOUFFRE M.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	